भारतीय मानक
Indian Standard

IS 15883 (Part 3) : 2015

निर्माण परियोजना प्रंबधन — दिशानिर्देश

भाग 3 लागत प्रबंधन

Construction Project Management — Guidelines

Part 3 Cost Management

ICS 03.100.30

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FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Management (Including Safety in Construction) Sectional Committee had been approved by the Civil Engineering Division Council.

A construction project is an endeavour undertaken by a project team on behalf of owner/client to create a built facility suited to the defined functional objectives. From inception to commissioning, the project goes through various distinct stages leading to progressive achievement of the project objectives. Each stage involves specific inputs, processes (both technical and managerial) and deliverables. Typically, the life cycle of a project from commencement to completion involves the following stages:

a) *Project appraisal* — Inception, feasibility and strategic planning;
b) *Project development* — Project brief development, planning and design, finalization of proposals, procurement of strategy, construction documentation including tender drawings, construction drawings, specifications, cost estimates, bill of quantities, procurement documents;
c) *Planning for construction* — Sequencing of project components, planning tools, resource planning and time cost trade off;
d) *Tender action* — Open competitive bidding/pre- qualification of agencies, issue of tender documents, evaluation of bids, negotiation if required and award of work;
e) *Construction* — Execution, monitoring, control, work acceptance ; and
f) *Commissioning and handling over* — Contractual closeout, financial closeout, defect liability commencement, facility handling over.

The distinct features of a construction project include the temporary nature of the project team involved, the evolutionary process of the project deliverables during project development stages and the unique output as the built facility. As a result of these features, unless there is efficient and effective project management, a construction project is faced with challenges of uncertainties leading to time over-runs, cost over-runs, changes in project parameters, loss of quality and inability to meet the functional objectives. While technical soundness of a proposal is an important aspect of a construction project, the management aspects, which involve techno-legal, financial and other issues, have also a significant role in the success of a project. Therefore, management functions and technical processes in a construction project need to be integrated towards achieving project objectives. Top management commitment plays an important role in harmoniously achieving these project objectives. In some of the public domain projects, it may be necessary to share relevant information with public at large through appropriate means.

To provide necessary guidance on effective construction project management, a series of standards are being developed as part of IS 15883 ‘Guidelines for Construction Project Management’. Part 1 General, of the standard since published as IS 15883 (Part 1) : 2009, covers general aspects of overall construction project management. This has been followed by publication of other parts as follows:

Part 2 : 2013 on Time management
Part 4 : 2015 on Quality management
Part 5 : 2013 on Health and safety management
Part 6 : 2015 on Scope management
Part 8 : 2015 on Risk management

The other parts of the standard are under preparation which will cover functions such as procurement management, communication management, human resource management, sustainability management and integration management.

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Indian Standard

CONSTRUCTION PROJECT MANAGEMENT — GUIDELINES

PART 3 COST MANAGEMENT

1 SCOPE

1.1 This standard (Part 3) covers guidelines for cost management aspects of construction project management.

1.2 The cost management aspects during the project formulation and appraisal stage of the project are not covered in this standard. The scope of this standard, therefore, covers the stages subsequent to the stage of approval (when a decision to implement the project including its financing is taken) till commissioning and handing over of the project.

1.3 The provisions of this standard are to be read in conjunction with IS 15883 (Part 1).

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards:

IS No.	*Title*
7337 : 2010	Glossary of terms in project management (*second revision*)
10400 : 2013	Glossary of terms in inventory management (*second revision*)
15198 : 2014	Glossary of terms in human resource development (*first revision*)
15883 (Part 1) : 2009	Guidelines for construction project management: Part 1 General

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7337, IS 10400 and IS 15198 shall apply.

4 GENERAL

4.1 Need for Cost Management

A project is undertaken to create a built facility within pre-determined budgeted cost utilizing the planned resources. Cost management is an essential component of project management and aims to achieve satisfactory project cost performance through efficient project planning and execution within the budgeted cost. Cost management of the project is necessary for the following reasons:

a) It is essential that the project cost is determined with reasonable accuracy and the project is accomplished within planned time frame and resources.
b) To develop realistic cost estimates to predict the likely final cost as it provides the basis for project budgetary processes.
c) Application of cost management on all stages of the project.
d) Cost estimates help determine the project feasibility, obtain financial approvals, plan project cash flow, provide basis for bid evaluations and project durations.
e) The client's need for cost management is to achieve the creation of the built facility with maximum value at economical cost within the planned time frame. The contractor's need for the cost management is to organize and control the utilization of the resources and produce the deliverables within the agreed cost and time frame adhering to the quality and safety standards.

4.2 Overview of Cost Management

Project cost management aims to complete the project within the authorized budgeted cost. The cost management essentially covers the processes related to cost estimation, cost planning and budgeting, and cost monitoring and control. These processes are applied in all the following stages of the construction project:

a) Pre-construction stage:
   1) Project development,
   2) Planning for construction, and
   3) Tender action.
b) Construction stage.
c) Commissioning and handing over stage.

The bearing of the other project management functions related to scope, time, quality, risk, procurement, health, safety and environmental aspects are to be recognized and duly considered in the cost management processes.

4.3 Organizational Structure for Cost Management

4.3.1 The organizational structure and the mechanism for the implementation of the cost management functions are dependent on the type of procurement method adopted and the contractual arrangement between the project participants (client, design professionals, management consultants and contractors) specifying their roles and responsibilities and coordination arrangements.

4.3.2 In the traditional design-bid-build model, two project management teams are involved; one dealing with the client's objectives in all the project stages and the other managing the contractor's interests during the post-contract award stages.

4.3.3 As the client is ultimately bearing the project cost, the client represented project management team shall be primarily responsible for managing the overall cost management functions with the main objective of keeping the project completion cost within the client's project budget limiting the cost over-runs.

4.3.4 During the pre-contract project development stages, the cost estimation functions are carried out through the cost estimators/quantity surveyors and managed by the client's project management team. This team shall also be responsible for coordinating the value management processes for cost optimization and also undertake the cost related bid preparation and evaluation processes.

4.3.5 In some cases, for better collaboration, the cost estimation processes are undertaken by the lead design consultant as a parallel process along with the design development by engaging the cost estimators/quantity surveyors as a part of the design team. However, the client's project management team shall closely coordinate with the design team to ensure that the cost estimates are in tune with the client's functional requirements and the budgetary costs.

4.3.6 During the post contract award stages, the client's project management team shall be responsible for managing cost implied change orders and other cost variations so that the costs incurred during project execution are in accordance with the planned baseline costs. The focus of the contractor's cost management team during this phase shall be on the efficient utilization of the resources so that the project completion is achieved with the desired markup.

5 SCOPE OF COST MANAGEMENT

5.1 General

The scope of cost management shall cover the effective implementation of cost processes with appropriate techniques in estimating budgeting and controlling costs with the objectives of project completion within the approved budgets with authorized variations.

5.1.1 The cost management processes shall be applied in all the project phases as cost is expended in all the phases to achieve the expected deliverables in these phases.

5.1.2 A cost management plan shall be established based on the nature, objectives and specific requirements of the project to detail out the proposed cost management methodology specifying the required outputs, techniques and deliverables.

5.1.3 The cost management processes shall be detailed out of project scope through the scope statements and project work break down structure (WBS). The WBS shall form the basis for the cost budgetary allocations and assignments of control accounts for the components of the WBS for the cost tracking and control processes.

5.1.4 Wherever required, the cost management processes shall be integrated with the process of other project management functions. The time and cost processes shall be aligned for developing cost integrated schedules and achieving the project completion with the planned time and cost targets.

5.1.5 While provisions relating to project formulation and appraisal stages are not covered in this standard, it is to note that during project appraisal phase, the pre-design cost estimates are worked out for determining the financial feasibility as part of establishing the overall project feasibility.

5.2 During Pre-construction Stage

5.2.1 The scope of cost management during pre-construction process is to identify the various types of resource requirements, determine the quantum and timing and convert these resource requirements into monetary terms of costs for carrying out the project activities and estimate the costs of obtaining the deliverables. Acceptable levels of contingencies are added to account for unanticipated minor variations.

5.2.2 Selection of project delivery system and contract strategy, selection of design professional and management consultants are some of the cost influencing aspects which are decided in pre-design stage.

5.2.3 The initial overall cost budget of the project is developed under different relevant cost subheads amenable for easier cost aggregation and budgetary allocations. In addition to the cost of the main building/ infrastructure works, the cost shall have the following components:

a) Capital costs for land procurement and its development.

b) Costs for site surveys and geotechnical investigations.

c) Cost of enabling infrastructure works.

d) Cost of engaging design professionals and management consultants.

e) Fee for approvals by the municipal/ development authorities and other statutory approvals.

f) Other costs chargeable to project.

5.2.4 Initial budgets prepared in the early stages of the project are modified and updated with the availability of more information in the subsequent project design and development stages taking into consideration the budgetary constraints. While developing the overall budgetary costs, the component-wise target costs are also assigned as a part of the cost planning and control measures.

5.2.5 Before the start of work, cost budgets and time schedules are integrated to establish the cost baseline for the purpose of monitoring and control.

5.2.6 The cost management processes during the pre-construction stage of the project provides greater potential for optimizing the project costs, while during construction stage the cost management emphasis is more on monitoring and control mode for adherence to the budgeted costs.

5.3 During Construction Stage

During construction phase, the scope of cost management is to monitor and track the cost status for updating the project budget with actual costs incurred and manage the changes to the cost baseline. The processes shall cover the comparison of actual costs with budgeted costs analysing the reasons for the variations. The scope of cost management in terms of cost related processes carried out in different project stages are shown in Table 1.

5.4 During Completion and Handover Phase

This close out phase shall cover documentation of as built costs, risk encountered and processes related to financial closure and approvals. Comparison of final cost with the original approved cost estimates and analysis of reasons of cost variance shall be brought out.

Table 1 Mapping of Cost Related Processes in Project Stages

(*Clause* 5.3)

Sl No.	Project Phases	Planning and Design Processes	Cost Related Processes
(1)	(2)	(3)	(4)
i)	**Preconstruction Phase:**		
	a) Project development	1) Project scope defined	i) Initial budgets
		2) Development of project brief	ii) Project delivery and contract strategy
			iii) Financing strategy
	b) Planning for construction	1) Engineering surveys and investigations	i) Preliminary cost estimates
		2) Conceptual design of alternatives	ii) Elemental cost analysis
		3) Preliminary/schematic designs of selected alternatives	iii) Value engineering iv) Constructability analysis
		4) Submission drawings for local bodies/development authorities	
	c) Tender action	1) Detailed design and working drawings and specifications: i) Architecture ii) Structural iii) Services iv) Development works	i) Detailed cost estimates/bill of quantities ii) Invitation of bids iii) Bid evaluation and work award iv) Contract agreement v) Construction schedule
		2) Preparation of tender document.	
		3) Pre-qualification process	
		4) Pre-bid construction schedules	
ii)	**Construction phase**	1) Construction drawings of all related disciplines (architectural, structural, services) and site development works	i) Project baseline cost and schedule ii) Site mobilization iii) Cost monitoring and control
		2) Construction activities and phase completion	iv) Authorized revisions to baseline costs and schedule
iii)	**Completion and handover phase**	1) Testing and commissioning of services	i) Documentation of as built actual costs including cost per unit parameter
		2) Contract closure	
		3) Handing over	ii) Review Elemental costs.
		4) Post utilization evaluation	iii) Cost risk encountered and final revised project cost and financial approvals iv) Preparation of operation and maintenance manuals

5.5 Value Management and Value Engineering

Application of value management and value engineering methodology is one of the important cost management processes. Application of value engineering principles on the selected alternatives enables the selection of the cost effective proposal with maximizing the value at the optimum cost. It is an organized approach for providing necessary functions at the lowest cost without compromising quality, reliability and performance parameters. Although the value engineering exercise could benefit the project objectives in the entire project life cycle phases, its potential for cost savings is maximum during preliminary and detailed design and estimation stage.

5.6 Mapping of Cost Related Processes in Project Phases

Cost related processes are carried out in each of the project phases along with the planning and design related processes as shown in Table 1. Based on the level of information available, project costs are progressively developed through different estimation methods as close as possible to the final expected costs. In the pre-construction phase the cost management focus is on the cost reduction/cost optimization potential of the project costs. In the tender evaluations and work award phase, final project budgetary costs are firmed up. Before start of the work, the budgetary costs of individual activities/work packages are integrated with the project schedule and baseline cost profile is established. During construction phase, the emphasis is on cost monitoring and control process to complete the project within the budgeted costs with approved variations for the changes [*see* **6.4.3.1**(f)].

6 COST MANAGEMENT

6.1 Resource Management

6.1.1 *Pre-construction Phase*

Resource management of construction project comprises planning, estimation and procurement of various types of resources during pre-construction stage and control of their utilization during execution stage. In the pre-construction stage of the project, decisions and procurement processes related to the engagement of planning and design professionals and management consultants are made by the client organization following the established procurement procedures and practices depending on the type and magnitude of the project. For large magnitude projects, criteria like quality and cost based methods are used for the selection of planning and design professionals and consultants. Selection of construction firm and contractors for project execution is an important component of resource management and carried out during pre-construction process depending upon the type of project delivery system and associated contract type envisaged for the project implementation.

6.1.2 *Construction Phase*

For the project execution, the physical resources required are manpower of different categories, construction materials, equipment and other site specific infrastructure facilities in terms of water, power, roads, communication, security and other required facilities, as follows:

a) *Manpower resources* — Manpower resources under the categories of construction workers and technicians shall be planned for their quantities, skills and time of requirement based on the project details, WBS, time schedule and estimates. Resource histograms shall be prepared for different categories of work force which can be done by using standard project management software with in-built labour constants. Necessary resource levelling shall be carried out to sort out the peak demands exceeding the resource availability and also to resolve idle labour situations by rescheduling certain activities within the available floats without delaying project completion time. Planning shall be done to take care of any situation of non-availability of local labour force necessitating import from other localities as in case of projects in remote locations.

b) *Construction materials* — Construction materials constitute a major proportion of project cost and hence sound material management process shall be established as a subset of cost management process. Material resource management essentially involves identification of various categories of material requirements, market survey about their source of availability, cost and leads involved, estimation of total quantities, determining the quantum and timing of requirements as per project schedule, procurement process from suppliers and delivery at site. The site related material management processes are storage and handling, usage in works, and site practices for minimization of wastages and prevention of environmental degradation.

c) *Construction equipment* — The modern construction practices adopt mechanized construction through the extensive use of construction equipment for various project activities for improving the quality and speed of construction. Some of the major construction equipment usage are the

equipment for earthwork operations; concrete production, transportation, placement and compaction; false work and shuttering; pile foundations; well foundations; launching of girders for bridges diaphragm wall constructions; road surfacing; material hoisting and handling; and smaller portable equipment for individual construction activities. During the equipment resource planning process, the equipment type and production capacities are decided based on the project requirements including the site constraints, on site availability of the equipment and durations of their deployment are worked out in relation to project schedule and quantum of work involved. For example, the capacity of concrete batching plant is worked out based on the quantum of concrete operations which are levelled considering the peak and low demand volumes. In the procurement process of equipment, economic considerations of owning and operating costs or hiring on rental/lease costs needs to be considered. On the whole, the equipment resources should be properly planned and deployed for improved speed and quality construction at economic costs.

As part of the site management processes, due attention shall be given for the location of the equipment and their onsite maintenance, planning and location of the site offices and laboratories, location of the material storage and other safety and site protection measures.

6.2 Cost Estimation

6.2.1 *Approximate Cost Estimation During Concept Design Stage*

This shall be done as follows:

a) During the concept planning and design stages workable design solutions, with alternative building materials, technology options and services systems shall be worked out by the respective design disciplines, the cost estimation of these alternatives shall be determined and a final design scheme selected based on the considerations of cost, time and other specific project objectives. It is recommended to evaluate these alternative designs through the application of value engineering principles.

b) The approximate cost estimation methods adopted during this concept stage may be analogous estimation technique based on the cost data from the past projects. Analogous estimation should consider the cost of recent past projects and make adjustments for escalation factor for time, location factor and other cost influencing factors for the proposed project.

6.2.2 *Preliminary Cost Estimation During Scheme Design*

This shall be done as follows:

a) The estimate developed for the final scheme design shall cover all the cost components of the project and the scope of project envisaged shall be firmed up. The exclusions shall also be brought out.

b) The estimate shall form the basis for according of approvals by the client and for monitoring of project cost.

c) The estimate shall be framed based on the schematic designs of all the components. The scheme design proposals should be further considered through the application of the value engineering exercises before proceeding with the detailed designs.

d) The estimate shall take into consideration all the site specific information like, topographic survey, geotechnical investigations, availability of peripheral services like approach roads, water, power, etc. Local construction practices and availability of local manpower shall also be considered.

e) The estimate shall take into account the basic cost related information on construction materials, manpower costs, machinery and other cost influencing parameters. Provision shall also be made in the estimate for the likely escalation in the cost of materials and manpower during the planning and execution phase of the project.

f) The estimate shall also take into account the basic cost related information on construction materials, manpower costs, machinery and other cost influencing parameters.

g) The estimate should bring out all the cost drivers that significantly influence the project costs. Besides the direct costs the preliminary cost estimate shall include cost towards design professionals, project management services and other specialized services. Project approval fee/charges levied by local authorities shall be included. Usually separate estimates are processed for the land acquisition and its security measures.

h) The realistic project duration required for the pre-construction stage activities, and project execution shall be worked out based on the

magnitude and nature of the project and funds availability and incorporated in the preliminary project estimate. The project procurement strategy along with the type of contract envisaged shall also be firmed up in this stage. The project time lines with specified project durations shall be decided with important milestone achievements. Realistic time durations should be allocated for the pre-construction planning and design and tender preparation and other enabling activities for the efficient implementation of the project execution process.

j) Prior to the project cost estimation, topographical survey and geotechnical investigations should be carried out to provide design inputs that would have bearing on the project costs.

k) Life cycle costing, value engineering and constructability analysis should be used to optimize the time and cost and improve the quality aspects. These techniques not only aim to improve the value of the product but also to improve the management processes and decisions and services.

m) Provision may be made for contingencies to account for the cost variations which are likely to occur but are not identifiable at the time of preparation of the estimates (*see* **6.2.4**).

6.2.2.1 *Building projects*

The following which are generally used for preliminary cost estimation in case of building projects, may be adopted:

a) *Floor area/total built-up area method* — Floor area/total built-up area method using unit area costs is commonly used for the preliminary cost estimation of the building projects. In this method the total built up area of the building is determined from the architectural drawings and multiplied by the unit cost per square meter of similar category of constructed buildings available from the database of construction costs.

This method of cost estimation for its application should take into account the following cost influencing parameters:

1) Construction technology aspects and proposed building specifications In accordance with the current code of practices like durability aspects, earthquake resistance, fire safety, etc;
2) Foundation systems based on subsurface conditions;
3) Provision of basements and water proofing technologies;
4) Number of storeys and large spans involved;
5) Mechanized constructions and formwork technologies;
6) Use of sustainability approach for building planning, design and construction; and
7) Other costs for specialized items and services.

b) *Construction cost index* — Construction cost index (CCI) serves as an important tool in the preparation of the cost estimates of the projects. Among the different types of construction industry related indices, CCI is commonly used as a measure of increase in construction costs with reference to a selected base year cost index which is usually taken as 100. CCI is location specific and its calculations takes into account the increase in cost of major materials, labour categories and equipment usage in the project over the corresponding rates of these components in the base year considered. The relative weightage contribution of these cost components is pre-determined based on the of project wherein the type and quantum of materials, labour and equipment usage normally varies. In building projects, these weightages also vary based on the materials of construction and the structural systems adopted. A format for the calculation of building cost index and city-wise building cost indices are periodically published by construction organizations The CCI may be used for updating of the preliminary estimates prepared based on the available plinth area rates of the earlier year to the current cost levels.

c) *Elemental cost method* — Elemental cost estimation is another approach that can be used to work out the preliminary cost estimates. This approach is more informative and along with value engineering technique provides opportunities for the consideration of alternative design solutions for the building elements/components. This method is broadly outlined in Annex A.

6.2.2.2 *Infrastructure projects*

The following methods which are generally adopted for the preliminary cost estimation of infrastructure projects like roads, bridges, water supply, sewerage

drainage, airports, dockyards, and dams, may be adopted:

a) For road projects, based on the road layouts, cross-sectional details and construction material specifications, geotechnical characteristics worked out in the planning process, the parametric cost data in terms of cost per unit length or cost per unit surface area of the road compiled from the past projects with suitable enhancements to cover current costs are used to obtain the preliminary cost estimates. Improved preliminary cost estimation could be made based on the approximate quantities of items worked out from the preliminary layouts and designs could be used with applicable unit rates of the items of work.

b) For bridge projects, the preliminary cost estimation needs to be based on the preliminary designs and drawings made considering the traffic requirements, site constraints, subsurface conditions, etc. The approximate quantities of items are worked out from the preliminary drawings and costing done with available information on the unit rate of these items. For the bridge structures, elemental costing method is a useful approach wherein costing of individual bridge elements like foundations, sub-structure, deck structure, bearings, approaches, railing, drainage, lighting, landscape works, etc, is done. As the bridge deck structure constitutes a major cost component, cost data on cost per unit plan area of the bridge deck obtained from the past projects may be useful for the preliminary cost estimation. This unit cost information related to deck structure is dependent on the parameters like span; width of the bridge; deck cross-section; structural system: material type in terms of steel, reinforced concrete, prestressed concrete, precast or cast *in-situ* and concreting composite systems, and erection and other construction technology aspects.

c) For infrastructure services such as water supply, sewerage and drainage systems for township like projects, database on the cost of these services worked out as cost per unit area of the site from the past projects could be adopted with suitable enhancements for the time factors. Such unit area costs depends on the parameters like type of developments (low-rise, medium or high rise), housing layouts, density and site characteristics. For more realistic preliminary cost estimation, preliminary layouts and designs of these services are worked out to arrive at the approximate quantities of the items and with the information on current unit rates of these items, the preliminary cost estimates are worked out.

6.2.2.3 *Other structures*

For other structures like airports, dams, dockyards and hydel project costing may be based on per unit costs of similar structures where such data is available. Where data is not available, approximate quantities based on preliminary designs of various components may be worked out and cost worked out based on prevalent market rates/schedule of rates as available.

6.2.3 *Detailed Cost Estimation Based on Detailed Designs*

The detailed cost estimation shall be done as follows:

a) Detailed cost estimates are prepared based on detailed designs. These detailed estimates are prepared for trade-wise sub-heads of work. The trade-wise bill of quantities (BOQ) is prepared based on detailed drawings following the Indian Standard methods of measurements of the items of work involved. The nomenclature of the items of the work should be fully described without any ambiguity as this forms the basis for the payment of bills of executed items in the contract document. The item nomenclature shall be based on the proposed works specifications.

b) Schedule of rates and analysis of rate documents periodically published by the construction organizations providing unit rates with item nomenclature are adopted for the preparation of the detailed cost estimates for building and infrastructure civil, electrical, water supply, sanitary and drainage works, etc. For bridge and hydro-electric projects similar items available in these documents can be utilized. For the specialized and other project specific non-schedule items detailed analysis of rates should be worked out on the basis of similar works carried out in the past, current market rates or based on any other rational basis for the preparation of the detailed estimates.

c) The bill of quantities of items of work in standard measurement units can be prepared manually or more efficiently through computer aided methods for accuracy and speed of preparation. Commercial software integrating the detailed drawings with

quantity surveying process can be advantageously used. These software can also used to monitor the as executed quantities in relation to the estimated quantities during the project execution as a cost tracking and controlling process.

d) The reasonability of detailed estimates can be broadly assessed through the methodology of elemental cost analysis. In this method, the quantity and cost of the building elements worked out in the detailed estimates are expressed in terms of unit floor area of the building and compared with similar quantity and cost in similar category of constructed buildings. This approach can also be used for infrastructure works considering the elements/ components of such works. The concept of elemental cost analysis for a typical building work is given in Annex A.

e) The main purpose of the detailed cost estimate shall be to predict the cost as nearly as possible to the expected cost of construction based on market condition and hence the detailed estimates worked out shall consider the prevailing rates of material and labour and other market condition. The construction cost index may be used to arrive at the percentage enhancement to be added to update the detailed estimate costs of the projects prepared based on the schedule of rates documents of the earlier years.

6.2.4 *Cost Contingency*

6.2.4.1 While framing the project cost estimates a certain amount of cost contingency shall be added to the base estimates to account for the cost variations which are likely to occur but are not identifiable at the time of preparation of the estimates. Incorporation of cost contingency is a cost related risk management approach to reduce the cost over-runs to an acceptable level. The quantum of the contingency is influenced by the project size, complexity, associated level of risks and level of information available during different stages of the project development. Compared to new constructions, repair/rehabilitation/re-modelling works and below ground works may involve greater uncertain conditions requiring increased contingency provisions.

6.2.4.2 The project cost contingency shall be considered in two components namely, design contingency to account for the design changes and the construction contingency to cater to the changes during the implementation phase like change in site conditions.

6.2.4.3 The traditional approach of providing cost contingency is through a fixed percentage of the base cost estimate based on the experience on the past projects and such percentage is usually 3 to 5 percent and this percentage may increase further for projects involving greater uncertainties. A more realistic determination of project cost contingency can be worked out based on probabilistic methods taking into consideration the various cost related uncertainties in the project.

6.2.4.4 Estimates may also include the amount for the management reserve to be funded for the project. Management reserve is an amount of the project budget withheld for management control purposes and are reserved for unforeseen work that is within scope of the project. The management reserve is not included in the cost baseline but is part of the overall project budget and funding requirements. When an amount of management reserve is used to fund unforeseen work, the amount of management reserve used is added to the cost baseline, thus requiring an approved change to the cost baseline.

6.3 Cost Budgeting

6.3.1 *Costs and Schedule Integration*

It shall be done as follows:

a) The integration between the detailed project costs and project time schedule shall be carried out in the cost planning and budgeting process before the start of construction. The project cost considered at this stage is the firmed up budgeted costs of the work packages/work items of the accepted tendered costs as per contract finalized with the successful tenderer. This contract cost may vary from the detailed estimate cost developed in the estimation stage due to the prevailing market conditions.

b) For the traditional item rate contracts of the design-bid-build delivery model, the contract cost shall be in the form of trade-wise items of work of the work package. For building projects, the work packages should include civil works; internal plumbing, electrical and air conditioning works; site development works such as roads, storm water drainage, water supply and sewerage work, etc. In case of projects like major roads, bridges and specialized works, the work packages should include the items for relevant trades of these projects and the relevant costs for such items. For the cost and schedule integration the item wise project costs shall be converted into project activity costs. The activities shall be identified in the scheduling process based on work break down structure methodology. This

process of working out activity costs from the items involved in the activities and determination of their occurrences in the timeline of project schedule is generally termed as cost planning process and the output of this process is the project baseline cost curve and this forms the basis for the cost monitoring and control process. The baseline cost curve is called as 'planned value curve' and this is also known as 'budgeted cost of work as scheduled'. This term is used to indicate that each of the project activity is assigned with a budgeted cost that needs to be monitored and controlled.

6.3.2 *Development of Cost Baseline*

The following information are required to develop the graphical profile of the cost baseline (planned value curve):

a) Itemized costs of work packages.
b) Individual activity costs derived based on the costs of items involved in the particular activity.
c) Bar chart form of project schedule containing the project activities with their durations and costs.
d) Information related to the proportion in which the activity cost is incurred in the duration of the activity since for certain activities the cost incurrence may not be in linear proportion with time duration.
e) Cost break-up of activities in terms of its components, materials, manpower and equipment, etc.

Once the proportion of the planned costs of the individual activities are known in each block of project durations (fortnightly or monthly), the summation of the monthly or fortnightly planned cost of the project shall be obtained. From this, the cumulative as-planned costs over the project duration shall be obtained forming the project baseline cost projection. The nature of this cost curve is usually a flat S-shaped curve depending upon the type and characteristics of the projects.

6.4 Cost Monitoring and Control

6.4.1 *General*

Cost monitoring and control shall be exercised on the processes and resources utilized in each of the project stages. The methods of cost monitoring and control may vary depending on the size and characteristics of the project and other project requirements. The approach should be simple and effective for its implementation. Generation of large amount of information may obscure the effectiveness of the approach. The approach shall not merely concentrate on the past cost occurrences but shall be forward looking to forecast the cost trend and provide early warnings for timely corrective control actions. The appropriate cost monitoring and control methodology shall be decided prior to the start of the project with the procedures established and documented.

6.4.2 *Cost Monitoring*

Cost monitoring shall involve the following:

a) It shall involve tracking and comparison of the actual cost being incurred during the course of project stages with reference to the baseline costs budgeted for each of the activities in the project stages. Depending upon the type, nature, size and complexity of the project, the cost monitoring shall be done at various prefixed intervals of time and/or at specified milestones.
b) Monitoring of the costs during preconstruction, construction and handing over stages shall be done by having closer watch on the various cost related processes as listed out in the Table 1.
c) During the project development, working out a realistic cost budget for the defined project scope forms an essential component of cost monitoring in this stage.
d) The appropriate type of project delivery and contract type needs to be selected that would enable closer cost monitoring processes.
e) During the planning and design stage, the development of cost estimates needs to be monitored to adhere to the initial budgeted costs.
f) Techniques of value management, value engineering, constructability analysis, elemental cost analysis may be used to carry out the cost reviews with the considerations for alternative designs, specifications and construction processes.
g) During detailed estimation processes, the accuracy in the preparations of the bill of quantities with correct item nomenclature with workable specifications needs to be monitored through review processes to avoid variations and changes during the project execution.
h) During construction stage the cost monitoring processes to bring out the deviations from the budgeted costs may be carried out through methods like periodic cost reporting systems, variance analysis and cost performance measurement techniques.

6.4.3 *Cost Control*

The cost control processes involve actions that are required to control changes/deviations between the budgeted costs and the actual costs so that the completed costs are within the budgeted costs including authorised revisions.

The techniques of cost monitoring and control broadly fall into the following two categories:

a) Direct cost control of resource utilizations, and
b) Measurement of cost performance through earned value management (EVM).

6.4.3.1 *Direct cost control*

In this approach, the total project cost shall be divided into the following cost elements and control is exercised on these elements individually on each major items/subheads of the work:

a) *Physical progress* — It is one of the important cost influencing parameters as time delay in project execution and handing over would result in cost escalation of resources and loss of revenue/usage due to non-completion of built facility within the stipulated time frame. Hence control on physical progress through schedule control techniques is an important aspect of cost control.
b) *Manpower control* — For each of the work items the actual manpower utilizations are recorded and compared with the planned budgeted values. From these records the item-wise actual unit cost (man-hour/man-day) for the labour component are arrived and controlled to keep within the corresponding budgeted costs. These man-power control measures are essential for labour intensive work items. In major contracts, item-wise labour cost component is managed/controlled by engaging labour rate contractors on labour rates for the unit quantity of work items.
c) *Material control* — As material constitutes the major cost component of work items, its effective utilization minimizing the wastage forms an essential component of direct cost control. The actual consumption of materials are recorded and compared with the theoretical/budgeted requirements and deviations beyond the permissible variations are identified and corrective actions taken. The excessive material utilization may arise due to improper storage, handling and incorporation in the work process. Waste minimization should be achieved by proper material storage, handling and measurement procedures. Optimum use of materials should be planned as a part of design process. Techniques of lean construction can be adopted for waste minimization strategies. Mechanization process integrated with material handling could achieve optimum use of material resources.
d) *Equipment control* — For work items involving equipment, the equipment cost component shall be substantial requiring effective equipment utilization control. The cost of equipment usage per unit quantity of work item executed should be recorded and monitored in comparison with the corresponding budgeted costs towards the equipment deployment (for example, cost of equipment usage per unit quantity of excavation or quantity of concrete produced and placed in position). The equipment hourly/daily utilization cost are arrived from records of capital cost, depreciation value, maintenance and repair costs, fuel cost and installation operational and demobilization costs. The records of daily job wise deployment, number of hours worked, repair/idle time should be maintained. As an overall cost management strategy, the economics of owning or hiring options are to be worked out based on capital cost requirements, utilization potential and other relevant factors.
e) *Sub-contractor control* — In construction contracts, sub-contractors are engaged to carryout identified components and/or specialized works like dewatering, waterproofing, HVAC and other services. Proper coordination needs to be ensured to make the work-front available for the sub-contractors.
f) *Cost of changes* — Cost of changes have major role in increasing the project costs over the original budgeted costs and hence need proper control procedure to deal with such cost changes. The changes may arise on account of design changes, change of construction methods and material specifications, additions and substitutions, and other reasons. As far as possible, changes should be minimized with proper planning and design in the pre-construction stage with the collection of all relevant information. Every proposal for changes involving cost implications shall be examined for their justification and reasonability and their cost and time implications should be approved by the competent authority. As a part of the contract document, the permissible variations,

initiation of changes and their control process should be established. The changes may be initiated by the design department or by the field unit depending upon its origination. Variations in the quantities of high cost items should be examined and controlled.

g) *Consultants* — Professional fees to the design and management consultants are treated as direct costs and budgeted as part of project costs. Quality and cost based selection of consultants should be carried out in large value consultancy works and such selection process should be decided at the pre-design phase of the project. Cost management functions shall be the part of the project management consultancy besides other aspects of project management.

h) *Other costs* — Other costs may be on account of salary, field and office expenses, site office, temporary facilities and utilities, security services, equipments and tools, insurances, taxes, etc.

6.4.3.2 *Earned value management*

Earned value management (EVM) is a valuable tool for the cost and schedule monitoring and control of the construction projects. The technique is used as a tool for the measurement of current time and cost performance and forecast the future outcomes. The technique is detailed out in Annex B.

EVM considers project schedule status and updated costs incurred at periodic intervals and provide an integrated approach for the measurement of cost and schedule performance during the course of project implementation. The performances are characterized by the variance between the planned performance and actual performance. The technique also forecasts the future cost performance based on the current cost trend and enables early warning signals for taking corrective measures in the event of unfavourable cost trends.

Implementation of earned value methodology provides the following information and enable managerial actions in situations of unfavourable cost and time performance:

a) Adherences of the actual costs incurred to the budgeted costs and identify the cost over-run or under-run.
b) Adherence of the time progress to the as planned schedule and identify the time over-runs.
c) Over or under utilization of resources.
d) Forecasting likely completion cost based on observed cost trend.

In construction contracts, it is valuable to incorporate the EVM methodology for monitoring the time progress and cost reporting and control processes. The limitations of the EVM come from the fact that the progress measurement based on the cost expenditures may not necessarily be in tune with the value creations. Also, the successful implementation of the method depends upon the extensive and accurate documentation of the periodic costs on various resource utilizations to capture the actual cost occurrences in relation to the project schedules. However, computerized approaches could take care of these aspects.

6.5 Post Construction Review and Documentation

All project cost documents relating to built cost, as built unit area rates, elemental/ component costs and cost related risks encountered shall be analyzed and preserved for later reference.

ANNEX A

[*Clauses* 6.2.2.1(c) *and* 6.2.3(d)]

ELEMENTAL COST ESTIMATION METHOD

A-1 GENERAL

Elemental cost estimation approach can be used in the early stages of the design process to work out the preliminary cost estimates. This approach is considered more informative and provides opportunities for the consideration of different alternative design solutions for the building elements/components. The method is broadly outlined in **A-2** to **A-4.**

A-2 ELEMENTAL CLASSIFICATION

A-2.1 The elemental classification is fundamental to elemental cost estimation and cost analysis. In this approach the built facility (buildings, roads, bridges, etc) as a finished product is divided into various components called elements which usually perform a function regardless of its design, specification and construction. These elements are usually divided in to three or four levels: major group elements, group elements, elements and sub-elements. Such classification provides a hierarchical frame work of division of the entire built facility system into distinctive components with the costs. This enables to provide a clear picture of the cost allocation between the elements of the built facility. The costs of the lower level elements are summed to get the costs of the higher level elements which in turn are summed up to obtain the total cost.

A-2.2 A typical classification of major group elements for a multi-storeyed building is shown in Table 2. Further division of one of the major group element (structural works) in to lower level elements is shown in Table 3. In a similar manner all other major group elements can be divided into lower level elements.

Table 2 Major Group Elements in Buildings

(*Clause* A-2.2)

Sl No. (1)	Building Works (2)	Major Group Elements (3)
i)	Structural works	a) Super structure b) Sub-structure
ii)	Civil works	a) Envelopes/enclosures b) Internal/external finishes c) Water proofing d) Joinery works e) Architectural elements
iii)	Engineering services	a) Electrical systems b) Plumbing systems c) HVAC systems d) Fire protection and fighting systems e) Security systems f) Lifts, escalators and travelators g) Other mechanical utilities and services
iv)	Interiors	a) Interior furnishings b) Suspended ceilings c) Acoustics d) Lighting
v)	External works	a) Land development/site grading b) Landscaping/horticulture c) Storm water drainage/harvesting d) Roads/pavements e) Water supply f) Sewerage g) Area/street lighting h) Boundary protection

A-3 ELEMENTAL QUANTITIES RATES AND ELEMENTAL COSTS

The quantities of items of work constituting the element are worked and with the unit rates of these items the elemental cost is determined. These elemental costs are expressed as cost per unit of measurement applicable to the element. For example, for a wall element the elemental cost is expressed as 'per square-metre' of the wall area. It is useful to express the elemental quantities and elemental costs in terms of quantity per square-metre and cost per square-metre of the gross built-up area of the building.

The elemental quantities and costs per unit gross built-up area of different categories of the building compiled from the actual quantities and actual costs of the past projects are useful in the preliminary estimation of subsequent projects.

A-4 SCHEDULE OF ELEMENTAL RATES AND COST ESTIMATION

Similar to the traditional schedule of rates of items of works under different trade-wise sub-heads, the schedule of rates of the individual elements per unit quantity of the element can be generated by adding the cost of the work items constituting the element. For example, the unit elemental rate of the internal brick masonry partition wall per square metre of the wall area is obtained by summing up the cost of the work items involved such as masonry work, plastering work and painting work in obtaining the finished cost of this wall element. Such schedules of elemental rates are useful in the cost planning/analysis and comparison of the alternative elements for a specified functional use. The summation of the cost of all elements constituting the building provides the total cost.

Table 3 Division of Major Group Element into Lower Level Elements (R.C.C. Structural Works)

(*Clause* A-2.2)

Sl No.	Major Group Elements	Group Elements	Elements	Sub-elements/ Components
(1)	(2)	(3)	(4)	(5)
i)	Superstructure	Vertical frames	a) Columns	1) Concrete 2) Reinforcement 3) Shuttering
			b) Shear walls	1) Concrete 2) Reinforcement 3) Shuttering
		Horizontal floors	a) Beams	1) Concrete 2) Reinforcement 3) Shuttering
			b) Solid slabs	1) Concrete 2) Reinforcement 3) Shuttering
			c) Waffle slabs	1) Concrete 2) Reinforcement 3) Shuttering
			d) Flat slabs	1) Concrete 2) Reinforcement 3) Shuttering
			e) Precast joists/slabs	1) Concrete 2) Reinforcement 3) Shuttering
ii)	Sub-structure	Excavation	a) Earthwork b) Dewatering c) Shoring/strutting d) Sheet piling	
		Shallow foundations	a) Isolated footings	1) Concrete 2) Reinforcement 3) Shuttering
			b) Raft foundations	1) Concrete 2) Reinforcement 3) Shuttering
			c) Grade beams	1) Concrete 2) Reinforcement 3) Shuttering
		Deep foundations	a) Piles	1) Pile boring 2) Concreting 3) Reinforcement
			b) Pile caps	1) Shuttering 2) Concreting 3) Reinforcement
			c) Grade beams	1) Shuttering 2) Concreting 3) Reinforcement
		Basement	a) Columns/shear walls	1) Shuttering 2) Concreting 3) Reinforcement
			b) Retaining walls	1) Shuttering 2) Concreting 3) Reinforcement
			c) Beams	1) Shuttering 2) Concreting 3) Reinforcement
			d) Slabs	1) Shuttering 2) Concreting 3) Reinforcement

ANNEX B

(*Foreword and clause* 6.4.3.2)

EARNED VALUE MANAGEMENT (EVM) TECHNIQUE

B-1 PERFORMANCE PARAMETERS OF EARNED VALUE MANAGEMENT (EVM) TECHNIQUE

The parameters of EVM that are used to measure the project cost and schedule performance are as shown in Fig. 1. These parameters are categorized into four groups namely, basic elements, variances, efficiency indices and forecasting parameters. Individual parameters are defined and explained in the following clauses and illustrated graphically in Fig.2.

B-1.1 Planned Value (PV)

The first step in the application of EVM methodology is to develop the project baseline cost curve called planned value curve. It is the plot of cumulative budgeted cost of activities (defined in the project work breakdown structure) at the periodic intervals (for example, monthly) of the project duration. The cumulative costs at various project intervals are obtained from the month-wise summary of cost incurred on the activities. Since this baseline cost curve is obtained based on the 'budgeted cost of activities and as per planned' project schedule, this is also termed as budgeted cost of work as scheduled (BCWS).

B-1.2 Earned Value (EV)

The term earned value (EV) indicates the value of work earned and this is obtained as the cumulative values of the quantum of the work actually executed in the activities multiplied by the corresponding budgeted unit costs of the respective activities. The quantum of the work executed in the activities at a given point of time (report date) could be as per planned quantity or at variance from the planned quantity. The earned value increases cumulatively as the activities gets completed along the project duration. This earned value plot is also called budgeted cost of work performed (BCWP).

B-1.3 Actual Cost (AC)

The actual cumulative cost of activities at a given point of time (review date) is obtained from the quantum of

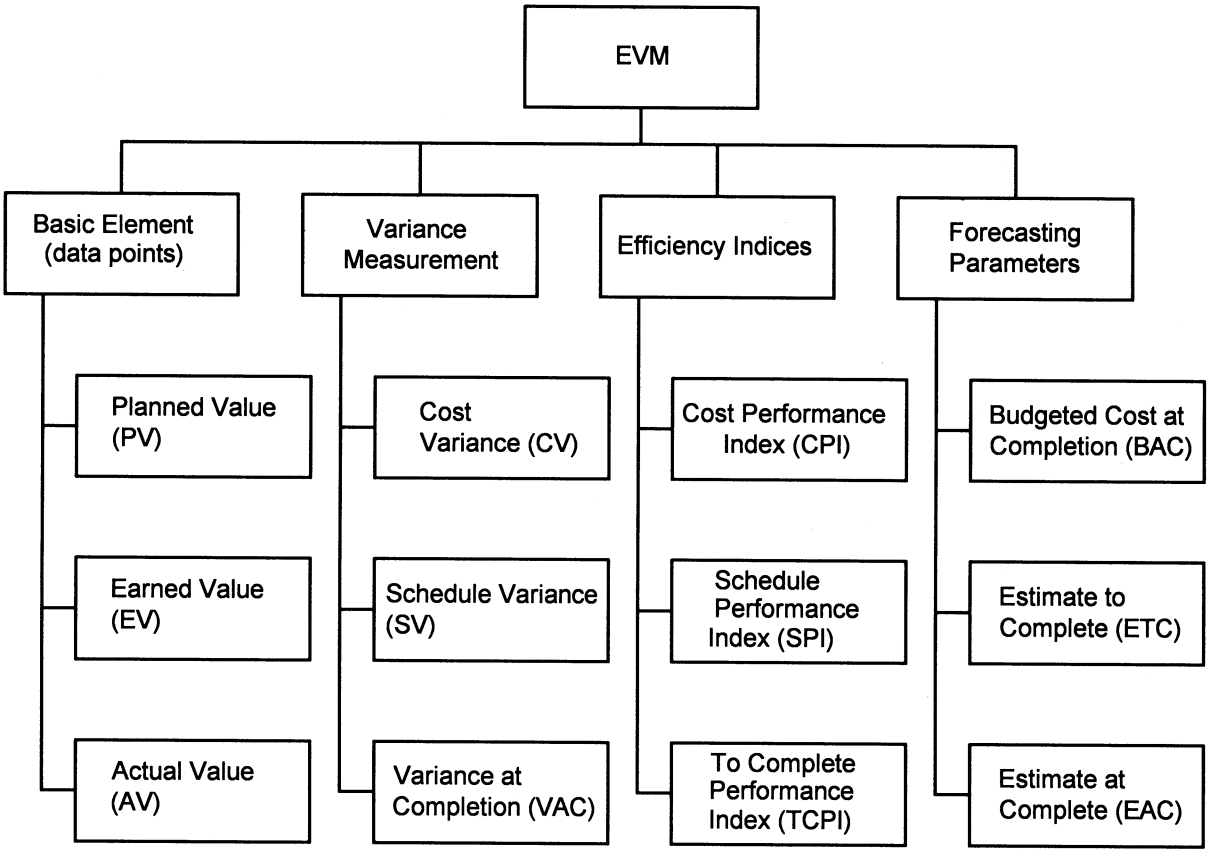

FIG. 1 PERFORMANCE MEASUREMENT PARAMETERS OF EVM

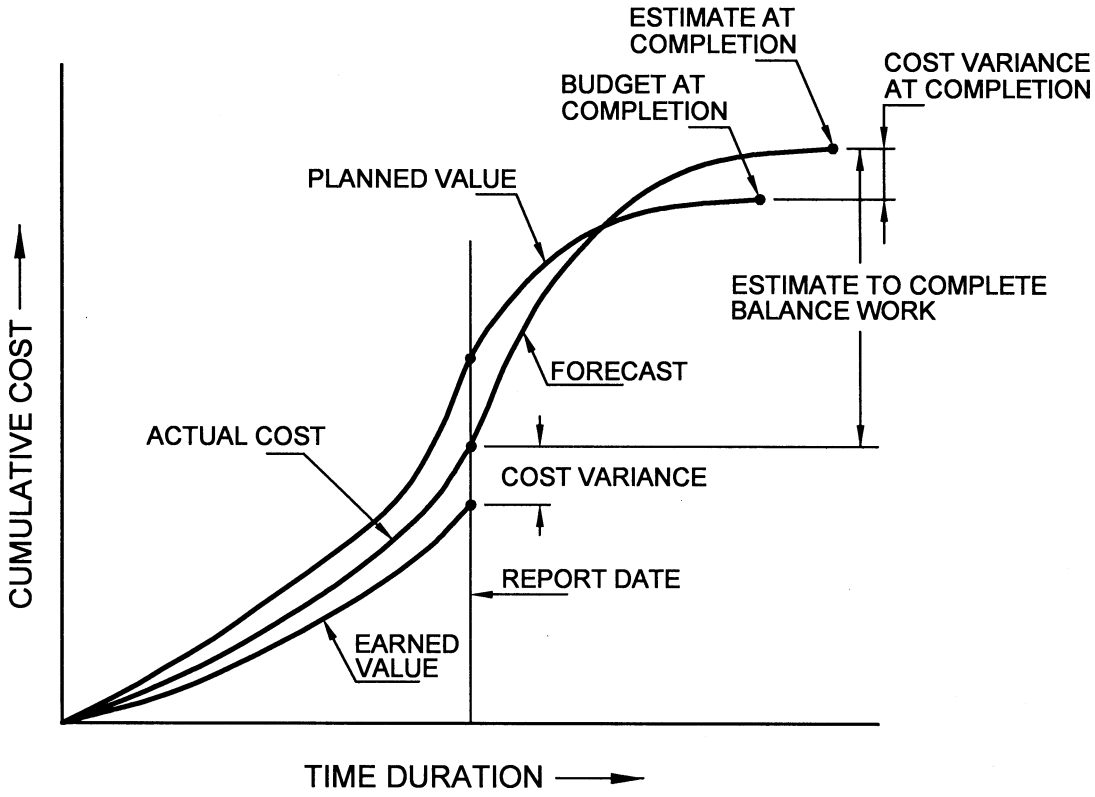

FIG. 2 EVM PARAMETERS

work actually executed in the activities multiplied by the actual unit costs of the work in respective activities. For well controlled project situations, the actual quantum of work and their actual unit cost shall adhere to the planned quantum of work and their budgeted unit cost. Otherwise they may be at variance with respect to the planned quantum of work and their budgeted unit cost price indicating favourable or unfavourable project situations. Major effort in the EVM methodology is to continuously compile the actual cost from the data collected on the cost of various resources utilized (manpower, material, equipment, etc) in the activities. The actual cumulative cost curve is developed progressively with the completion of activities during the course of project implementation. This actual cost curve is also termed as actual cost of work performed (ACWP).

B-1.4 Measurement of Variances

B-1.4.1 *Cost Variance* (*CV*)

The cost performance of the project is measured in terms of cost variance which is the difference between the earned value and the actual cost of the work carried out.

$$CV = EV - AC$$

$$\text{Cost variance percentage} = \left(\frac{CV}{EV}\right)\times 100$$

When EV and AC are equal, the project is on the budgeted cost. A negative and positive value of CV indicates the project cost over-run and cost under-run respectively. The cost overrun could be on account of lower productivity of labour and equipment and over consumption or wastage of materials. Negative CV could also be attributed to the inaccuracy of the original budget costs. Cost variance percentage indicates the cost over-run and cost under-run as the percentage of earned value. Negative and positive cost variance percentage indicates percentage cost over-run and cost under-run respectively.

B-1.5 Cost Performance Index

B-1.5.1 The cost variances are project specific values. However, the cost performance is also expressed as an index to serve as common basis for comparison with other projects besides usage in forecasting calculations. The cost performance Index is expressed as percentage to indicate the percentage efficiency of the cost and performance.

B-1.5.2 Cost performance index (CPI) measures the value of work completed compared to the actual cost incurred on the project and is calculated by dividing the earned value by the actual cost. The CPI when expressed as percentage, indicates the cost efficiency of the work completed.

Cost performance index (CPI) = EV/AC

CPI less than one and more than one indicates cost over-run and cost under-run respectively.

B-1.6 Forecasting Parameters

EVM methodology provided three basic forecasting parameters relating to completion costs. These are budgeted cost at completion (BAC), estimate to complete (ETC) and estimate at completion (EAC).

The other parameters derived from the basic parameters are: variance at completion (VAC), planned percentage complete (PPC), actual percentage complete (APC), and to complete cost performance index (TCPI).

B-1.6.1 *Budgeted Cost at Completion* (*BAC*)

Budgeted cost at completion is the total cumulative budgeted cost of all the project activities as per the planned schedule. It is the total base line cost and is the end value of the planned value curve.

B-1.6.2 *Estimate to Complete* (*ETC*)

The estimate to complete the balance work may be determined in one of the following three approaches as per the decision of the project team:

a) In the first approach, ETC is calculated with the consideration that the balance work shall be completed with the up to date trend of the cost efficiency represented by CPI

ETC = (BAC – EV)/CPI

EAC = AC + (BAC – EV)/CPI

As CPI = EV/AC, EAC may be written as:

EAC = BAC/CPI

b) In the second approach, ETC is calculated based on the decision that the balance work shall be controlled and completed at the original budgeted costs

ETC = BAC – EV

EAC = AC + (BAC – EV)

c) In the third approach the cost to complete the balance work shall be assessed by working out a new cost estimate with revised budgeted costs and added to the up to date actual cost

EAC = AC + (ETC) revised

B-1.6.3 *Estimate at Completion* (*EAC*)

The forecast of the estimated cost at completion is determined by adding to the up to date actual cost (AC) the projected cost estimate to complete the balance work (ETC).

EAC is a new revised cost estimate at completion. EAC is determined based on the following considerations:

$$EAC = AC + ETC$$

B-1.6.4 *Variance at Completion* (*VAC*)

The difference between the original baseline budgeted cost and estimate at completion is termed as VAC, that is,

$$VAC = BAC - EAC$$

B-1.6.5 *Planned Percentage Complete* (*PPC*)

It is the percentage of work planned to be completed as on the reporting date.

$$PPC = \frac{PV}{BAC}$$

B-1.6.6 *Actual Percentage Complete* (*APC*)

It is the percentage of work actually completed as on the reporting date

$$APC = \frac{AC}{BAC}$$

B-1.6.7 *To Complete Cost Performance Index* (*TCPI*)

TCPI is a planned cost performance index that needs to be achieved for the completion of the balance work as per the decision of the project team. TCPI can be based either on budget cost at completion (BAC) or on estimate at completion (EAC).

$$\text{TCPI based on BAC} = \frac{(BAC - EV)}{(BAC - AC)}$$

$$\text{TCPI based on EAC} = \frac{(BAC - EV)}{(EAC - AC)}$$

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Construction Management (Including Safety in Construction) Sectional Committee, CED 29

Organization	*Representative(s)*
In personal capacity (*103, Charak Sadan, Vikaspuri, New Delhi*)	Shri P. Krishnan (***Chairman***)
Aecom India Private Limited, Noida	Representative
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Builders' Association of India, Mumbai	Shri H. S. Pasricha Shri Sanjay Soni (*Alternate*)
Building Materials and Technology Promotion Council, New Delhi	Dr Shailesh Kumar Agrawal Shri Pankaj Gupta (*Alternate*)
Central Building Research Institute (CSIR), Roorkee	Dr Achal K. Mittal Shri Ajay Chaurasia (*Alternate*)
Central Public Works Department, New Delhi	Shri B. B. Dhar Shri Sanjeev Rastogi (*Alternate*)
Construction Industry Development Council, New Delhi	Shri P. R. Swarup Shri Ravi Jain (*Alternate*)
Creative Design Consultants and Engineers (P) Ltd, Ghaziabad	Shri Aman Deep
Delhi Development Authority, New Delhi	Shri Ashok Khurana Chief Engineer (HQ) (*Alternate*)
Delhi Metro Railway Corporation, New Delhi	Shri Daljeet Singh
Delhi Tourism and Transportation Development Corporation, New Delhi	Shri Jose Kurian Shri Vivek Bansal (*Alternate*)
EH and S Cares, New Delhi	Shri A. K. Tripathi
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Indian Buildings Congress, New Delhi	Shri A. K. Srivastava Shri P. S. Chadha (*Alternate*)
Indian Institute of Technology, New Delhi	Prof B. Bhattacharjee Dr K. N. Jha (*Alternate*)
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M.N. Dastur and Company (P) Limited, Kolkata	Shri S.K. Guha Shri Gobinda Pal Choudhury (*Alternate*)
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Ministry of Statistics and Programme Implementation, New Delhi	Dr Devendra Verma Shri R. Rajesh (*Alternate*)
National Buildings Construction Corporation Limited, New Delhi	Shri Rajendra Chaudhari Shri H. K. Dhawan (*Alternate*)
National Highways Authority of India, New Delhi	Shri R. K. Gandhi Shri R. N. Chowdhary (*Alternate*)
National Institute of Construction Management and Research, Mumbai	Dr Anil Agarwal

Organization	*Representative(s)*
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PHD Chamber of Commerce and Industry, New Delhi	Dr Ranjeet Mehta
Planning Commission, New Delhi	Shri S. S. Ganapathy
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Scientist C (Civil Engg), BIS

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Delhi Tourism and Transportation	Shri Jose Kurian
Development Corporation, New Delhi	Shri Vivek Bansal (*Alternate*)
EH and S Cares, New Delhi	Shri A. K. Tripathi
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(*Continued from second cover*)

This standard (Part 3) on cost management is intended to cover the guidelines on cost management processes which are to be carried out during the project phases and for project completion within the approved budgeted costs with the authorized variations. The successful project outcome depends on the efficient cost management restricting the cost overruns besides the other parameters of adherence to time targets, achieving specified quality standards and safety provisions. In situations of improper management of cost aspects, the timely project completion and planned utilization of the built facility will get seriously jeopardized due to such cost overruns and resulting financial problems. Even the project may abruptly get halted on these accounts. Such adverse situations should be avoided by implementing a robust cost management mechanism in all phases of project.

This standard is organized in the following sequence: at the beginning the need for cost management and scope of the cost management processes during pre-construction phases are brought out; then cost management process flow through project phases is covered; followed by three essential cost related processes namely, cost estimation, cost planning and budgeting, and cost monitoring and control are covered along with the tools and techniques. The techniques of cost estimation and analysis through elemental method, and cost monitoring and control through earned value method (EVM) are incorporated in detail in Annex B. For improved productivity, speed and accuracy, the implementation of cost related techniques using computerized approach with appropriate project management software are encouraged.

The guidelines may be applicable in general in all construction projects. However for smaller projects, the applicability of various provisions may be decided appropriately by the parties concerned.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is compiled with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that specified value in this standard.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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