Designation: E1804 – 16

Standard Practice for Performing and Reporting Cost Analysis During the Design Phase of a Project[1]

This standard is issued under the fixed designation E1804; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers an arranged method for providing cost analysis during the design phase of a building project.

1.2 The use of this practice increases the level of communication between the design professional, owner, and the cost professional providing the cost consulting services.

1.3 The practice establishes a structured method to support design decisions.

1.4 The practice provides design and cost professionals with a framework for historically tabulating information to be used on relevant future projects.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E631 Terminology of Building Constructions

E833 Terminology of Building Economics

E1369 Guide for Selecting Techniques for Treating Uncertainty and Risk in the Economic Evaluation of Buildings and Building Systems

E1557 Classification for Building Elements and Related Sitework—UNIFORMAT II

E2514 Practice for Presentation Format of Elemental Cost Estimates, Summaries, and Analyses

3. Terminology

3.1 *Definitions*—For definitions of general terms related to building construction used in this practice, refer to Terminology E631; and for general terms related to building economics, refer to Terminology E833.

4. Summary of Practice

4.1 This practice provides an organized approach for cost analysis during the design phase of a building project. The practice presents the necessary information for the design professional and owners to make decisions.

4.2 This practice establishes a recommended procedure for formatting the final project information for its use in forecasting the cost of future projects.

5. Significance and Use

5.1 This practice increases the level of communication, provides an organized approach to cost control during the design of a project, and also provides a means of identifying extraordinary cost items and changes in assumptions between estimates.

5.2 The users of this practice include owners, developers, contractors, cost professionals, estimators, architects, engineers, specification writers, quantity surveyors, and anyone charged with the responsibility of successfully managing the design of a building and its related site work within a specified project budget.

5.3 Use this reporting format during the following:

5.3.1 Contracting for design cost analysis services,

5.3.2 Comparing the current design costs to a previous estimate, and

5.3.3 Responding to each design phase.

5.4 This practice provides a tool for analyzing design options and examining strategies to maintain the project budget.

6. Types of Estimates and Level of Detail

6.1 *Purpose of Estimate:*

6.1.1 The cost analysis procedure consists of providing information in text and estimate form at the completion of each significant phase of the design process: program, schematic, design development, and construction documents. Apply this format for each component when the construction project is comprised of several definable building types.

6.1.2 Comparisons of UNIFORMAT II estimates to a contractor's proposal will require the estimate to be resummarized to MasterFormat.[3]

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.81 on Building Economics.

Current edition approved Oct. 1, 2016. Published October 2016. Originally approved in 1996. Last previous edition approved in 2012 as E1804-12. DOI: 10.1520/E1804-16.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Construction Specifications Institute (CSI), 110 South Union Street, Suite 100, Alexandria, VA 22314, http://www.csinet.org.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

6.2 *Program Phase Estimate:*

6.2.1 The program/predesign estimate includes construction costs, construction impact fees, and construction related expenditures. It is prepared from the early stage of the design process to assemble project data in a systematic format from established project criteria. The resulting report provides the baseline criteria and costs for the design team.

6.2.2 The program predesign estimate is prepared in an elemental form using UNIFORMAT II (Classification E1557 and Practice E2514). Elemental analysis allows the estimate to be prepared using basic elements, costs per square foot (meter) of gross floor area, ratios, and, where necessary, lump sum allowances. Calculate the design allowance using risk evaluation techniques as described in 7.7 of Guide E1369.

6.3 *Schematic Design Phase Estimate:*

6.3.1 The schematic design estimate provides for the first cost analysis based on project specific design criteria. Prepare the estimate in UNIFORMAT II, Level 3 (Classification E1557 and Practice E2514) based on preliminary floor plans, preliminary specification outlines, general finish schedule information, and typical structural, mechanical, and electrical information. Use building parameters in establishing the project base line costs. When specific criteria are not yet established, use target costs (allowances). Target costs provide design team guidance during the continuation of the design. Calculate the design allowance using risk evaluation techniques in 7.7 of Guide E1369.

6.3.2 Compare the schematic design estimate to the program estimate. The comparison provides information to the design professional on the changes since the last estimate.

6.4 *Design Development Phase Estimate:*

6.4.1 Preparation of the design development estimate includes the quantifying of key building elements. Quantities of materials are calculated and multiplied by material and labor unit prices to develop the total cost for each element. Use this method to arrive at a total cost for each element. Quantify and price key building systems to replace the building parameters used in the previous estimate. Calculate the design allowance using risk evaluation techniques in 7.7 of Guide E1369.

6.4.2 Summarize the design development estimate in MasterFormat. Restructure the design development estimate in UNIFORMAT II (Classification E1557 and Practice E2514) when comparing with the schematic design estimate. The reformatted design development estimate will provide the basics for the translation between the schematic and design development estimates.

6.5 *Construction Document Phase Estimate:*

6.5.1 The construction document's estimate is the final estimate of a project's construction costs based on detailed project information. Prepare quantity information in MasterFormat. Subdivide pricing into material, labor, and equipment costs.

6.5.2 Use MasterFormat to compare the final construction document's estimate to the design development estimate. Calculate the design allowance using risk evaluation techniques in 7.7 of Guide E1369.

6.5.3 Reformat the construction document's estimate to UNIFORMAT II, Level 2 (Classification E1557) to provide historical data for future building costs.

6.6 *Reconciliation of Estimate with General Contractor:*

6.6.1 *Reconciliation*—Comparison of independent estimates for the project. Summarize estimates using MasterFormat to facilitate comparison with the general contractor's format.

6.6.2 Reconciliation of estimates can be required at any design phase.

7. Report Format

7.1 Use this standard format for every cost report and expand as necessary to respond to project requirements.

7.1.1 *Title Page*—Report the following information:

7.1.1.1 Name of the project,

7.1.1.2 Location of the project,

7.1.1.3 Type of estimate,

7.1.1.4 Date of the estimate report,

7.1.1.5 Design team name and address,

7.1.1.6 Cost consulting firm's name and address, and

7.1.1.7 Owner name and address (unless confidential).

7.1.2 *Table of Contents*—Include the name of each section and page number.

7.1.3 *Task Outline*—Briefly describe the cost assignment undertaken by the firm.

7.1.4 *Project Description*—Briefly describe the project location, site area, site development, building size and function, exterior materials, interior finishes, and special functions of the facility.

7.1.5 *Notes Concerning the Estimate*—Include observations, assumptions, and information obtained from the design professionals, site observations, and research conducted for this project. Include opinions and project documentation obtained from sources other than the current construction documents. The following outline is a basis for organizing the notes section.

7.1.5.1 General notes include discussion of general conditions of the project, profit/fee projections, and general comments about the proposed construction project or local economy where applicable.

7.1.5.2 Site work notes include discussion of site related items and concerns.

7.1.5.3 Building notes are organized per the UNIFORMAT II structure (Classification E1557) or MasterFormat specification divisions.

7.1.5.4 Provide analysis for degree of risk used to establish the design allowance, construction contingency (Guide E1369), and escalation values.

7.1.6 *Summaries* are presented from the most global to the specific. Reduce costs to a commonly understood element for the overall report (for example, cost/sf, cost/key, cost/acre, cost/bed). Include the following:

7.1.6.1 Overall summary,

7.1.6.2 Site development summary,

7.1.6.3 Building work summary,

7.1.6.4 Special structures summary (when appropriate), and

7.1.6.5 UNIFORMAT II summary (contract document estimate only).

7.1.7 *Cost Comparison Summaries* shall include information and opinions on how the project has changed from the previous cost estimate. When the report is the first estimate, the program design shall be used as the initial benchmark for comparison.

7.1.7.1 Costs are compared in UNIFORMAT II for program, schematic design, and design development estimates. The construction documents estimate is compared to the design development estimate using major specification divisions. Format the cost comparison summary report as follows:

Sub-Grouping	Previous Estimate	Current Estimate	Variance
Site work	$450 000	$475 000	$25 000

7.1.7.2 Organize the detailed explanation of changes between the estimates as follows:

Sub-Grouping	Variance	Reasons/Comments
Site work	$25 000	Allowance for landscaping increased ($5 000). Earthwork quantities increased ($25 000). Allowance for site lighting decreased ($5 000).

7.1.8 Design alternatives are alternate solutions that are mutually acceptable to the design team and cost engineer. Include a summary of the proposed costs of the alternates and notations if these costs are mutually exclusive or overlap with other suggested alternates. Each alternate detail report shall consist of the following:

7.1.8.1 Description of the related base estimate criteria,

7.1.8.2 Description of the proposed alternate,

7.1.8.3 Summary of costs for additions and deductions from the base estimate, and

7.1.8.4 Adjustment for general conditions, fee, and escalation.

8. Information Needed at Each Design Stage

8.1 The following list shows what documents and information are the minimum to be provided by the design professional at each estimate level.

8.1.1 *Program Phase Estimate*—The program phase establishes the building budget. The cost estimate consists of building parameters, finish levels, and general site development activities. The cost professional requires the following information:

8.1.1.1 *Design Program*—Detailing the project function, purpose, and characteristics. The program includes material information relating to the gross floor area of prime building spaces, equipment, and building systems,

8.1.1.2 Cost limitations and allowances,

8.1.1.3 Site configuration, limitations, known soil and rock information, and the location of available utility services to the building, and

8.1.1.4 General information about the exterior building elevations and floor plan configuration.

8.2 *Schematic Design Phase Estimate*—The cost professional requires the following documents:

8.2.1 *Site Development:*

8.2.1.1 Paving and parking requirements,

8.2.1.2 Finish building grades,

8.2.1.3 Original site drawings,

8.2.1.4 Storm drainage solution,

8.2.1.5 Existing utility location,

8.2.1.6 Site retaining walls, and

8.2.1.7 Site lighting requirements.

8.2.2 *Building Work:*

8.2.2.1 Principal floor plans,

8.2.2.2 Specification outline,

8.2.2.3 Exterior wall sections,

8.2.2.4 Mechanical/electrical/plumbing systems outline (suggested equipment requirements),

8.2.2.5 Finish schedule by room types,

8.2.2.6 Structural foundation system,

8.2.2.7 Typical structural framing system, and

8.2.2.8 Roof system selections.

8.2.3 *Specialty Structures:*

8.2.3.1 Structure type (bridge, gazebo, etc.) and

8.2.3.2 Height and floor plan dimensions.

8.3 *Design Development Phase Estimate*—The cost professional requires the following documents:

8.3.1 *Site Development:*

8.3.1.1 Site plans, indicating building locations and site improvements (including all paved areas, site utilities, landscaping ideas, and building or vertical structure locations),

8.3.1.2 Topographical information (current and engineered topographical information),

8.3.1.3 Utility location (showing all underground structures and lines), and

8.3.1.4 Demolition plans and information.

8.3.2 *Building and Specialty Structures:*

8.3.2.1 Current floor plans,

8.3.2.2 Project specification outline with selected equipment and acceptable manufactures,

8.3.2.3 Exterior wall sections,

8.3.2.4 Building elevations and sections,

8.3.2.5 Mechanical, electrical, and plumbing system descriptions and one line diagrams reflecting the design of the HVAC, plumbing, fire protection, and electrical systems, and riser diagrams with panel information,

8.3.2.6 Structural foundation design, typical structural framing,

8.3.2.7 Preliminary finish schedule with material selections,

8.3.2.8 Typical interior wall types, and

8.3.2.9 Acoustical guidelines.

8.4 *Construction Documents Phase Estimate*—The cost professional requires the following documents:

8.4.1 *Site Development:*

8.4.1.1 Final site drawings showing current and engineered topographical information,

8.4.1.2 Utility locations and design showing all underground structures and utility lines,

8.4.1.3 Demolition, landscaping, miscellaneous site structures and related details,

8.4.1.4 Elevations and sections, and

8.4.1.5 Details, schedules, and notes to be used in the construction of the project.

8.4.2 *Building and Specialty Structures:*

8.4.2.1 Project specifications, completely describing materials and manufactures,

8.4.2.2 Current floor plans,
8.4.2.3 Building elevations and building sections,
8.4.2.4 Exterior wall sections,
8.4.2.5 Details of exterior walls, stairs, toilet rooms, etc.,
8.4.2.6 Finish schedule and notes,
8.4.2.7 Typical interior partition details with notes,
8.4.2.8 Special details and conditions (millwork, handrails, etc.),
8.4.2.9 Structural plans, notes, sections, and details fully describing the structural building requirements,
8.4.2.10 Conveyance plans specifications and sections fully describing the elevators, escalators, and lifts,
8.4.2.11 Mechanical plans, notes, and sections fully describing the plumbing, HVAC, and fire protection requirements, and
8.4.2.12 Electrical plans, notes, and sections fully describing the electrical, communications, security, and equipment requirements.

9. Keywords

9.1 analysis; cost; design; estimating

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; http://www.copyright.com/