This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: E2514 – 15 (Reapproved 2020)

Standard Practice for Presentation Format of Elemental Cost Estimates, Summaries, and Analyses[1]

This standard is issued under the fixed designation E2514; 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 the concurrent use of relevant ASTM standards for the preparation of elemental cost estimates, summaries, and analyses and specifically their presentation in a concise, consistent, and logical manner.

1.2 While the style and directions use construction terms applied to buildings, the principles apply equally well to other forms of construction where appropriate elemental classifications exist.

1.3 This practice is not an estimating manual, nor is it a guide to the skills and knowledge required of an estimator or other cost professional.

NOTE 1—The skills and knowledge acquired by a trained and experienced estimator are essential to the successful application of any elemental presentation format. They are the foundation of any estimate and the underpinning knowledge required when applying the elemental technique.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E631 Terminology of Building Constructions

E833 Terminology of Building Economics

E1557 Classification for Building Elements and Related Sitework—UNIFORMAT II

E1804 Practice for Performing and Reporting Cost Analysis During the Design Phase of a Project

E1836/E1836M Practice for Building Floor Area Measurements for Facility Management

E2083 Classification for Building Construction Field Requirements, and Office Overhead & Profit

E2168 Classification for Allowance, Contingency, and Reserve Sums in Building Construction Estimating

2.2 *ASTM Adjunct:*

Basic Instructional Model Spreadsheet [3]

3. Terminology

3.1 *Definitions:* Definitions—For other 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.

3.1.1 *element, n—in construction planning, design, specification, estimating, and cost analysis*, a significant component part of the whole that performs a specific function, or functions, regardless of design, specification, or construction method.

3.1.1.1 *Discussion*—While through analysis, or by direct application, construction estimates categorized into elements (functional elements) with allocated costs, may be summarized in an **elemental cost summary** or **elemental cost analysis**; elements (functional elements) also provide a framework for consistent preliminary project description, outline, and performance specification, through all stages of planning, design, construction, and maintenance.

3.1.2 *elemental cost analysis, n—in construction planning, design, specification, estimating, and cost analysis*, a tabulation of cost categorized by **major group element**, **group element**, or **element**, or any combination thereof, to which a **parameter quantity**, or parameter quantities, has, or have, been applied to derive benchmark figures (rates, ratios, percentages, and so forth).

[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.

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[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 ASTM International Headquarters. Order Adjunct No. ADJE2514.

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3.1.2.1 *Discussion*—Elemental cost analyses are valuable tools in planning, estimating, and controlling construction cost through all stages of planning and design. The benchmark figures are primarily derived from underlying estimate detail but can, in some circumstances, be used directly to approximate estimates for other projects.

3.1.3 *elemental cost summary, n—in construction planning, design, specification, estimating, and cost analysis*, a tabulation of cost categorized by **major group element**, **group element**, or **element**.

3.1.4 *group element, n—in construction planning, design, specification, estimating, and cost analysis*, a significant component part of the whole that includes relevant **elements** which, as a group, perform specific function, or functions, regardless of design, specification or construction method.

3.1.5 *major group element, n—in construction planning, design, specification, estimating, and cost analysis*, a very significant component part of the whole that includes relevant **group elements** which, as a group, perform major specific function, or functions, regardless of design, specification or construction method.

3.1.6 *parameter quantity, n—in construction planning, design, specification, estimating, and cost analysis*, a measure of the amount (quantity) of work included within a **major group element**, **group element**, or **element**, or any combination thereof, which, using standardized metrics, ensures consistent **elemental cost analysis** preparation and comparison.

3.1.7 *sub-element, n—in construction planning, design, specification, estimating, and cost analysis*, a component part of an **element** that performs a specific function, or functions, regardless of design, specification or construction method.

3.1.8 *UNIFORMAT II UII, n*—a hierarchical breakdown structure of construction work ordered by **elements**.

3.1.8.1 *Discussion*—Primarily designed for cost management (planning, control, and analysis) during the planning, budgeting, and design phases of construction, its hierarchical elemental breakdown structure is also used for qualitative – text rich – reports (preliminary project description, condition assessment, asset description), and other quantitative – text and numerical – purposes (value engineering, risk analysis, preliminary time schedule, building information modeling).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *elemental cost plan, n*—an estimate, summarized and presented in element groups, that has been sanctioned by the owner/client.

3.2.1.1 *Discussion*—In practice an elemental cost plan includes the high level presentation figures contained in any of the relevant presentation formats referenced in this standard which, when sanctioned, become the benchmark figures against which subsequent estimates are compared.

3.3 For additional guidance on certain other terminology related to estimates, budgets, cost plans, and cost models refer to Appendix X1.

4. Summary of Practice

4.1 This practice covers the concurrent use of several ASTM standards that together form a valuable and tried framework for elemental cost presentation especially when used for design stage construction cost estimating of buildings, and also:

4.1.1 Identifies three arrangements, estimate, summary, and analysis, of elemental cost presentation;

4.1.2 Provides conventions for use in completing these presentations; and

4.1.3 Provides suggestions for some typical uses, including reporting, error checking, change tracking, and comparison through the planning, design, construction, and final archival record stages common to all building projects.

4.2 This practice is about arrangement, format, and presentation only. It is not an estimating manual and relates solely to the presentation of elemental estimates or costs, or both, in a very specific format.

4.3 For the purposes of this practice an estimate is deemed to be the whole *corpus* of measurement, description, and pricing detail that together make up the total sum. The two formats referred to in this practice, elemental summary and elemental analysis, are either a summary arrangement or an analysis arrangement of this underlying estimate detail. These formats represent a high-level presentation of the basic estimate. An elemental estimate is different in that there is no underlying detail and so, in this case, the presentation is the estimate, using the elemental analysis format.

5. Significance and Use

5.1 *Significance:*

5.1.1 The application of elements (see 3.1.1 and Terminology E833) to the description and the summary and analysis of building construction cost provides a consistency, commonality, and utility through all stages of design that other forms of estimate presentation do not.

5.1.2 This practice describes a simple format for elemental cost analysis presentation that is both valuable and informative when used during the various design stages of construction development.

5.2 *Use*—Users include owners, developers, contractors, cost professionals, estimators, architects, engineers, quantity surveyors, facility managers, and others involved in property development, construction, maintenance, and management.

5.2.1 *Reporting*—Cost reports structured by elements provide estimates, summaries, and analyses by applying "Cost to Function." This application works whether the approach is "Design to Cost" or "Cost to Design." Value analysis is greatly assisted through the allocation of estimated cost to elements.

5.2.2 *Controlling*—Comparison of progressively more detailed estimates is simplified where cost is allocated to appropriate elements regardless of design or specification, permitting efficient review and checking of new estimates. Design estimating using elements allows for benchmarking and the setting of cost limits (baseline) for a building design from the outset, and also permits the establishment of an elemental cost plan (see 3.2.1). Baseline records and cost plans are accessed and compared with current reports.

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5.2.3 *Recording*—Historic and baseline cost records are easily kept for all forms of building construction, and in a format that can be used for the planning and design of future projects.

5.2.4 *Other Uses*—Elemental summaries and analyses are equally useful in forensic estimating and in quantitative risk analysis.

5.2.5 *Relationship to "Trade" Estimating*—Traditional trade (or construction) estimating summarizes cost to a product, or trade classification. This is valuable when construction work has been fully specified or contracted, but is less so through the planning and design stages. The two systems (trade and elemental) are compatible in that they both relate to the same end product, for example, a building; they differ solely in the way cost is aggregated. Each estimate form can be converted to the other by coding or allocating each construction component to an appropriate trade/product division or element. During design evolution, changes in design and specification can make trade estimates difficult to compare with previous or other, or both, estimates and so can hinder the process of cost control during the design phase.

5.2.6 *Additional Narrative Information*—While costs presented in these formats are descriptive in themselves they do not tell the full story of a project's design. Narrative description of the construction work should also be an integral part of any complete presentation. Reference and description of this narrative form can be found in Practice E1804, and in Classification E1557 Appendix X3—Preliminary Project Description (PPD).

5.3 A detailed description of the presentation formats now follows. These descriptions are provided in eight sections, each intended to aid understanding of a particular facet of the formats:

Appearance	Section 6
Element Inclusions and Exclusions	Section 7
Basic Rules	Section 8
Layout	Section 9
Numeric Precision	Section 10
Estimate Calculation	Section 11
Analysis Calculation	Section 12
Variations and Additions	Section 13

6. Presentation Format—Appearance

6.1 *Elemental Cost Estimate*—It is not always readily apparent whether an elemental presentation format is actually an elemental cost estimate or an elemental cost analysis. They are quite specifically designed to be consistent in appearance with a common, structured layout that permits the ready comparison of one with another. Elemental cost summaries are obviously different in appearance however. An example elemental cost estimate is included as Appendix X3.

6.1.1 The least used of the three elemental presentation arrangements. While outwardly identical in appearance to the *analysis* format, the derivation of the data displayed within it is quite different.

6.1.2 Its limited use is primarily caused by its intent. It provides a means of preparing a structured estimate for a project when little, if any, design information is available, by using the results of elemental analyses from other, similar, designs.

6.1.3 Once design has commenced each succeeding estimate is prepared using the increasingly more detailed design documents. Consequently, there are construction details that can be identified, quantified and estimated very early in the process, which will become progressively more detailed. These updates will be consistently presented in a format that is valuable in tracking cost by means of comparison and so quickly become either an *elemental summary* or an *elemental analysis*.

6.1.4 *Hierarchy of Use*—An *elemental cost estimate* requires the use of cost figures derived from other, pre-existing, *analyses*.

6.1.4.1 The *estimate* presentation uses high order parameter ratios and unit rates derived from a database of *elemental cost analyses* of similar work.

6.1.4.2 The retention of *analyses* from previous projects is an essential prerequisite to the successful preparation of an *elemental estimate* presentation.

6.1.5 The preparation of continuing estimates through the design and documentation phases is an iterative process, while preparation of the initial cost estimate is not. Continuing design estimate presentations, based on increasingly developed design detail will far outnumber those of an initial cost estimate during the design life cycle of a project.

6.1.6 Cost modeling, based upon empirical knowledge, an understanding of basic requirements, and data obtained from elemental cost analyses of similar, completed, projects, can also be used to generate an elemental cost estimate, summary or analysis presentation.

6.1.7 An initial cost estimate will be very simple and brief, although the presentation will appear to be identical to an elemental cost analysis of a detailed estimate, or a complex cost model.

6.2 *Elemental Cost Summary*—This format is primarily used for reporting as it provides a summary of the underlying, detailed, estimate in a simple, consistent, form. An example elemental cost summary is included as Appendix X4.

6.2.1 It is a cost summary only and makes no attempt to analyze the result.

6.2.2 It provides more information than a total cost lump sum by showing the distribution of estimated cost among the various building elements and, when sanctioned by the owner/client, may become the elemental cost plan. This cost summary not only permits the speedy comparison of the various, ongoing, design estimates for the specific project, but with estimates for other projects too.

6.2.3 The comparisons made are usually between two cost summaries: the current summary and either another summary, a baseline summary, or the elemental cost plan. Included as part of a report to an owner, client, consultant, or other members of the project team, a cost summary permits each team member to compare and assess the impact of their recent design decisions and to reflect on their specific impact, both positive and negative, on the project's overall cost and economic viability.

6.2.4 This ready comparison is made easier by the use of a standard format and specifically defined element titles, wherein cost is applied to function (element) and not trade or material

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classification. Using a standard reporting format allows each element cost to be reported consistently through the design life of any project.

6.3 *Elemental Cost Analysis*—This format is the most widely used as it provides a range of high-level information (analysis) about the underlying estimate. This analysis is of most value to the cost estimating and cost controls practitioner. An example elemental cost analysis is included as Appendix X5.

6.3.1 Applying analysis at a high-level permits a relatively simple and concise, yet sophisticated, review and report on a construction project's forecast cost that can be applied throughout the design phase. Whether the information available for estimating is scant (before design has been commenced) or extensive (when design has progressed or is finally complete), the analysis format remains unchanged.

6.3.2 To maintain this consistency in reporting and analysis the "high level" element, or parameter, quantities used in the analysis must be obtainable and measurable at, and through, all stages of design.

6.3.3 The consistent format makes comparison between the current elemental cost analysis and other elemental cost analyses easy. Frequent comparison is an essential activity when maintaining control of cost while allowing the design details to develop and increase in complexity through a project's design phase. The Basic Instructional Model Spreadsheet permits the demonstration of this very simple way of identifying cost deviations from a Benchmark, Baseline, or Elemental Cost Plan.

6.3.4 Cost modeling techniques can generate sophisticated underlying cost estimate detail that can make good use of this "high level" analysis also.

7. Presentation Format—Element Inclusions and Exclusions

7.1 *ASTM Standards*—Several existing ASTM standards are combined to provide the essential components that together create an elemental format suitable for estimating, analysis, and control.

7.1.1 Classification E1557 provides the primary elemental components. It describes and delineates the physical elements in a three level hierarchy. By itself Classification E1557 does not provide a complete hierarchy suitable for use in cost estimating as it omits other essential non-physical elements that are part of any estimating process and are an integral part of any cost presentation.

7.1.2 Classification E2083 provides additional elements without which any estimate will be incomplete.

7.1.3 Classification E2168 provides further elements that are essential in any estimate prepared before design is complete. Estimates prepared during the design process are usually expected to be a forecast of a reasonable bid. Therefore estimates prepared during the design process will necessarily need to include allowance for, as yet incomplete or evolving design decisions, or both.

7.2 *Inclusions:*

7.2.1 Group elements in accordance with Classification E1557. These are the Levels 1, 2, and 3 referred to therein. For other forms of construction refer to the relevant Standard Classification of Elements.

7.2.2 Field requirements, office overhead, and profit in accordance with Classification E2083.

7.2.3 Allowances, both general and specific, for intended work as described in Classification E2168.

7.3 *Exclusions:*

7.3.1 Consultant fees and disbursements and other items that are not specifically part of the construction cost.

7.3.2 Contingencies, both general and specific, for unintended work as described in Classification E2168.

8. Presentation Format—Basic Rules

8.1 *Separate Buildings/Structures:*

8.1.1 Each building or structure shall be summarized (analyzed, estimated) separately.

8.2 *Units of Measure:*

8.2.1 All measurements shall be SI except where other customary measurements are in use, for example, United States of America uses U.S. conventional measurements.

8.2.2 *Applicable Standards:*

8.2.2.1 Floor areas, when used as the main parameter, shall be measured and reported in accordance with Practice E1836/E1836M.

8.2.2.2 Group element and element metrics (units of measure) shall be measured and recorded in accordance with Classification E1557 (Appendix X1) or other published Standard Classification.

9. Presentation Format—Layout

9.1 There are three major sections inherent in any written elemental cost presentation. These are the identification section, the main body section, and the totals section. All three are essential sections without which any presentation is incomplete.

9.2 *Identification Section (see Fig. 1)*—Identification is essential which, at a minimum, will include:

9.2.1 *Title* **(1)**—Obvious and necessary for identification, but not as essential to cost as other identifiers.

9.2.2 *Location* **(2)**—Location does affect cost. Any cost presentation must include this information.

9.2.3 *Dates*—All estimates are time sensitive and must never be presented without identifying applicable dates.

Title:❶	Eight Storey Office Building	Dates	
Location:❷	Anywhere in the World	Estimate Date:❸	2001.02.15
		Bid Date:❹	2005.03.25

FIG. 1 Identification Section (Part 1)

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Main Parameter		Reference: ❼	Office - Medium Rise
Quantity ❺	5,019	Estimate Class: ❽	Class 5 (Order of Magnitude)
UoM: ❻	M2 (GFA)		

FIG. 2 Identification Section (Part 2)

9.2.3.1 *Estimate Date* **(3)**—This is the date on which the estimate was completed.

9.2.3.2 *Bid Date* **(4)**—This is the date to which the presented estimate forecasts (or records) the bid cost. It is important to recognize that every pre-bid estimate is a forecast of an anticipated bid, and that it must include all necessary cost allowances to allow for deferred, or evolving, design decisions, as well as anticipated cost inflation between the estimate date and the bid date. Recording the cost of an actual bid will only require the inclusion of those cost allowances specifically called for in the bid documents.

9.2.4 *Main Parameter (see* Fig. 2*)*—It is common practice to include the Main Parameter, used in any analysis, within the Identification section. For buildings the main parameter will most commonly be the gross floor area measurement (see Practice E1836/E1836M). In special circumstances, however, other main parameters may be appropriate, and will be used instead. Such parameters will vary with the industry for which the estimate is being prepared. These main parameters might include for example: production volume or capacity measures, number of users or occupants, or other specific industry measures.

9.2.4.1 *Quantity* **(5)**—The measured or designed/planned main parameter quantity.

9.2.4.2 *Unit of Measure* **(6)**—Appropriate to the quantity, normally a number, area or a volume.

NOTE 2—It may also be necessary to add an additional identifier to distinguish between measurements made in accordance with different measuring rules, for example, floor areas can be measured as either gross, rentable, net, or assignable areas.

9.2.5 *Reference* **(7)**—An easy reference to the type of building that the cost figures portray, or represent, is important to ensuring that comparisons to other projects are made on an equitable basis. Several published classification schemes are available that can be used for this purpose. This reference is the minimum needed. To aid in the search for appropriate but yet more refined comparison these classification schemes may be expanded to include specific attributes, for example, the number of floors (storeys) above and below grade.

9.2.6 *Estimate Class* **(8)**—It is important to indicate a relevant classification that identifies the reliability of the presented cost figures. This classification will change depending upon the completeness of the design documents or design/planning information, or both, used in the preparation of the underlying estimate. Suitable classifications may exist within an organization or be published publicly through a Standards organization.

9.2.7 *Additional Items*—There are numerous additional items that could be included within the identification section, for example, anticipated, or actual, contract duration, form of contract, or method of contract procurement, number of floors above and below grade. However, these are secondary identifiers—that should form part of the necessary additional information pertaining to the estimate which is recorded elsewhere—and are not essential to the presented mathematical summary or analysis.

9.3 *Body Section (see* Fig. 3*)*—In this section each element is presented, containing its specific range of elements. The titles for each of these sections are determined by the appropriate standard classification and all sections are included regardless of whether they will be used or not. It is the maintenance of this consistent presentation format that allows ready comparison and record keeping.

9.3.1 *CODE and Code* **(1)**—Section designator relevant to the appropriate standard classification of elements.

9.3.2 *LEVEL 2 GROUP ELEMENT and Level 3 Element* **(2)**—Element titles relevant to the appropriate standard classification of elements.

9.3.3 *Element and ELEMENT* **(3)***:*

9.3.3.1 *Ratio*—In an elemental analysis this is the ratio of element quantity to the main parameter quantity and is used as an estimate check measure. In an elemental estimate a suitable ratio may be used to calculate the element quantity.

CODE	LEVEL 2 GROUP ELEMENT	Element & ELEMENT ❸				Estimate Sums ❹		
Code❶	Level 3 Element ❷	Ratio	Quantity	UoM	Unit Rate	Element	ELEMENT	MJR GROUP
A. SUBSTRUCTURE								$145,094
A10	FOUNDATIONS						$69,727	
A1010	Standard Foundations	0.111	6000	M2	7.67	46,027		
A1020	Special Foundations			M2		0		

FIG. 3 Body Section Example (Part 1)

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Main Parameter ❺			Percentage ❻		
Element	ELEMENT	MJR GROUP	Element	ELEMENT	MJR GROUP
		$2.69			2.7%
	$1.29			1.3%	
0.85			0.8%		
0.00			0.0%		

FIG. 4 Body Section Example (Part 2)

9.3.3.2 *Quantity*—The element quantity for the specific element An element quantity is a parameter quantity and will be constant in the particular case considered, but which will vary in those cases when the building design solution (shape, massing) changes.

9.3.3.3 *UoM*—Unit of measure for the elemental quantity.

9.3.3.4 *Unit Rate*—In an elemental analysis this a derived cost per unit, and is used as a measure against other estimates and norms. In an elemental estimate it is a cost per unit obtained from elemental analyses of other, comparable projects.

9.3.4 *Estimate Sums* **(4)***:*

9.3.4.1 *Element*—In an elemental analysis this is an accumulated sum obtained from the underlying estimate detail. In an elemental estimate this is the product of the element quantity multiplied by an elemental unit rate.

9.3.4.2 *ELEMENT*—An accumulated sum of elements (see Section 12).

9.3.4.3 *MAJOR GROUP (see* Fig. 4*)*—An accumulated sum of ELEMENTS (see Section 12).

9.3.5 *Main Parameter* **(5)***:*

9.3.5.1 *Element, ELEMENT, MAJOR GROUP*—A derived figure (see Section 12).

9.3.6 *Percentages* **(6)***:*

9.3.6.1 *Element, ELEMENT, MAJOR GROUP*—A derived figure used as an estimate check measure (see Section 12).

9.4 *Totals Section (see* Fig. 5*)*—The primary result of any estimate is always a total sum, notwithstanding the extent of detail with which it is prepared or presented, or both. Within each elemental presentation there may in fact be several totals and subtotals leading to a final total sum.

9.4.1 Total Section (Parts 1 and 2) together demonstrate one total line within the elemental estimate and elemental analysis examples included within the appendixes.

9.4.2 *MAJOR GROUP Estimate Sum Total* **(1)**—See 12.3.3.

9.4.3 *MAJOR GROUP Main Parameter Total* **(2)**—See 12.4.3.

9.4.4 *MAJOR GROUP Percentage* **(3)**—See 12.5.3 and Note 3.

NOTE 3—The line chosen for display in total section (Parts 1 and 2) is also a key line whose totals have also been selected to be the reference point for all percentage calculations throughout the elemental analysis. The example uses the total building cost as this point. Consequently all percentage calculations shown in the analysis relate to this cost sum and are expressed as being a proportion (percentage) of this figure. There are other totals that may sometimes be included against which the percentage calculations are made. These are usually considered to be subsidiary and are employed in specific circumstances only. They are discussed in Section 13, Variations, that follows.

10. Presentation Format—Numeric Precision

10.1 *Element and ELEMENT:*

10.1.1 *Ratio*—Round to the nearest three decimal places.

10.1.2 *Quantity*—Round to the nearest whole number.

10.1.3 *Unit Rate*—Round to the nearest two decimal places.

10.2 *Sums:*

10.2.1 *Element, GROUP ELEMENT, MAJOR GROUP ELEMENT*—For projects of less than $500 000 round to the nearest $100, and for larger projects, to the nearest $1000.

10.3 *Main Parameter:*

10.3.1 *Element, GROUP ELEMENT, MAJOR GROUP ELEMENT*—Round to the nearest two decimal places.

10.4 *Percentage:*

10.4.1 *Element, GROUP ELEMENT, MAJOR GROUP ELEMENT*—Round to the nearest one decimal place.

11. Presentation Format—Estimate Calculation

11.1 In its most basic form an elemental estimate may employ the following calculation methodology. Few elemental estimates are prepared in such a fundamental way so presentation usually reverts to the elemental analysis form (see Section 12).

11.2 An elemental estimate is typically an aggregation of the product of elemental quantities multiplied by elemental unit rates. In some circumstances the product of the main parameter quantity and main parameter unit rates may also be used.

11.3 *Element and ELEMENT:*

11.3.1 *Ratio*—Obtained from appropriate historic data or generated by a mathematical massing model.

TOTAL - BUILDING CONSTRUCTION						❶ $5,463,482

Total Section (Part 1)

	❷ $101.18		❸ 100.0%

Total Section (Part 2)

FIG. 5 Total Sections

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11.3.2 *Quantity*—The product of ratio *multiplied* by the main parameter quantity.

11.3.3 *Unit Rate*—Obtained from appropriate historic data (for example, elemental analyses).

11.4 *Sums:*

11.4.1 *Element*—The product of quantity *multiplied* by the elemental unit rate.

11.4.2 *GROUP ELEMENT*—The sum of element sums contained within the group.

11.4.3 *MAJOR GROUP ELEMENT*—The sum of the group element sums contained within the group element.

11.5 *Main Parameter:*

11.5.1 *Element*—The element sum divided by the main parameter quantity.

11.5.2 *GROUP ELEMENT*—The group element sum divided by the main parameter quantity.

11.5.3 *MAJOR GROUP ELEMENT*—The major group element sum divided by the main parameter quantity.

11.6 *Percentages:*

11.6.1 *Element*—The element sum divided by the designated major group estimate total.

11.6.2 *GROUP ELEMENT*—The group element sum divided by the designated major group estimate total.

11.6.3 *MAJOR GROUP ELEMENT*—The major group element sum divided by the designated major group estimate total.

12. Presentation Format—Analysis Calculation

12.1 An elemental analysis derives the results of elemental cost divided by elemental quantity. It also derives the result of element cost divided by the main parameter quantity.

12.2 *Element and ELEMENT:*

12.2.1 *Ratio*—Quantity *divided* by main parameter quantity.

12.2.2 *Quantity*—Obtained from within the estimate detail. Items specifically designated as element parameter quantities.

12.2.3 *Unit Rate*—element sum *divided* by element quantity.

12.3 *Sums:*

12.3.1 *Element*—The sum of items obtained from the underlying estimate detail.

12.3.2 *GROUP ELEMENT*—The sum of element sums contained within the group.

12.3.3 *MAJOR GROUP ELEMENT*—The sum of the group element sums contained within the group element.

12.4 *Main Parameter:*

12.4.1 *Element*—The element sum divided by the main parameter quantity.

12.4.2 *GROUP ELEMENT*—The group element sum divided by the main parameter quantity.

12.4.3 *MAJOR GROUP ELEMENT*—The major group element sum divided by the main parameter quantity.

12.5 *Percentages:*

12.5.1 *Element*—The element sum divided by the designated major group estimate total.

12.5.2 *GROUP ELEMENT*—The group element sum divided by the designated major group estimate total.

12.5.3 *MAJOR GROUP ELEMENT*—The major group element sum divided by the designated major group estimate Total.

13. Presentation Format—Variations and Additional User Information

13.1 *Percentage Calculations:*

13.1.1 Some practitioners may add additional, total and subtotal lines into their analyses. While these additional totals have no effect upon the end result (the total estimated cost) they do run the risk of implying that they represent a complete figure. The more so if the additional total or subtotal is designated as the 100 % reference point, yet excludes critical sums for such elements as field requirements, office overhead and profit, and allowances.

13.1.2 Allowances are not contingencies and are an integral part of the estimate without which the estimate will be incomplete and will fall short of forecasting a reasonable bid figure. For a more detailed discussion and distinction between allowances and contingencies refer to Classification E2168.

13.1.3 Included within the ASTM Basic Instructional Model Spreadsheet is a sheet tab entitled "Research." There, compared side by side, are the calculated effects of moving the 100 % 'marker' to two other locations (subtotals). There it can be seen that the effect of doing so is not great and does not materially skew the percentage figures displayed for all the other elements.

13.1.4 Clients and owners may see, and are often presented with, the full cost analysis presentation for their project as part of a routine cost presentation. The 100 % designator does imply completeness and can be misunderstood if applied to subtotal figures that do not represent a complete entity.

13.2 *Ratios and Element Quantities:*

13.2.1 The first analysis column of the format included in this practice displays the ratio of element quantity to the main parameter quantity. This serves two essential functions:

13.2.1.1 It is a mathematical description of the subject building's shape; and

13.2.1.2 Ratios are a valuable, macro level, estimate error checking tool.

13.2.2 Shape changes will be reflected in the ratio displayed. For example, when using gross floor area as the main parameter, a single storey building will show a ratio of 1.000 for slab on grade, and suspended roof elements, and 0.000 for the suspended floor element. A two storey building would indicate 0.500 instead for all of these same elements. There are many other relationships that can be explored by trial using the ASTM Basic Instructional Model Spreadsheet.

13.2.3 Wall to floor ratios are also a valuable indicator of the level of design economy inherent in the shape (massing) of the building.

13.2.4 Macro level estimate error checking may be undertaken after the shape ratio relationships have been understood. It is important the quantities used for these calculations are obtained from the underlying estimate. Using figures specifically measured for this purpose, and not normally used in the

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