Designation: E3008/E3008M – 16ε1

Standard Classification for Transportation Surface Elements—UNIFORMAT II[1]

This standard is issued under the fixed designation E3008/E3008M; 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.

ε[1] NOTE—Adjunct title and stock number in 2.3 were updated editorially in May 2020.

1. Scope

1.1 This standard establishes a classification of transportation surface elements within the UNIFORMAT II family of elemental classifications. It covers the full breadth of vehicular transportation surfaces, from rural roads to multi-lane interstate highways.

1.2 UNIFORMAT II classifications have an elemental format similar to the original UNIFORMAT[2] building elemental classification. However, the title UNIFORMAT II differs from the original in that it now takes into consideration a wide range of constructed entities that collectively form the built environment.

1.3 Elements, as defined here and in Classifications E1557 and E2103/E2103M, are major physical components that are common within constructed entities. Elements perform their given function(s), regardless of the design specification, construction method, or materials used.

1.4 This elemental classification serves as a consistent reference for analysis, evaluation, and monitoring during the feasibility, planning, and design stages when constructing transportation surfaces.

1.5 Using UNIFORMAT II elemental classifications ensures a consistency in the economic evaluation of construction projects over time and from project to project.

1.6 UNIFORMAT II classifications also enhance reporting at all stages of a constructed entity's life cycle—from feasibility and planning through the preparation of working documents, construction, maintenance, rehabilitation, and disposal.

1.7 This classification is unsuitable for process applications or for preparing trade estimates.

1.8 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.9 *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.*

1.10 *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:*[3]

E631 Terminology of Building Constructions
E833 Terminology of Building Economics
E917 Practice for Measuring Life-Cycle Costs of Buildings and Building Systems
E964 Practice for Measuring Benefit-to-Cost and Savings-to-Investment Ratios for Buildings and Building Systems
E1057 Practice for Measuring Internal Rate of Return and Adjusted Internal Rate of Return for Investments in Buildings and Building Systems
E1074 Practice for Measuring Net Benefits and Net Savings for Investments in Buildings and Building Systems
E1121 Practice for Measuring Payback for Investments in Buildings and Building Systems
E1185 Guide for Selecting Economic Methods for Evaluating Investments in Buildings and Building Systems
E1369 Guide for Selecting Techniques for Treating Uncertainty and Risk in the Economic Evaluation of Buildings and Building Systems
E1699 Practice for Performing Value Engineering (VE)/

[1] This classification 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 June 1, 2016. Published June 2016. DOI: 10.1520/E3008_E3008M-16E01.

[2] The original UNIFORMAT classification was developed jointly by the General Services Administration (GSA) and the American Institute of Architects (AIA).

[3] 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.

Value Analysis (VA) of Projects, Products and Processes
E1804 Practice for Performing and Reporting Cost Analysis During the Design Phase of a Project
E1946 Practice for Measuring Cost Risk of Buildings and Building Systems and Other Constructed Projects
E2013 Practice for Constructing FAST Diagrams and Performing Function Analysis During Value Analysis Study
E2506 Guide for Developing a Cost-Effective Risk Mitigation Plan for New and Existing Constructed Facilities
E2691 Practice for Job Productivity Measurement

2.2 *ASTM UNIFORMAT II Classification Standards Family:*[3]

E1557 Classification for Building Elements and Related Sitework—UNIFORMAT II
E2083 Classification for Building Construction Field Requirements, and Office Overhead & Profit
E2103/E2103M Classification for Bridge Elements—UNIFORMAT II
E2168 Classification for Allowance, Contingency, and Reserve Sums in Building Construction Estimating
E2514 Practice for Presentation Format of Elemental Cost Estimates, Summaries, and Analyses
E2516 Classification for Cost Estimate Classification System

2.3 *ASTM Adjunct:*[4]

Discount Factor Tables - Adjunct to E917 Practice for Measuring Life-Cycle Costs of Buildings and Building Systems - Includes Excel and PDF Files

3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

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

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

3.2.3 *major group element, n—in construction planning, design, specification, estimating, and cost analysis*, is 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.

4. Significance and Use

4.1 This standard builds on the concepts and organizational framework established in Classification E1557. This classification describes transportation surface elements that are major components of most vehicular transportation surfaces. The elemental classification is the common thread linking activities and participants in a transportation surface project from initial planning through operations, maintenance, and disposal.

NOTE 1—As this classification refers solely to permanent, physical parts of any construction, two additional classifications, Classifications E2083 and E2168, need to be included when calculating construction cost. These standards provide for the inclusion of construction enabling, temporary, and risk mitigation cost figures. Procedures for reporting all these figures are described in Practices E1804 and E2514 and Classification E2516. While these three latter standards were primarily written for building construction, they are nonetheless appropriate and readily applied to other forms of construction as well.

4.2 The users of transportation surface UNIFORMAT II include:

4.2.1 *Financial and Investment*—Typically owners, developers, bankers, lenders, accountants, and financial managers.

4.2.2 *Implementation*—Primarily project managers; facilities programmers; designers, including engineers; and project controls specialists, including cost planners, estimators, schedulers, specification writers, and risk analysts.

4.2.3 *Facilities Management*—Comprising property portfolio managers, operating staff, and maintenance staff.

4.2.4 *Others*—Public officials, manufacturers, educators, students, and other project stakeholders.

4.3 *Apply This Classification When Undertaking the Following Work on Transportation Surface Projects:*[5]

4.3.1 *Financing and Investing:*

4.3.1.1 Structuring costs on an elemental basis for economic evaluations (Guide E1185 and Practices E917, E964, E1057, E1074, E1121, and E1804) early in the design process helps reduce the cost of early financial analysis and can contribute to substantial design and operational savings before decisions have been made that limit options for potential savings.

4.3.2 *Implementing:*

4.3.2.1 *Cost Modeling, Cost Planning, Estimating and Controlling Project Time and Cost During Planning, Design, and Construction*—Use the transportation surface UNIFORMAT II classification to prepare budgets and to establish elemental cost plans before design begins. Project managers and project controls specialists use these cost plans against which to measure and control project cost, and quality, and to set design-to-cost targets.

4.3.2.2 *Conducting Value Engineering Workshops*—Conducting value engineering workshops (Practices E1699 and E2013). Use this classification as a checklist to ensure that alternatives for all elements of significant cost in the transportation surface project are analyzed in the creativity phase of the

[4] Available from ASTM International Headquarters. Order Adjunct No. ADJE091717-EA. Original adjunct produced in 1984. Adjunct last revised in 2003.

[5] For a more comprehensive discussion of the uses of UNIFORMAT II, see Bowen, Charette, and Marshall, UNIFORMAT II—A Recommended Classification for Building Elements and Related Sitework, National Institute of Standards and Technology, Special Publication 841, Gaithersburg, MD, 1992; Charette and Marshall, UNIFORMAT II Elemental Classification for Building Specifications, Cost Estimating, and Cost Analysis, National Institute of Standards and Technology, NISTIR 6389, Gaithersburg, MD, 1999; and Kasi and Chapman, Benefits of Using ASTM Building Economics Standards for the Design, Construction, and Operation of Constructed Facilities, National Institute of Standards and Technology, Special Publication 1098, Gaithersburg, MD, 2012.

job plan. Also, use the elemental cost data to expedite the development of cost models for transportation surface systems.

4.3.2.3 *Developing Initial Project Master Schedules*—Since projects are essentially built element by element, UNIFORMAT II classifications are an appropriate basis for preparing construction schedules at the start of the design process. Project managers and project controls specialists use these time plans against which to measure and control project time (Practice E2691), and to set milestone target dates.

4.3.2.4 *Performing Risk Analyses*—Simulation (Guides E1369 and E2506) is one technique for developing probability distributions of transportation surface costs when evaluating the economic risk in undertaking a transportation surface project. Use individual elements and group elements in this classification for developing probability distributions of elemental costs. From these distributions, build up probability distributions of total costs to establish project contingencies (Practice E1946 and Classification E2168) or to serve as inputs to an economic analysis.

4.3.2.5 *Structuring Preliminary Project Descriptions During the Conceptual Design Phase*—This classification facilitates the description of the scope of the project in a clear, concise, and logical sequence for presentation to the client; it provides the basis for the preparation of more detailed elemental estimates during the early concept and preliminary design phases, and it enhances communication between designers and clients by providing a clear statement of the designer's intent.

4.3.2.6 *Coding and Referencing Standard Details in Computer-Aided Design Systems*—This classification allows a designer, for example, to reference an assembly according to this classification's element designations and build up a database of standard details. This is particularly appropriate to design modeling and building information modeling (BIM) applications.

4.3.3 *Managing Facilities:*

4.3.3.1 Recording and writing property condition assessment reports in a structured way, using UNIFORMAT II classifications, provides for a consistent, accessible, and searchable database of real property inventory.

4.3.4 *Other Activities:*

4.3.4.1 Structuring cost manuals and recording construction, operating, and maintenance costs in a computer database. Having a cost manual or computer database in an elemental format assists the preparation of an economic analysis early in the design stage and at a reasonable cost.

5. Basis of Classification

5.1 The framework in Fig. 1 shows the various constructed entities that collectively are used to create the built environment. Each entity is treated as a module. Appropriate modules used together will effectively describe any planned or built development. This standard classification describes exclusively the elements that make up one of those constructed entities, transportation surface, shown as the shaded block under the heading of Heavy (Civil) Entities.

5.1.1 This transportation surface classification is applicable to the full breadth of vehicular transportation surfaces. The classification includes unpaved roads, paved roads, and divided highways. The classification does not include the following types of transportation surfaces: driveways, railroads, and runways.

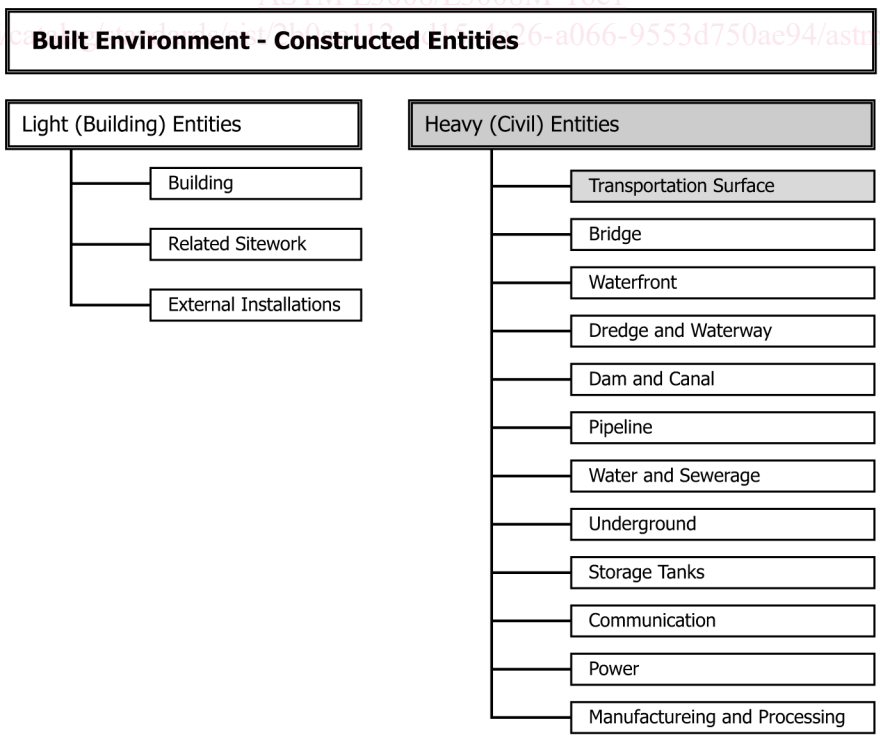

FIG. 1 List of Constructed Entities Suitable for Inclusion in the Family of UNIFORMAT II Elemental Classifications

5.2 The classification is consistent with typical costing practices used at the conceptual design phase.

5.3 Each element has a significant impact on the cost, and it usually occurs frequently.

5.4 Each element performs a specific function.

5.5 Table 1 divides the classification of transportation surface elements into three hierarchical levels: Level 1—Major Group Elements, Level 2—Group Elements, and Level 3—Individual Elements. The Major Groups are listed in the normal chronological order of construction.

5.6 Sub-Classifications (not included in this standard) are named Sub-Elements and comprise as many hierarchical levels (Level 4 and below) as are deemed appropriate to the needs of that specific example.

5.7 The decision as to where among the classification elements to include specific construction items will rely on professional judgment as to where professionals in current practice normally look for such items.

5.8 Only items that impact the choice and cost of the surface transportation elements are included. Other civil works in the transportation system are not included. Consequently, this classification does not include utilities—pipelines (water, natural gas, and petroleum) and transmission lines (electrical, communication, and video)—sharing the same right of way as the transportation system.

5.9 Elements, as used and defined in UNIFORMAT II, will ideally display the following additional attributes:

5.9.1 Capable of being defined precisely;

5.9.2 Self explanatory;

5.9.3 Separable at all stages of development;

5.9.4 Quantifiable at all stages of development;

5.9.5 Capable of reconciliation with other elemental classifications;

5.9.6 Allow comparisons, project to project, in a meaningful way;

5.9.7 Is a functional component of the constructed entity.

5.10 Sitework elements are provided for exclusive use in support of the construction of transportation surfaces, not to classify elements of major civil construction works. Sitework elements presented in Table 1 are designed to provide sufficient detail to planners so they will not need to resort to other elemental classifications when working on a transportation surface project.

TABLE 1 UNIFORMAT II Classification of Transportation Surface Elements
Level 0 Classification ID: TRAN [02]

Level 1 Major Group Elements	Level 2 Group Elements	Level 3 Individual Elements
A Sub-grade	A10 Earthwork	A1010 Excavation and Fill
		A1020 Ditches
		A1030 Water Detention / Retention
		A1040 Erosion Control
	A20 Structures	A2010 Retaining Walls
		A2020 Culverts
B Travelled Way	B10 Main	B1010 Surface
		B1020 Base
	B20 Edge	B2010 Shoulder
		B2020 Multi-Use Path
		B2030 Curb
		B2040 Barrier
		B2050 Median
C Services	C10 Intelligent Transportation	C1010 Security / Surveillance Systems
		C1020 Tolling Devices
		C1030 Dynamic Message Signs
		C1040 Lane Utilization Systems
	C20 Utilities	C2010 Power
		C2020 Communications
		C2030 Storm Sewer
		C2040 Other Utilities
D Protection	D10 Traffic	D1010 Signs
		D1020 Signals
		D1030 Markings
		D1040 Lighting
	C20 Property	D2010 Fence
		D2020 Noise Inhibitors
E Site Work	E10 Preparation	E1010 Clearing and Grubbing
		E1020 Wildlife Protection
		E1030 Wetland Protection
		E1040 Demolition / Relocation
		E1050 Pavement Removal
		E1060 Special / Hazardous Waste Treatment
	E20 Restoration	E2010 Landscaping
		E2020 Environmental Restoration / Replacement

6. Description of UNIFORMAT II Transportation Surface Elements and Units of Measure

6.1 *Elements and Functions*—Table 2 provides, for each Level 3 Individual Element, the name, description, inclusions, exclusions, and unit of measure.

6.2 *Description*—The element descriptions help you understand the purpose and application of the element.

6.3 *Includes*—The purpose of the element inclusions is to list features that make up the element.

6.4 *Excludes*—The purpose of the element exclusions is to list features that are not included in the element but which are included elsewhere in this classification.

NOTE 2—Because this classification refers solely to permanent physical parts of transportation surface constructions, references to construction enabling (cranes and formwork), temporary construction (cofferdams and traffic detours), and risk mitigation (allowances and contingencies) cost figures are omitted from the element exclusions.

6.5 *Unit of Measure*—The purpose of the unit of measure is to provide a means for calculating the magnitude, or size, of each element in any transportation surface description; units of measure are important to all users of elemental classifications. Units of measure are of prime importance in the elemental cost management process. Both SI and inch-pound units are reported. SI units are reported first followed by inch-pound units within brackets. Table 2 uses the following unit of measure abbreviations: linear metres (m) and linear feet (ft); square metres (m^2) and square feet (ft^2); cubic metres (m^3) and cubic yards (yd^3); and kilograms (kg) and pounds (lb).

7. Keywords

7.1 construction; design economics; economic analysis; economic evaluation; elemental transportation surface classification; elemental/systems classification; life-cycle costing; master schedules; outline specifications; preliminary project description; risk analysis; sitework; standard classifications of transportation surface systems; transportation surface assemblies; transportation surface cost estimation; transportation surface cost planning; transportation surface elemental format; transportation surface elements; transportation surface functional elements; transportation surface systems classification; UNIFORMAT II; value engineering

TABLE 2 Description of UNIFORMAT II Transportation Surface Elements and Units of Measure

A SUB-GRADE	
A10 Earthwork	
	A1010 Excavation and Fill
Description	Excavation, placement, and compaction of material for the purposes of modifying existing ground lines to achieve the desired elevation
Includes	Shrinkage factor for embankment, hauling material to or from the site, compaction, rock excavation
Excludes	Special or hazardous waste treatment or removal, ground improvement or reinforcement
Unit of Measure	m^3 [yd^3]
	A1020 Ditches
Description	Open drainage system that detains water as it runs off the transportation surface
Includes	Paved and unpaved ditches
Excludes	Outlets, Right-of-Way acquisitions
Unit of Measure	m^3 [yd^3]
	A1030 Water Detention / Retention
Description	Retention basins store water and collect additional storm water during periods of heavy rain. Detention basins collect storm water during periods of heavy rain but do not store water continuously.
Includes	Orifices, risers, dewatering devices
Excludes	Earthwork
Unit of Measure	m^3 [yd^3] or LUMP SUM
	A1040 Erosion Control
Description	Measures put in place to improve the long-term stability of a slope.
Includes	Soil reinforcement, slope walls
Excludes	Retaining walls
Unit of Measure	m^2 [ft^2]
A SUB-GRADE	
A20 Structures	
	A2010 Retaining Wall
Description	Allows for a significant change in ground elevation by containing the earth.
Includes	Mechanically stabilized earth walls, cast-in-place walls, modular block walls
Excludes	Temporary works such as sheet piling
Unit of Measure	m^2 [ft^2]
	A2020 Culverts
Description	Structure that permits water to flow across the line of travel and under the transportation surface.
Includes	Pipe and box culverts
Excludes	Approach ditches, soil above culvert
Unit of Measure	m [ft] or EACH
B TRAVELLED WAY	
B10 Main	
	B1010 Surface
Description	Part of the transportation surface in contact with the mode of transportation.
Includes	Concrete or asphalt overlay. Bituminous, concrete, or combination pavement structures. Brick, concrete block, and stone paving systems.
Excludes	Base and sub-base material.
Unit of Measure	m^2 [yd^2]
	B1020 Base
Description	Supports the pavement and provides a foundation for future maintenance.
Includes	Sub-base material, if required
Excludes	Surface pavement
Unit of Measure	m^2 [yd^2]
B TRAVELLED WAY	
B20 Edge	
	B2010 Shoulder
Description	Part of a transportation surface outside of the travelled lanes.
Includes	Concrete, asphalt, or continuously reinforced pavement, base course, and sub base within the area defined as the shoulder
Excludes	Surface, base course, and sub base supporting the travelled lanes
Unit of Measure	m^2 [yd^2]
	B2020 Multi-use Path
Description	Paved surface for pedestrian or bicycle traffic, or both.
Includes	
Excludes	Sub-grade material and placement
Unit of Measure	m^2 [yd^2]
	B2030 Curb
Description	Guides traffic and collects water for drainage.
Includes	Concrete and bituminous curb, combination curb, and gutter
Excludes	
Unit of Measure	m [ft]
	B2040 Barrier
Description	Structure designed to withstand forces due to crashes, separate the opposing traffic, and protect bridge structures and other elements adjacent to live traffic.
Includes	Jersey barriers, guard rail, traffic attenuators, protective shields mounted on barrier, cable barrier systems
Excludes	
Unit of Measure	m [ft]