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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.

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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

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)/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

[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.

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[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.

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 Adjuncts:*[4]

Discount Factor Tables Adjunct to Practices E917, E964, E1057, E1074, and E1121

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 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

[4] Available from ASTM International Headquarters. Order Adjunct No. ADJE091703. Original adjunct produced in 1984.

[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.

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.

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

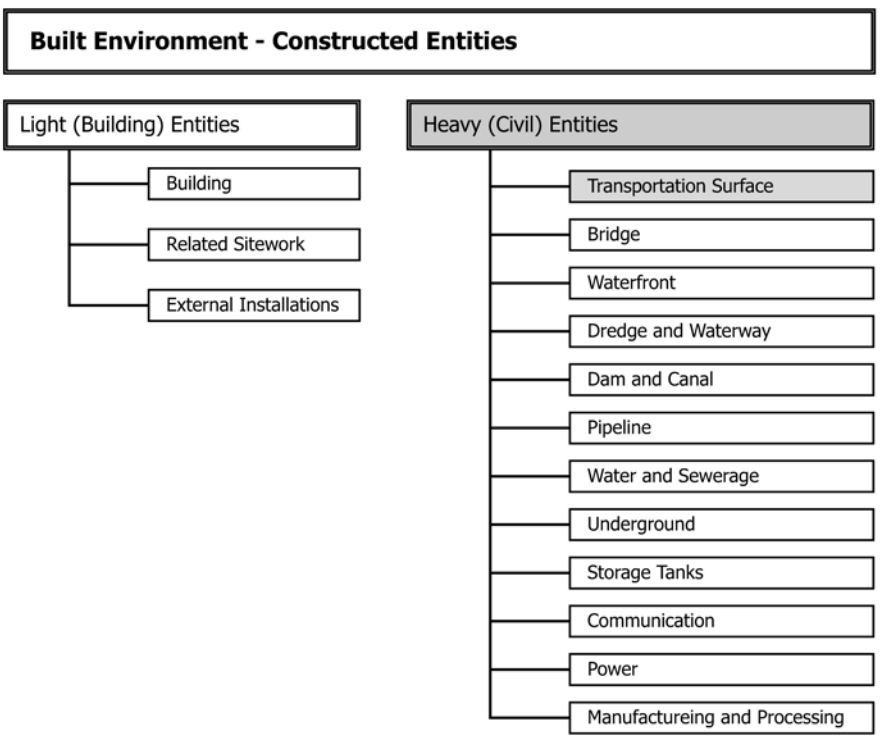

FIG. 1 List of Constructed Entities Suitable for Inclusion in the Family of UNIFORMAT II Elemental Classifications

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

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.

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.

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]

TABLE 2 *Continued*

	B2050 Median
Description	Separates directions of traffic to minimize head-on collisions and control crossover locations.
Includes	Flush, raised grass, and landscaped medians
Excludes	Barriers
Unit of Measure	m [ft]
C SERVICES	
C10 Intelligent Transportation	
	C1010 Security / Surveillance Systems
Description	Systems that record information and alert authorities in the event of suspicious behavior.
Includes	Cameras, alarms, recording software, motion-sensing lights
Excludes	Electrical work
Unit of Measure	EACH or LUMP SUM
	C1020 Tolling Devices
Description	Elements involved in the collection of usage fees from the users of the transportation surface.
Includes	Open road electronic tolling systems, toll plaza equipment
Excludes	Toll booth structures (see Classification E1557)
Unit of Measure	EACH or LUMP SUM
	C1030 Dynamic Message Signs
Description	Signs that convey information through changeable electronic message boards.
Includes	Fabrication and installation of sign and support, and power
Excludes	Printed signs, lane utilization systems
Unit of Measure	EACH
	C1040 Lane Utilization Systems
Description	Systems that track traffic speed and congestion information to provide real-time information to dynamic message signs and signals, allowing for a more efficient reconfiguration of traffic.
Includes	Power
Excludes	Dynamic message signs
Unit of Measure	LUMP SUM
C SERVICES	
C20 Utilities	
	C2010 Power
Description	Power supply to elements within the surface transportation project, such as signals, lighting, and intelligent transportation systems.
Includes	Junction boxes, conduit, conductors, cables
Excludes	Overhead transmission lines
Unit of Measure	m [ft] or EACH
	C2020 Communications
Description	Communications services to elements within the surface transportation project, typically intelligent transportation services requiring remote access, such as dynamic message signs and various security systems.
Includes	Conduit, fiber, twisted copper wire
Excludes	
Unit of Measure	m [ft] or EACH
	C2030 Storm Sewer
Description	Closed drainage structure that conveys water from collection points to outlet points.
Includes	Pipe, joints, inlets, catch basins, manholes, trench, and backfilling
Excludes	Hazardous or special material handling
Unit of Measure	m [ft] or EACH
	C2040 Other Utilities
Description	Work needed to provide other utilities that are not explicitly covered within the power, communications, and storm sewer elements described previously.
Includes	Gas, electric, telephone, and other private utilities
Excludes	Power, communications, storm sewer
Unit of Measure	m [ft] or EACH
D PROTECTION	
D10 Traffic	
	D1010 Signs
Description	Provision of information through printed message boards.
Includes	Fabrication and installation of sign and support, foundation
Excludes	Dynamic message signs
Unit of Measure	EACH
	D1020 Signals
Description	Utilized to control the flow of traffic, commonly in areas of intersecting travel directions.
Includes	Power source and support
Excludes	
Unit of Measure	EACH
	D1030 Markings
Description	Delineate driving lanes, shoulder locations, turning lanes, and other traffic movements.
Includes	Pavement markings, reflective markers, delineators
Excludes	
Unit of Measure	m [ft] or EACH
	D1040 Lighting
Description	Illumination from fixtures providing vehicle traffic direction, task lighting, and vandalism discouragement.
Includes	Fabrication and installation of mast, lights, base plates, and power
Excludes	Base support (see Barriers)
Unit of Measure	EACH

TABLE 2 *Continued*

D PROTECTION	
D20 Property	
	D2010 Fence
Description	Protects property by limiting access from one side to the other.
Includes	
Excludes	
Unit of Measure	m [ft]
	D2020 Noise Inhibitors
Description	Physical entities that mitigate the noise impact on surrounding areas.
Includes	Berms, noise walls
Excludes	Retaining walls
Unit of Measure	m^2 [yd^2]
E SITEWORK	
E10 Preparation	
	E1010 Clearing and Grubbing
Description	Removal from the construction site of trees, stumps, tree roots, and abandoned utilities, and the grading and leveling of the site.
Includes	Tree removal, abandoned utilities, minor earth work
Excludes	Major earth work, major utility removal (see Earthwork, Demolition, Relocation)
Unit of Measure	EACH or Hectare [Acre]
	E1020 Wildlife Protection
Description	Measures to limit the impact of surrounding construction projects on the local wildlife habitats.
Includes	
Excludes	
Unit of Measure	LUMP SUM
	E1030 Wetland Protection
Description	Measures to limit the impact of surrounding construction projects on the size and sustainability of a designated wetlands area. May also require the creation of additional wetland areas to compensate for the loss of wetland area due to construction.
Includes	
Excludes	
Unit of Measure	m^3 [yd^3] or LUMP SUM
	E1040 Demolition / Relocation
Description	Complete or partial removal of an existing bridge, building, or other structure, or the removal and reinstallation of various items that conflict with the proposed work, such as buildings or utilities.
Includes	Removal of bridge elements and disposal, removal of building elements and disposal, relocation of utilities such as storm sewer, power, and natural gas.
Excludes	
Unit of Measure	EACH
	E1050 Pavement Removal
Description	Complete or partial removal of an existing transportation surface from the construction site.
Includes	Removal and disposal of pavement, shoulder, curb, median, base or sub base.
Excludes	Demolition, Relocation
Unit of Measure	EACH
	E1060 Special / Hazardous Waste Treatment
Description	Discovery, excavation, recovery, and disposal of hazardous materials.
Includes	Excavation and disposal of material
Excludes	General excavation (see Demolition, Relocation, Earthwork)
Unit of Measure	m^3 [yd^3]
E SITEWORK	
E20 Restoration	
	E2010 Landscaping
Description	Aesthetic enhancement of the visible appearance of an area of land
Includes	Topsoil, planters, seeding
Excludes	Earthwork
Unit of Measure	m^2 [yd^2]
	E2020 Environmental Restoration / Replacement
Description	Restoring or replacing elements of the environment disturbed by construction.
Includes	Restoration or replacement of wetlands
Excludes	
Unit of Measure	Hectare [Acre]

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

APPENDIX

X1. DESCRIPTION OF UNIFORMAT II TRANSPORTATION SURFACE ELEMENT FUNCTIONS

(Nonmandatory Information)

X1.1 Elements and Functions

X1.1.1 Table X1.1 provides the name and functions for each Level 3 Individual Element. The functions are classified as Primary, Secondary, and Tertiary. All three levels of functions may be served. However, one or two functions may be the driving force behind the existence of the element, and they are classified as Primary functions.

TABLE X1.1 Description of UNIFORMAT II Transportation Surface Element Functions

A SUB-GRADE	
A10 Earthwork	
A1010 Excavation and Fill	
Primary Function	Define roadway
Secondary Function	Support pavement
Tertiary Function	Protect environment
A1020 Ditches	
Primary Function	Convey water (longitudinally)
Secondary Function	Store water
Tertiary Function	Minimize erosion
A1030 Water Detention / Retention	
Primary Function	Prevent flooding
Secondary Function	Replenish groundwater
Tertiary Function	Store water
A1040 Erosion Control	
Primary Function	Prevent erosion
Secondary Function	Protect traffic
Tertiary Function	Protect environment
A SUB-GRADE	
A20 Structures	
A2010 Retaining Wall	
Primary Function	Protect property
Secondary Function	Retain earth
Tertiary Function	Protect environment
A2020 Culverts	
Primary Function	Convey water (transversely)
Secondary Function	Consolidate drainage
Tertiary Function	Support pavement
B TRAVELLED WAY	
B10 Main	
B1010 Surface	
Primary Function	Receive load
Secondary Function	Direct water
Tertiary Function	Comfort riders
B1020 Base	
Primary Function	Support load
Secondary Function	Distribute load
Tertiary Function	Drain water
B TRAVELLED WAY	
B20 Edge	
B2010 Shoulder	
Primary Function	Protect pavement
Secondary Function	Shelter vehicles
Tertiary Function	Store snow
B2020 Multi-use Path	
Primary Function	Protect non-motorists
Secondary Function	Maintain speed
Tertiary Function	Support disabled person
B2030 Curb	
Primary Function	Protect pavement
Secondary Function	Direct water
Tertiary Function	Maintain speed
B2040 Barrier	
Primary Function	Separate traffic
Secondary Function	Deflect vehicles
Tertiary Function	Minimize maintenance
B2050 Median	
Primary Function	Separate traffic
Secondary Function	Shelter non-motorists
Tertiary Function	Regulate crossovers
C SERVICES	
C10 Intelligent Transportation	
C1010 Security / Surveillance Systems	
Primary Function	Protect travelers
Secondary Function	Deter vandalism
Tertiary Function	Protect infrastructure
C1020 Tolling Devices	
Primary Function	Maintain transportation systems
Secondary Function	Minimize inconvenience
Tertiary Function	Ensure payment
C1030 Dynamic Message Signs	
Primary Function	Display message
Secondary Function	Update message
Tertiary Function	Facilitate multiple message

TABLE X1.1 *Continued*

C1040 Lane Utilization Systems	
Primary Function	Manage traffic
Secondary Function	Direct traffic
Tertiary Function	Update information
C SERVICES	
C20 Utilities	
C2010 Power	
Primary Function	Convey power
Secondary Function	Eliminate obstacles
Tertiary Function	Conserve energy
C2020 Communications	
Primary Function	Convey information
Secondary Function	Expedite conveyance
Tertiary Function	Secure cables
C2030 Storm Sewer	
Primary Function	Collect water
Secondary Function	Convey water
Tertiary Function	Filter drainage
C2040 Other Utilities	
Primary Function	Convey service
Secondary Function	
Tertiary Function	
D PROTECTION	
D10 Traffic	
D1010 Signs	
Primary Function	Guide traffic
Secondary Function	Prevent mistakes
Tertiary Function	Simplify message
D1020 Signals	
Primary Function	Control traffic
Secondary Function	Manage traffic
Tertiary Function	Minimize collisions
D1030 Markings	
Primary Function	Guide traffic
Secondary Function	Direct traffic
Tertiary Function	Maintain speed
D1040 Lighting	
Primary Function	Protect traffic
Secondary Function	Protect non-motorists
Tertiary Function	Discourage vandalism
D PROTECTION	
D20 Property	
D2010 Fence	
Primary Function	Limit access
Secondary Function	Define boundary
Tertiary Function	Fit surroundings
D2020 Noise Inhibitors	
Primary Function	Abate traffic noise
Secondary Function	Create visual barrier
Tertiary Function	Enhance appearance
E SITEWORK	
E10 Preparation	
E1010 Clearing and Grubbing	
Primary Function	Eliminate obstacles
Secondary Function	Create staging area
Tertiary Function	Accommodate environmental needs
E1020 Wildlife Protection	
Primary Function	Protect traffic
Secondary Function	Protect wildlife
Tertiary Function	Accommodate (wildlife) crossings
E1030 Wetland Protection	
Primary Function	Protect wetlands
Secondary Function	Compensate wetland loss
Tertiary Function	
E1040 Demolition / Relocation	
Primary Function	Eliminate obstacles
Secondary Function	Protect structures
Tertiary Function	Protect environment
E1050 Pavement Removal	
Primary Function	Eliminate obstacles
Secondary Function	Protect environment
Tertiary Function	Recycle materials
E1060 Special / Hazardous Waste Treatment	
Primary Function	Protect environment
Secondary Function	Dispose hazardous waste
Tertiary Function	Protect workers

TABLE X1.1 *Continued*

E SITEWORK	
E20 Restoration	
E2010 Landscaping	
Primary Function	Enhance appearance
Secondary Function	Prevent erosion
Tertiary Function	
E2020 Environmental Restoration / Replacement	
Primary Function	Enhance appearance
Secondary Function	Minimize construction impact
Tertiary Function	