



Designation: E2103/E2103M – 13

## Standard Classification for Bridge Elements—UNIFORMAT II<sup>1</sup>

This standard is issued under the fixed designation E2103/E2103M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This standard establishes a classification of bridge elements within the UNIFORMAT II family of elemental classifications. It covers most highway bridges, railroad bridges, and pedestrian bridges.

1.2 UNIFORMAT II classifications have an elemental format similar to the original UNIFORMAT<sup>2</sup> 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 other UNIFORMAT II Classifications, 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 bridges.

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:<sup>3</sup>

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

<sup>1</sup> 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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<sup>2</sup> The original UNIFORMAT classification was developed jointly by the General Services Administration (GSA) and the American Institute of Architects (AIA).

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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

2.1.1 *ASTM UNIFORMAT II Classification Standards Family:*<sup>3</sup>

E1557 Classification for Building Elements and Related Sitework—UNIFORMAT II

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

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

2.2 *ASTM Adjuncts:*<sup>4</sup>

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.

## 4. Significance and Use

4.1 This standard builds on the concepts and organizational framework first established in Classification E1557. This classification describes bridge elements that are major components of most highway, railroad, and pedestrian bridges. The elemental classification is the common thread linking activities and participants in a bridge 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 Bridge 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 Bridges:*<sup>5</sup>

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 bridge 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 bridge 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 bridge 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 bridge costs when evaluating the economic risk in undertaking a bridge 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 (Practices E1946 and 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

<sup>5</sup> 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; and 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.

<sup>4</sup> Available from ASTM International Headquarters. Order Adjunct No. ADJE091703. Original adjunct produced in 1984. Adjunct last revised in 1985.

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, bridge structures, shown as the shaded block under the heading of Heavy (Civil) Entities.

5.1.1 This bridge classification is applicable to most types of highway, railroad, and pedestrian bridges crossing over highways, railroads, walkways, and waterways. The classification includes slab bridges; beam/girder bridges; truss bridges;

true and tied-arch bridges; cable-stayed bridges; and suspension bridges. The classification does not include the following movable bridge types: draw bridges; lift bridges; and bascule bridges.

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 bridge 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 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. Appendix X1 provides an example Sub-Classification of bridge elements.

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 bridge elements are included. Other civil works in the transportation system are not included. Consequently, this classification does

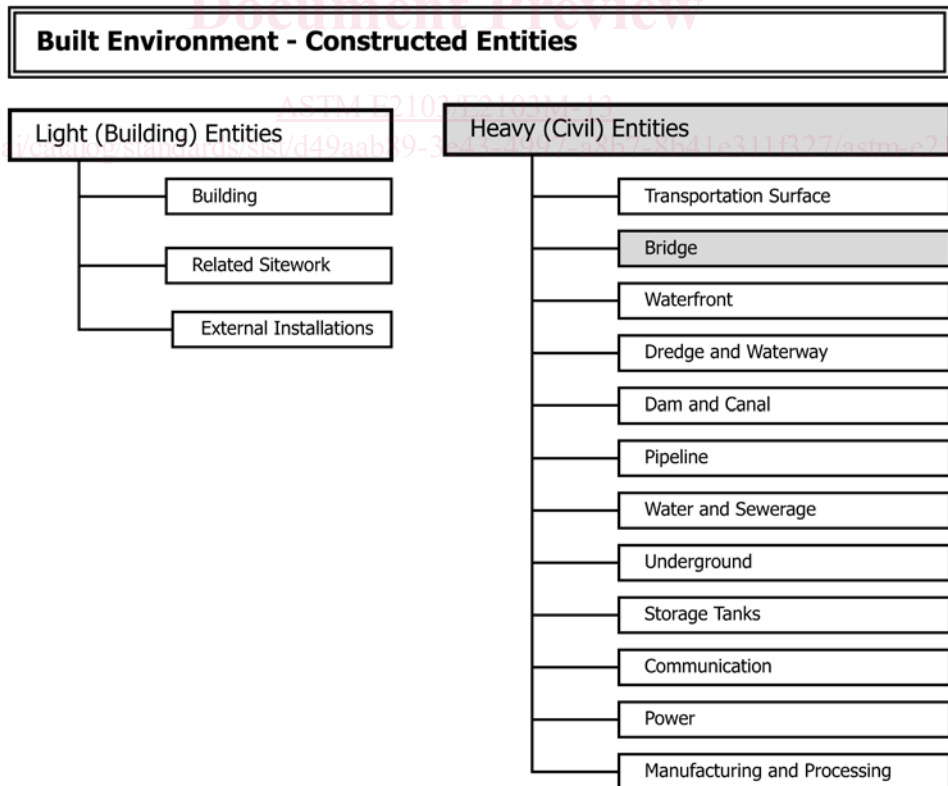


FIG. 1 List of Constructed Entities Suitable for Inclusion in the Family of UNIFORMAT II Elemental Classifications

**TABLE 1 UNIFORMAT II Classification of Bridge Elements**

Level 1 Major Group Elements	Level 2 Group Elements	Level 3 Individual Elements	
Substructure	Piers	Foundations Walls Columns Cap Beams	
	Towers	Foundations Walls Columns Cap Beams	
	Abutments	Foundations Stems Wing Walls	
	Other Supports	Thrust Blocks Anchorages	
Superstructure	Short Span Assemblies	Flexural Members Diaphragms Bracings Bearings	
	Long Span Assemblies	Ribs Cables Hangers Spandrels Ties Truss Members Segmental Box Girders	
	Deck	Structural Surface Wearing Surface	
Protection	Structure Protection	Slope Walls Expansion Joints Protective Coats Sacrificial Beams Drainage Systems Inspection and Maintenance Systems	
		Traffic Protection	Barriers Protective Shields Traffic Controls
		Other Protection	Lighting Signage Sound Barrier Walls Air Pressure Barriers Enclosure
Sitework	Site Preparation	Clearing and Grubbing Demolition and Relocation Earthwork Hazardous Material Handling Environmental Restoration/Replacement	
	Approach Construction	Approach Slabs Sleeper Slabs Earth Retention Systems	

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<https://standards.itih.ai/catalog/standards/sist/d49aab89-3e43-4997-a8b7-8b41e311b228/e2103-e2103m-13>

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 bridges, 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 bridge project.

## 6. Description of Project Elements

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

<b>SUBSTRUCTURE</b>	
<b>Piers</b>	
	<b>Foundations</b>
Primary Function	Transfer load, Minimize settlement
Secondary Function	Minimize maintenance
Tertiary Function	Facilitate construction
Description	Foundations are structures that transfer the load of the bridge substructures to the ground. They may be spread footings, piles, or drilled shafts. The type depends upon the soil conditions.
Includes	Excavation and backfilling
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or m [ft]
	<b>Walls</b>
Primary Function	Distribute load, Protect foundation
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Walls are structures that support the columns; in addition to transferring the load from the columns to the foundation, they protect the pier against impacts from vehicles, vessels, and debris.
Includes	
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
	<b>Columns</b>
Primary Function	Distribute load
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Columns are structures that support the cap beam and transfer the load from the cap beam to the wall below.
Includes	
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
	<b>Cap Beams</b>
Primary Function	Distribute load
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Cap beams are structures that receive and transfer beam loads from the deck to the bridge columns.
Includes	Bridge seat
Excludes	Bearings and anchor bolts (see Bearings, Flexural Members)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
<b>SUBSTRUCTURE</b>	
<b>Towers</b>	
	<b>Foundations</b>
Primary Function	Transfer load, Minimize settlement
Secondary Function	Minimize maintenance
Tertiary Function	Facilitate construction
Description	Foundations are structures that transfer the load of the bridge substructures to the ground. They may be spread footings, piles, or drilled shafts. The type depends upon the soil conditions.
Includes	Excavation and backfilling
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or m [ft]
	<b>Walls</b>
Primary Function	Distribute load, Protect foundation
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Walls are structures that support the columns; in addition to transferring the load from the columns to the foundation, they protect the pier against impacts from vehicles, vessels, and debris.
Includes	
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
	<b>Columns</b>
Primary Function	Distribute load
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Columns are structures that support the cap beam and transfer the load from the cap beam to the wall below.
Includes	

**TABLE 2 Continued**

Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
	<b>Cap Beams</b>
Primary Function	Distribute load
Secondary Function	Enhance appearance
Tertiary Function	Expedite construction
Description	Cap beams are structures that receive and transfer beam loads from the deck to the bridge columns.
Includes	Bridge seat
Excludes	Bearings and anchor bolts (see Bearings, Flexural Members)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
<b>SUBSTRUCTURE</b>	
<b>Abutments</b>	
	<b>Foundations</b>
Primary Function	Transfer load, Minimize settlement
Secondary Function	Minimize maintenance
Tertiary Function	Facilitate construction
Description	Foundations are structures that transfer the load of the bridge substructures to the ground. They may be spread footings, piles, or drilled shafts. The type depends upon the soil conditions.
Includes	Excavation and backfilling
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or m [ft]
	<b>Stems</b>
Primary Function	Distribute load, Retain earth
Secondary Function	Minimize erosion
Tertiary Function	Minimize settlement
Description	Stems are usually supported on piles; they partially or fully retain earth behind, support the ends of the first and last spans of the bridge, and support the approach slab.
Includes	Bridge seat, reinforcing, concrete, and finishing
Excludes	Slope wall, foundation, and anchor bolts and bearings (see Foundations, Barriers, Slope Wall, Bearings)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or kg [lb]
	<b>Wing Walls</b>
Primary Function	Retain earth
Secondary Function	Minimize erosion
Tertiary Function	Enhance appearance
Description	Wing walls (parallel, perpendicular, or angled) are structures connected to the abutment and supported by piles that retain the embankment below the approach road.
Includes	Reinforcing, concrete, and finishing
Excludes	Approach slab and parapet (see Approach Slab, Barriers)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ]
<b>SUBSTRUCTURE</b>	
<b>Other Supports</b>	
	<b>Thrust Blocks</b>
Primary Function	Transfer load, Transfer thrust
Secondary Function	Minimizes movement
Tertiary Function	
Description	Thrust blocks are a special substructure of a true arch bridge that receive loads from the ribs and transfer loads to the foundation.
Includes	Structure excavation, reinforcing, concrete, and finishing
Excludes	Furnishing and installation of anchor bolts, bearing plates, utility relocation (see Demolition and Relocation, Flexural Members)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ]
	<b>Anchorage</b>
Primary Function	Secure cable, Transfer load
Secondary Function	Maintain even distribution
Tertiary Function	
Description	Anchorage are a special substructure to which the weight of the deck and supporting superstructure is secured via cables and steel eye bars imbedded in solid rock or massive concrete blocks.
Includes	Structure excavation, reinforcing, concrete, finishing, and cable support (Steel Eye Bar)
Excludes	
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ]

**TABLE 2** *Continued*

<b>SUPERSTRUCTURE</b>	
<b>Short Span Assemblies</b>	
	<b>Flexural Members</b>
Primary Function	Support Load
Secondary Function	Minimize deflection
Tertiary Function	Increase redundancy
Description	Flexural members are commonly known as beams and girders that support the bridge deck. When the depth of the girder is shallow, it is referred to as a beam.
Includes	Fabrication and installation of beams and girders
Excludes	Diaphragms, bracings, bearings (see Diaphragms, Bracings, Bearings)
Unit of Measure	kg [lb] or m [ft]
	<b>Diaphragms</b>
Primary Function	Stabilize girder, Brace girders
Secondary Function	Facilitate deck reconstruction
Tertiary Function	
Description	Diaphragms are braces for shallow-depth beams.
Includes	
Excludes	
Unit of Measure	kg [lb] or m <sup>3</sup> [yd <sup>3</sup> ]
	<b>Bracings</b>
Primary Function	Stabilize girders
Secondary Function	Facilitate deck reconstruction
Tertiary Function	
Description	Bracings are steel angles used to brace deep-depth girders.
Includes	Fabrication and erection of structural steel angles
Excludes	
Unit of Measure	kg [lb]
	<b>Bearings</b>
Primary Function	Transfer load
Secondary Function	Facilitate expansion and contraction
Tertiary Function	Minimize maintenance
Description	Bearings are mechanical systems that transfer vertical and longitudinal forces; expansion bearings allow rotational and longitudinal movement, whereas fixed bearings allow only rotational movement.
Includes	Fabrication and erection of bearings and anchor bolts
Excludes	Bridge seat (see Cap Beams, Stem Abutments)
Unit of Measure	EACH
<b>SUPERSTRUCTURE</b>	
<b>Long Span Assemblies</b>	
	<b>Ribs</b>
Primary Function	Transfer load
Secondary Function	Facilitate inspection
Tertiary Function	Enhance appearance
Description	Ribs are rectangular-, square-, or circular-shaped parts of the superstructure for arch bridges; they receive loads from hangers and spandrels and transfer them to the foundation.
Includes	
Excludes	Bracings, bearings (see Bracings, Bearings)
Unit of Measure	kg [lb], or m <sup>3</sup> [yd <sup>3</sup> ], or m [ft]
	<b>Cables</b>
Primary Function	Transfer load
Secondary Function	Enhance appearance
Tertiary Function	
Description	Cables, made of steel wires bound together and draped over towers to anchors at each cable end, receive through hangars the load from the deck.
Includes	Fabrication and installation of cables, cable support
Excludes	Anchorage (see Anchorage)
Unit of Measure	m [ft]
	<b>Hangers</b>
Primary Function	Transfer load
Secondary Function	Increase vertical clearance
Tertiary Function	Enhance appearance
Description	Hangers are rods or strands that connect the deck to the ribs (arch bridges) or the main cable (cable-stayed or suspension bridges); they receive loads from the deck and transfer loads to the ribs or main cable in tension.
Includes	Splices (rod), strand assembly, protection
Excludes	End connections (see Flexural Members and Ribs)
Unit of Measure	m [ft]

**TABLE 2** *Continued*

<b>SUPERSTRUCTURE</b>	
<b>Spandrels</b>	
Primary Function	Transfer load
Secondary Function	Increase reliability
Tertiary Function	Enhance appearance
Description	Spandrels are concrete or steel members that connect the deck to the ribs (arch bridges); they receive loads from the deck and transfer loads to the ribs in compression. They are below the deck and above the rib.
Includes	Concrete or steel members, protection
Excludes	End connections (see Flexural Members and Ribs)
Unit of Measure	m [ft]
	<b>Ties</b>
Primary Function	Eliminate thrust
Secondary Function	
Tertiary Function	
Description	A tie is a horizontal tension member that connects the two ends of the compression ribs of an arch bridge and balances the horizontal thrust.
Includes	Fabrication and erection of structural steel, stiffeners, splices, and other connections
Excludes	Hangers, bearings (see Bearings, Hangers and Spandrels)
Unit of Measure	kg [lb]
	<b>Truss Members</b>
Primary Function	Support load, Reduce weight
Secondary Function	Minimize deflection
Tertiary Function	
Description	Truss members, connected at nodes by plates, are two-dimensional structures that support the superstructure.
Includes	Splices and other connections
Excludes	Bracings, bearings (see Bracings, Bearings)
Unit of Measure	kg [lb], or m <sup>3</sup> [yd <sup>3</sup> ], or m [ft]
	<b>Segmental Box Girders</b>
Primary Function	Support Load
Secondary Function	Minimize deflection
Tertiary Function	Facilitate Construction
Description	Segmental box girders are concrete box sections with or without overhanging flanges. The segments are precast sections which are post tensioned in the field.
Includes	Post tensioning
Excludes	Bracings, bearings (see Bracings, Bearings)
Unit of Measure	m [ft]
<b>SUPERSTRUCTURE</b>	
<b>Deck</b>	
	<b>Structural Surface</b>
Primary Function	Transfer load
Secondary Function	Minimize maintenance
Tertiary Function	Facilitate future expansion
Description	The structural surface supports the wearing surface and traffic.
Includes	Reinforcing, concrete, and finishing
Excludes	Expansion joint assembly, parapet, barriers (see Expansion Joints, Barriers, Drainage Systems)
Unit of Measure	m <sup>3</sup> [yd <sup>3</sup> ] or EACH
	<b>Wearing Surface</b>
Primary Function	Protect structure, Guide traffic
Secondary Function	Comfort riders
Tertiary Function	Reduce maintenance
Description	The wearing surface is the part of the road or rail system that comes into contact with the vehicle or train car wheels.
Includes	Concrete or asphalt overlay or rails, striping, marking,
Excludes	
Unit of Measure	m <sup>2</sup> [yd <sup>2</sup> ]
<b>PROTECTION</b>	
<b>Structure Protection</b>	
	<b>Slope Walls</b>
Primary Function	Protect abutment
Secondary Function	Prevent erosion
Tertiary Function	Enhance appearance
Description	Slope walls, made of stone, concrete, gravel, or gravel with asphalt mix, support the sloped surface and protect the bridge abutment.
Includes	Reinforcing, concrete, and finishing
Excludes	Excavation and backfill (see Earthwork)