Standard Classification for
Facility Asset Component Tracking System (FACTS)[1]

1. Scope

1.1 This standard (FACTS) establishes a classification of building and sitework elements and components, and their associated functions, attributes, and products. Elements, as defined here, are major assemblies and components common to buildings and sitework. Elements usually perform given functions, regardless of the design specification, construction method, or materials used. The attribute classification will lead to more effective management of the operation, maintenance, and life cycle cost of the asset.

1.2 The classification:

1.2.1 Incorporates Levels 1, 2, and 3 from Classification E1557:

1.2.1.1 Major Group Element (Classification E1557 Level 1).

1.2.1.2 Group Element (Classification E1557 Level 2).

1.2.1.3 Element (Classification E1557 Level 3).

1.2.2 Establishes sub-elements at Levels 4 and beyond:

1.2.2.1 Because the main objective is content and not specifically rigid structure, levels beyond those established in Classification E1557 are not balanced.

1.2.2.2 Products and characteristics are introduced at varying levels, depending on the appropriate element and elemental function.

1.2.2.3 Functional elements are aligned with products and product characteristics.

1.2.3 Incorporates the noun-adjective-attribute relationship between elements, elemental function and the associated products and characteristics.

1.2.4 This approach identifies specific products that will support the element at its functional level. However, the classification permits the introduction of additional products necessitated due to higher order requirements, such as but not limited to:

(1) Asset type
(2) Asset function
(3) Asset conditions
(4) Building code requirements

1.3 The classification seeks to define a larger universe of attributes, products, and characteristics that may define its functional use and life cycle cost.

1.4 The classification also provides a logical database structure for the implementation of related Real Property Management applications and business processes such as:

(1) Building Information Modeling (BIM) Technologies
(2) Smart Building Technologies
(3) Sustainability
(4) Computerized Maintenance Management Systems (CMMS)
(5) Facility Asset Management Systems
(6) Property Condition Assessment
(7) Real Property Development
(8) Project Management Systems
(9) Cost Planning, Estimating, and Control Procedures

1.5 Use of the classification provides a consistent means for analysis, evaluation, monitoring, and reporting during the life of the asset, from planning through design, construction, operations, maintenance, rehabilitation, and disposal.

1.6 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *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:*[2]

E833 Terminology of Building Economics

E917 Practice for Measuring Life-Cycle Costs of Buildings and Building Systems

E1334 Practice for Rating the Serviceability of a Building or Building-Related Facility (Withdrawn 2013)[3]

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

E1480 Terminology of Facility Management (Building-Related)

E1557 Classification for Building Elements and Related Sitework—UNIFORMAT II

E1670 Classification for Serviceability of an Office Facility for Management of Operations and Maintenance

E1699 Practice for Performing Value Engineering (VE)/Value Analysis (VA) of Projects, Products and Processes

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

E2018 Guide for Property Condition Assessments: Baseline Property Condition Assessment Process

E2135 Terminology for Property and Asset Management

E2156 Guide for Evaluating Economic Performance of Alternative Designs, Systems, and Materials in Compliance with Performance Standard Guides for Single-Family Attached and Detached Dwellings

E2166 Practice for Organizing and Managing Building Data

E2452 Practice for Equipment Management Process Maturity (EMPM) Model

E2495 Practice for Prioritizing Asset Resources in Acquisition, Utilization, and Disposition

E2506 Guide for Developing a Cost-Effective Risk Mitigation Plan for New and Existing Constructed Facilities

E2604 Practice for Data Characteristics of Equipment Asset Record

E2675 Practice for Property Management System Outcomes

E2812 Practice for Uniform Data Management in Asset Management Records Systems

3. Terminology

3.1 *Definitions:* For definitions of terms used in this classification, refer to Terminologies E833, E1480, and E2135.

3.1.1 *Additional Definitions:*

3.1.2 *adjective*—defines a noun by describing the place or thing, that is, function of the named system or element.

3.1.3 *attribute*—the inherent physical or performance characteristics specifying a place or thing as distinct from something else.

3.1.4 *elements*—defined as significant component part of the whole that performs a specific function, or functions, regardless of design, specification, or construction.   **E833, E1557**

3.1.5 *function*—the purpose of the entire project or some portion thereof determined by the needs or desires of the user/owner and expressed in two words, an active verb and measurable noun.   **E833, E1699, E2013**

3.1.6 *noun*—name such as a place or thing and used in identifying the building system or primary building elements.

3.1.7 *verb*—describes an action or occurrence that indicates a state of being.

4. Significance and Use

4.1 This classification defines building elements as major assemblies, components, and attributes common to real property assets and sitework. Elements perform given functions, regardless of the design specification, construction method, materials or products used. (See Terminology E1480, Classifications E1557 and E1670, and Practice E2675.)

4.2 The classification aligns products to specific functional elements and/or sub-element to enable the development of specialized maintenance procedures. (See Practices E2452, E2604, and E2675.)

4.3 This alignment will help streamline warehousing requirements and enable functional business units to use a common nomenclature. (See Terminology E1480 and Practice E2452.)

4.4 The classification will lead to more effective life cycle management of the operation, maintenance and cost of the asset by linking activities and participants in an asset's full life-cycle, from initial planning through construction, operations, maintenance, repair, modernization, and disposal. (See Practices E917 and E1334, Classification E1670, Practice E1946, and Guide E2506). See Fig. 1 for life cycle application of FACTS.

4.5 The benefits of the life cycle application of FACTS are:
4.5.1 Maintain project tracking and transparency through all phases of project lifecycle.
4.5.2 Continue to develop requirements and information tracked as processes evolve.
4.5.3 Inform future projects, policies, processes, and guidance with lessons learned/best practices.

4.6 The users of this classification include owners, architects and engineers, developers, property managers, asset managers, project managers, operation and maintenance staff, cost estimators, construction contractors, and database administrators. (See Guide E1369, Terminology E1480, Guide E2156, and Practice E2812.)

4.7 Application of this classification (FACTS) provides for value-added activities that cannot be derived from using a solely product-based approach. (See Guide E1369 and Practice E1699.)

4.8 FACTS provides a scalable classification structure applied across the project lifecycle at various levels of depth and
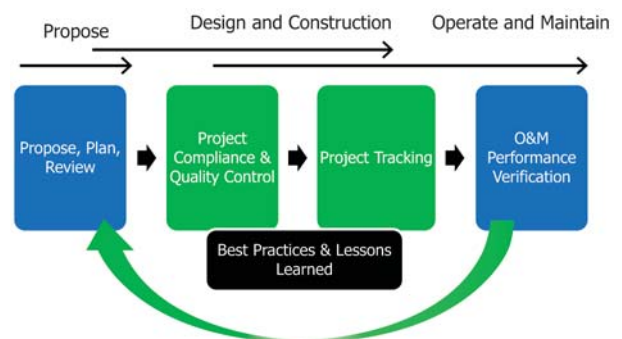

FIG. 1 Life Cycle Application of FACTS

granularity. In the planning, design, and construct stages, scope definition and cost estimates become progressively more granular as performance management requirements and detailed design specifications are completed.

4.9 During the operate and disposal phases, recurring maintenance and non-recurring maintenance procedures are conducted, and assets are ultimately disposed of. Using FACTS, each of the activities in the asset lifecycle can be associated with the appropriate element, product and associated attributes. Thus enabling the calculation of the total cost of ownership of the asset including activities ranging from PM's (Preventive Maintenance Activities), to major remediation, restoration, and ultimate disposal and/or demolition of the asset. (See Fig. 2.)

4.10 FACTS presents building information in a relational structure with sufficient granularity to meet the requirements for a uniform building classification system that supports establishment of the total cost of ownership of assets. (See Practice E917.)

4.11 FACTS presents building information in a relational structure with sufficient granularity to meet the requirements for a uniform building classification system that supports establishment of the total cost of ownership of assets. (See Practice E917.)

4.12 FACTS represents elements, work results, products, materials, and properties in a relational model that can be consistently applied across a portfolio of assets or buildings. (See Fig. 3.)

4.12.1 In this structure, products are assigned to their respective building element or work result to account for specific functional use.

4.12.2 Without knowledge of this context, designers could fail to select products that align with the purpose of the building.

4.12.3 Facility managers could lack key inputs to define maintenance procedures. FACTS' relational data structure among elements and products provides the solution to this critical gap and narrows the scope to the appropriate selection of elements that support a specific functional use of the product. (See Classifications E1557 and E1670.)
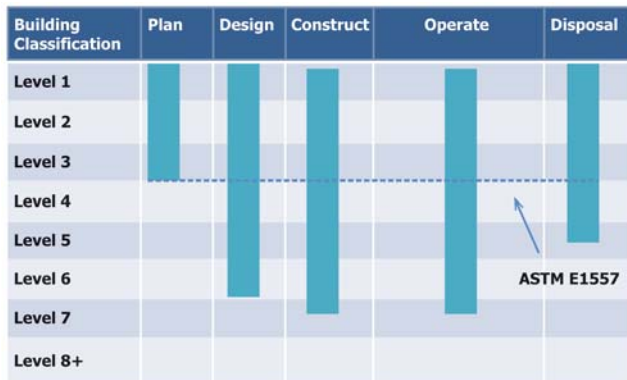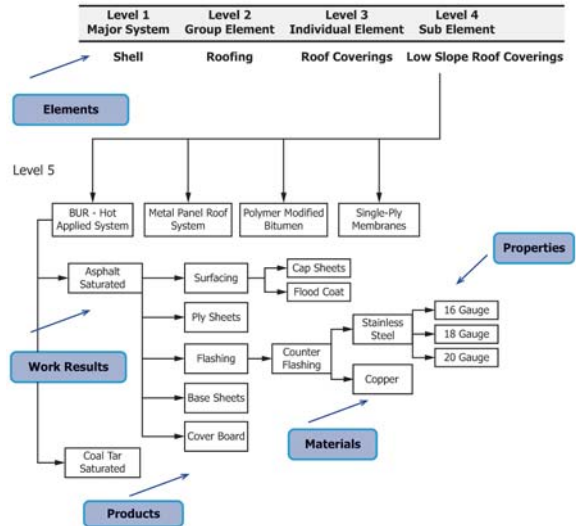

FIG. 3 FACTS and the Integrated Relational Structure of Elements, Work Results, Products, Materials, and Properties

4.13 This approach narrows the specific products that may support the function identified, however, it does not explicitly rule out certain products and materials due to the unknown nature of higher order functions, such as the building type, building function, building conditions, building code requirements, etc.

Note 1—For example, if the higher order building function was a prison, this would rule out the use of any ceilings or outlets that are not tamper-proof and as a result, the selection criteria from the database of elements would become limited.

Therefore, the classification seeks to define a larger universe of products and characteristics that may define its functional use. However, the classification also provides a logical database structure where business rules may be applied to further limit the selection criteria based on a higher order function as demonstrated in Fig. 3.

4.14 The alignment of functional elements to a product-based schema focuses on identifying the respective function at the following:

4.14.1 Major Group Element (Classification E1557 Level 1),

4.14.2 Group Element (Classification E1557 Level 2),

4.14.3 Element (Classification E1557 Level 3),

4.14.4 Sub-Element (Level 4),

4.14.5 Associated Performance Attributes (Not Level Bound), and

4.14.6 Identifying the specific products and characteristics.

4.15 Fig. 4 demonstrates an example of the methodology used for identifying each Level within a Built-Up Roofing System. Level 2 = Roofing, Level 3 = Roof Coverings.

4.16 FACTS is a standard that best answers the call to "collect data once…for use by many." FACTS is built to leverage data so multiple stakeholders/users within an organization can benefit from the shared data. (See Fig. 5.)

4.16.1 Fig. 5 reflects the multiple stakeholder groups and functional users in any organization involved with the built
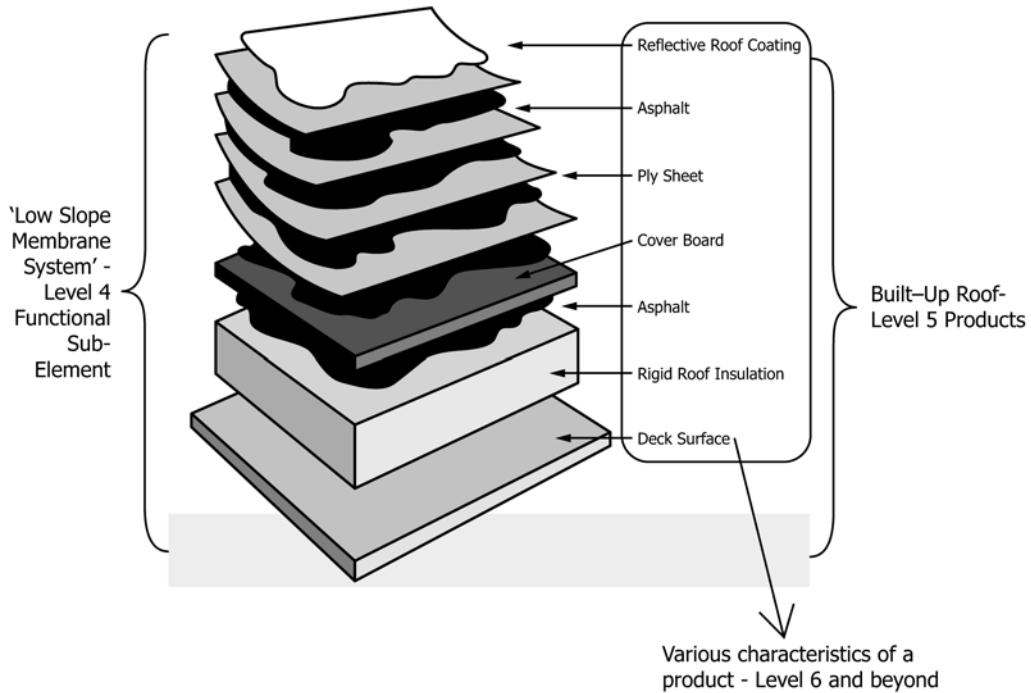

FIG. 2 Appropriate Level of Detail for FACTS Applied Across the Asset Life Cycle

FIG. 4 FACTS and the Logic Structure of Database

Function	Touch-Points to Asset Data
Asset Manager	Element, product, material type, age, life cycle, initial cost, operating cost, disposal cost, quantities, locations, size, make, model, serial number
Building Manager	Age, life cycle, operating cost, quantities, locations and size
Project Manager	Element, product, material type, quantities, locations and size
Data Miner/Database Administrator	Element, product, material type, age, life cycle, initial cost, operating cost, disposal cost, quantities, locations, size, make, model, serial number
Estimator	Element, product, material type, initial cost, operating cost, disposal cost, quantities, locations and size
Designer	Element, product, material type, age, life cycle, initial cost
Constructor	Element, product, material type, initial cost, make, model, serial number, size, location
O & M Contractor	Element, product, material type, age, operating cost, disposal cost, quantities, locations and size

FIG. 5 Classification Needs by Functional User

environment, as well as the many needs typically associated with each specific functional user.

5. Basis of Classification

5.1 This classification is intended for use in the real property asset environment, including associated sitework.

5.2 The current Classification E1557, UNIFORMAT II defines a four-level structure, the first three of which are mandatory in application of the Classification E1557 standard.

5.3 The experience of applying the Classification E1557 for the Existing Facility Operation, Computerized Maintenance Management System (CMMS), Building Information Modelling (BIM), and Project Management/Project Controls communities clearly demonstrated the need for expanding the Classification E1557 into a more granular structure that tied element/function to attribute, and product.

5.4 FACTS identifies the relationships between functional building elements, components, and the materials and methods necessary to construct, maintain, and manage the components.

5.5 FACTS identifies attributes that impact the decision process for the user. These attributes inform the user of the significant factors that would lead to their choice of systems, materials, and/or products based on certain characteristics and ultimately their associated life cycle requirements.

5.6 FACTS is based on an expansion of Classification E1557 with the introduction of Noun/Adjective/Attribute logic for use in Object Modeling, Preventive Maintenance (PM) development, and other emerging Asset Management technologies.

5.7 FACTS is function driven, but is not level balanced. To that extent, the identification of performance attributes, products, and product characteristics occurs at varying levels within the structure depending on the Element and Sub-Element. This can be represented in the following example (see Fig. 6) where primary and secondary attributes are defined prior to product selection.

5.8 Fig. 6 represents a scenario which demonstrates a more comprehensive decision process by the user where the function and multiple performance criteria are evaluated prior to the selection of product and associated characteristics.

5.9 The benefits of FACTS include:

(1) Enable users to find an individual object quickly on the basis of its attributes.

(2) Convey "meaning" of an object from the definition of its attributes and function.

(3) Provides a classification structure with the inherent ability to evolve with industry and technological advances.

(4) Use of a multi-disciplined or universal vernacular that enables better integration of the various parts of a comprehensive asset management process. Integration of the respective industry systems and tools will reduce costly errors as a result of miscommunication and synthesis of multiple and increasingly complex departmental taxonomies.

5.10 FACTS provide a baseline to develop a comprehensive decision analysis for selection of products that meet design specifications.

5.11 The use of FACTS allows the inputs to be mapped to the classification system as a filtering mechanism to limit the selection criteria. In doing so, this can also impact the decision criteria for maintenance, repair, and renovation. The diagram (see Fig. 7) provides a simple graphic of this information flow. Each product is selected based on element, performance attributes, and higher order functions (code, space type, security). Maintenance decisions are then determined based on the selected product, its performance attribute, and its characteristics.

5.12 Data provided by the user (at the lowest level available) is then fed into a database to capture information such as element, sub-element, performance attribute, product and associated characteristics, and maintenance specific data such as product lifecycle, replacement cost, and operational costs. This data is then used in project estimates and thus completes the loop of information. (See Fig. 1.)

6. Description of Project Elements

6.1 *Elements*—In construction planning, design, specification, estimating, and cost analysis, as operations, elements are defined as significant component parts of the whole that performs a specific function, or functions, regardless of design, specification or construction. (See Classification E1557.)
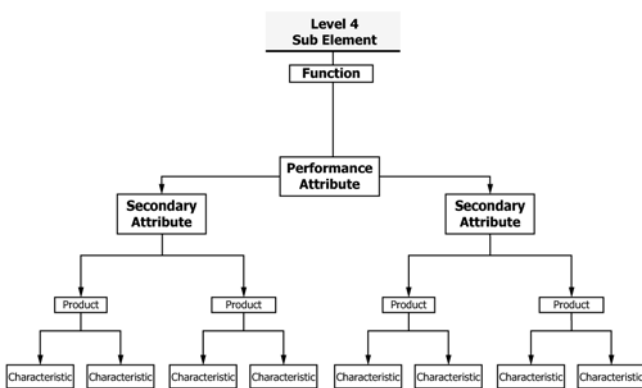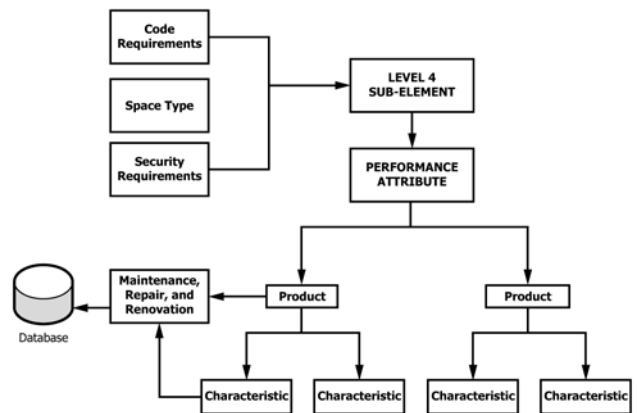

FIG. 6 FACTS Functional Diagram

FIG. 7 Data Flow Diagram

6.2 *Functions*—Function is defined as the purpose of the entire project or some portion thereof determined by the needs or desires of the user/owner and expressed in two words, an active verb and measurable noun. (See Table 1.)

(1) L1 reflects Level One

(2) L2 reflects Level Two

(3) L3 reflects Level Three, and

(4) L4 reflects Level Four

6.3 *Verb*—Describes an action or occurrence that indicates a state of being.

6.4 *Noun*—Name such as a place or thing and used in identifying the building system or primary building elements which ultimately require systems and elemental repairs and maintenance investments.

6.5 *Adjective*—Defines a noun by describing the place or thing, that is, function of the system or element named.

6.6 *Attribute*—FACTS defines attributes as the inherent physical or performance characteristics specifying a place or thing as distinct from something else. Attributes are also viewed as features of the elements or sub-elements that influence the selection of the supporting products to meet the elemental functional or performance requirements of the elements. (See Table 2.) Attribute is also viewed as the inherent physical or performance characteristics specifying a place or thing as distinct from something else.

6.7 *Noun/Adjective/Attribute*—FACTS presents a nomenclature mapping for Preventive Maintenance Mapping, NCAD

TABLE 1 FACTS Level 4 Function–Sample

Reference ID	WBS Level				Functional Definition
	1	2	3	4	
B30		Roofing			
B3010			Roof Coverings		
B301001				High Slope	Repel Fluid
B301002				Low Slope	Repel Fluid
B301003				Roof Insulation and Fill	Amplify Density
B301004				Flashing and Trim	Waterproof
B301005				Gutters and Downspouts	Collect Fluid
B301099				Other Roofing	Repel Fluid
B3020			Roof Openings		
B302001				Area Glazing	Allow Light
B302002				Gravity Roof	Condition Air
B302003				Roof Hatches	Control Access
B302004				Sky Lights	Allow Light
B302005				Smoke and Fire Relief	Protect Life
B302006				Smoke Vents	Protect Life

TABLE 2 FACTS Level 4 Performance Attributes–Sample

Reference ID	WBS Level				Performance Attributes
	1	2	3	4	
B30		Roofing			
B3010			Roof Coverings		
B301001				High Slope	
B301001-022					Durability
B301001-033					Fire Resistance
B301001-090					Weather Resistance
B301002				Low Slope	
B301002-022					Durability
B301002-033					Fire Resistance
B301002-090					Weather Resistance
B301003				Roof Insulation and Fill	
B301003-022					Durability
B301003-033					Fire Resistance
B301003-090					Weather Resistance
B301004				Flashing and Trim	
B301004-022					Durability
B301004-090					Weather Resistance
B301005				Gutters and Downspouts	
B301005-022					Durability
B301005-090					Weather Resistance
B301099				Other Roofing	
B301099-022					Durability
B301099-033					Fire Resistance
B301099-090					Weather Resistance
B3020			Roof Openings		
B302001				Area Glazing	
B302001-022					Durability
B302001-076					Thermal Control
B302001-090					Weather Resistance

Standards, Object Modeling, and Project Controls following the structure of Noun/Adjective Attributes (See Table 3).

(1) Noun/adjective/attributes may be identified at multiple levels depending on the element, system, and product.

(2) *Multiple Noun Identifiers*—Some products may require multiple nouns to appropriately identify the building systems and elements for which the product supports.

(3) *Multiple Adjective Identifiers*—Primary and required secondary functions may drive one or more adjective fields.

(4) *Multiple Attributes*—Physical and performance-based.

(5) *Coding*—All equipment descriptions coded to the FACTS data table.

7. Keywords

7.1 adjective; asset management; attribute; BIM; CMMS; condition assessment; cost estimating; cost planning; element; function; inventory; life cycle cost; maintenance; non-recurring; noun; present value; product; recurring; risk management; sustainability; value engineering; verb

TABLE 3 FACTS Noun/Adjective/Attribute Table–Sample

Classification Code	NCAD Std.	NCS v5	Noun	Noun	Adjective	Attribute	Attribute
G304006.01.01.01	PMP-01	P	Heating Distribution	Pumping Stations	Centrifugal Pump	End Suction	Close Coupled
G304006.01.01.02	PMP-01	P	Heating Distribution	Pumping Stations	Centrifugal Pump	End Suction	Frame Mounted
G305005.01.01.01	PMP-01	P	Cooling Distribution	Pumping Stations	Centrifugal Pump	End Suction	Close Coupled
G305005.01.01.02	PMP-01	P	Cooling Distribution	Pumping Stations	Centrifugal Pump	End Suction	Frame Mounted