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Designation: E2637 – 08

StandardGuide for Utilizing the Environmental Cost Element Structure Presented by Classification E2150[1]

This standard is issued under the fixed designation E2637; 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 The Environmental Cost Element Structure (ECES) covered by Classification E2150 (and Adjunct E2150) provides a consistent and comprehensive structure across all phases of environmental remediation projects and is a tool to improve the cost management of those projects. This guide is intended to facilitate the application of the ECES to any environmental remediation project, without regard to project size.

1.2 Classification E2150 establishes the broad, top-level framework for environmental remediation projects by providing a hierarchical list of project elements to two levels of detail. Its associated Adjunct E2150 supports the top-level structure by providing more detailed elements and definitions of the ECES to three additional levels of detail. Although it is assumed that the user is familiar with Classification E2150, much of the content of the classification is repeated in this guide to relieve the user of the burden of back-and-forth referencing during use. It is assumed, however, that all users of this guide will have at hand both Classification E2150 and the Adjunct E2150 during project planning.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E2150 Classification for Life-Cycle Environmental Work Elements—Environmental Cost Element Structure

2.2 *ASTM Adjunct:*

Adjunct E2150 Adjunct to Classification E2150: Environmental Cost Element Structure at Levels 3, 4, and 5 and Definitions[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*—A congressional mandate, also known as *Superfund*, CERCLA prescribes actions and regulatory requirements for reducing risks to human health and the environment resulting from releases or threatened releases of hazardous substances into the environment.

3.1.2 *Resource Conservation and Recovery Act (RCRA)*—A congressional mandate that requires the management of regulated hazardous wastes and requires that permits be obtained for facilities (both public and private) that treat, store, or dispose of hazardous wastes. RCRA also establishes standards for these facilities and requires corrective actions (for example, remediation) of past releases of hazardous waste from regulated waste management units.

3.2 *Acronyms:*

3.2.1 *AST*—Aboveground Storage Tank

3.2.2 *CERCLA*—Comprehensive Environmental Response, Compensation, and Liability Act

3.2.3 *CLP*—Certified Laboratory Procedure

3.2.4 *CMS*—Corrective Measure Study

3.2.5 *COA*—Code of Accounts

3.2.6 *CWM*—Chemical Warfare Materials

3.2.7 *D&D*—Decontamination and Decommissioning

3.2.8 *DOE*—Department of Energy

3.2.9 *(EC)2*—Environmental Cost Engineering Committee

3.2.10 *ECAS*—Environmental Cost Analysis System

3.2.11 *ECES*—Environmental Cost Element Structure

3.2.12 *EM*—Environmental Management

[1] This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.81 on Building Economics.

Current edition approved Sept. 1, 2008. Published December 2008. DOI: 10.1520/E2637-08.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from ASTM International Headquarters. Order Adjunct No. ADJE2150.

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3.2.13 *EPA*—Environmental Protection Agency

3.2.14 *ER*—Environmental Restoration

3.2.15 *FRTR*—Federal Remediation Technologies Roundtable

3.2.16 *FS*—Feasibility Study

3.2.17 *HRS*—Hazard Ranking System

3.2.18 *HTRW*—Hazardous, Toxic, and Radioactive Waste

3.2.19 *LTSM*—Long-Term Surveillance and Maintenance

3.2.20 *O&M*—Operations and Maintenance

3.2.21 *OECD*—Organization of Economic Cooperation and Development

3.2.22 *PA/SI*—Preliminary Assessment/Site Investigation

3.2.23 *RA*—Remedial Action

3.2.24 *RACER*—Remedial Action Cost Estimating Requirement (System)

3.2.25 *RCRA*—Resource Conservation and Recovery Act

3.2.26 *RD*—Remedial Design

3.2.27 *RFA*—RCRA Facility Assessment

3.2.28 *RFI*—RCRA Facility Investigation

3.2.29 *RI*—Remedial Investigation

3.2.30 *SLTM*—Surveillance and Long-Term Monitoring

3.2.31 *S&M*—Surveillance and Maintenance

3.2.32 *SM&A*—Sampling, Monitoring and Analysis

3.2.33 *USACE*—U.S. Army Corps of Engineers

3.2.34 *UST*—Underground Storage Tank

3.2.35 *WBS*—Work Breakdown Structure

3.2.36 *WM*—Waste Management

4. Summary of Practice

4.1 The ECES is a comprehensive hierarchical list of work activities (tasks, items, or products) that may be required to accomplish environmental restoration, waste management, facility decontamination and decommissioning, or other environmental projects. Its activity-based structure provides a consistent and visible cost management framework, with sufficient detail and coverage of project types, so that it can be used by private industry and government agencies in the United States and other countries to track project costs.

4.2 While primarily a cost structure, the ECES can also serve as a model for developing a work breakdown structure (WBS). A WBS provides a framework for managing the cost, schedule, and performance objectives of a project. The WBS framework allows a project to be separated into logical component parts and makes the relationship of the parts clear. It defines the project in terms of hierarchically related action-oriented elements. Each element provides logical summary points for assessing technical accomplishments and for measuring cost and schedule performance.

4.3 It is recommended that projects using the ECES and associated dictionary routinely report costs to Level 3 in the cost structure. More detailed reporting levels (that is, sub-Level 4 and beyond) are provided to allow users to address high risk, high value, or high technological interest areas of projects.

5. Significance and Use

5.1 In addition to its cost management and project management functions, the ECES can also be used to support a number of other program and project functions. These functions include:

5.1.1 Bid solicitation, collection, and evaluation;

5.1.2 Communicating project data between installations, complexes, agencies, and industry;

5.1.3 Providing a project checklist;

5.1.4 Cost and schedule estimating;

5.1.5 Historical cost/schedule data collection;

5.1.6 Historical project data collection (for example, technology deployments, project conditions);

5.1.7 Validating and calibrating cost estimates and software tools; and

5.1.8 Establishing and disseminating best practices and lessons learned.

5.2 Several government agencies are already incorporating this structure into existing and future cost estimating models, databases, and other similar software tools and systems.

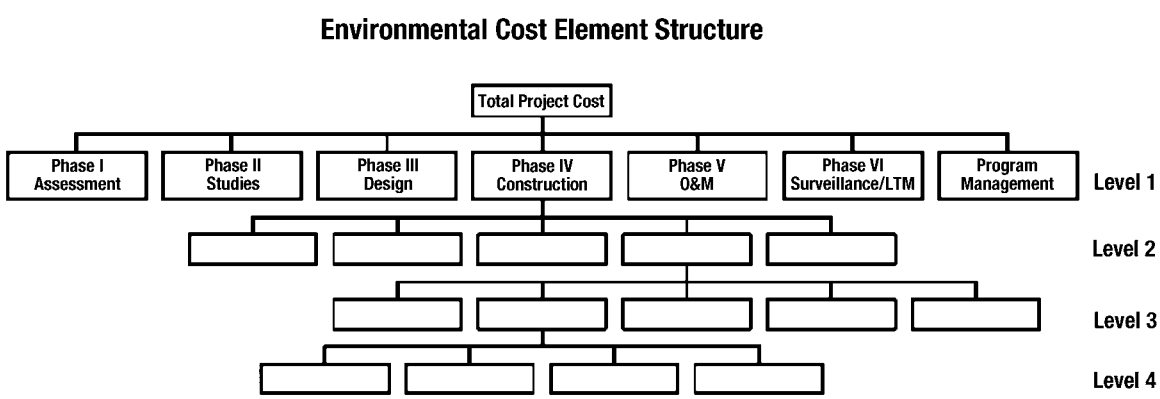

FIG. 1 Hierarchical Structure of the Environmental Cost Element Structure

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6. Procedure

6.1 *Overall Structure*—The hierarchical nature of the ECES cost structure (Fig. 1) allows detailed cost data at Level 3 to be summarized into higher level cost elements in a standardized fashion. It is recommended that the ECES be used as a common standard through its top three levels. The use of Level 4 or lower is optional. Similarly, while Level 5 is generally deemed to provide a sufficiently low level of detail for most projects, the project managers are free to add further lower levels for their specific projects or portions of their projects. Care must be taken in developing the associated numerical codes, however, to assure that each level directly relates to the next higher level so that the project costs can readily be "rolled up" for reporting purposes.

6.2 *Level 1*—Level 1 of the structure includes seven cost categories. The first six categories represent the six life-cycle phases of an environmental project. The final category—Program Management, Support, and Infrastructure—is included to address costs that are not attributable to a distinct project or are program management costs. Throughout the rest of this guide, the Level 1 cost element for Program Management, Support, and Infrastructure will be referred-to as Phase 8, to simplify references to the Level 1 cost elements. With minor variations in the definitions, these project life-cycle categories apply to all environmental projects and programs, including environmental remediation, waste management, decontamination and decommissioning, ordnance and explosive retrievals, underground and above-ground storage tanks, and other environmental work.

6.2.1 *Phase 1: Assessment*—Assess and inspect site, prepare site inspection reports.

6.2.2 *Phase 2: Studies*—Risk assessment, characterization and investigations, development and analysis of treatment or remediation options, and treatability studies.

6.2.3 *Phase 3: Design*—Engineering design and preconstruction activities of treatment or remediation alternatives.

6.2.4 *Phase 4: Construction*—Construction of selected treatment or remediation alternatives. Includes start-up, but excludes all operations.

6.2.5 *Phase 5: Operations and Maintenance (O&M)*—Includes all operations and maintenance for the selected treatment or remediation alternatives. Phase ends when cleanup or waste treatment goals are met.

6.2.6 *Phase 6: Surveillance and Long-Term Maintenance (SLTM)*—Operations have ceased or were not integral to selected treatment or remediation alternatives.

6.2.7 *Phase 7: Reserved for Future Use*

6.2.8 *Phase 8: Cross Cut*—Program-wide activities that are required, but cost is not specific to a single or distinct project (for example, program management, support, and infrastructure).

NOTE 1—Fig. 2 illustrates the life-cycle nature of the seven Level 1 cost elements.

6.3 *Level 2*—Level 2 of the ECES represents major elements necessary to perform work in an environmental project. There are 34 elements included in this structure (see Table). It should be noted that in the Level 2 structure, Level 2 elements are marked with life-cycle phase numbers in the left columns. These numbers represent the applicability of that phase to that element. This is not necessarily all-inclusive. There may be cases where that element may be applicable for a phase that is not marked. For example, an overall Project Plan developed at the beginning of a project, especially a large and complex project, will often be followed by very detailed *Work Plans* that cannot be developed until much more information is available later in the project, for example, at Phase 4 or Phase 5. This structure is flexible, and the user can use other phases even though they are not marked in the columns.

6.4 *Level 3*—Level 3 of the structure consists of more detailed elements required to perform the tasks at the Level 2 of the ECES. See the structure for the Level 3 elements, and the

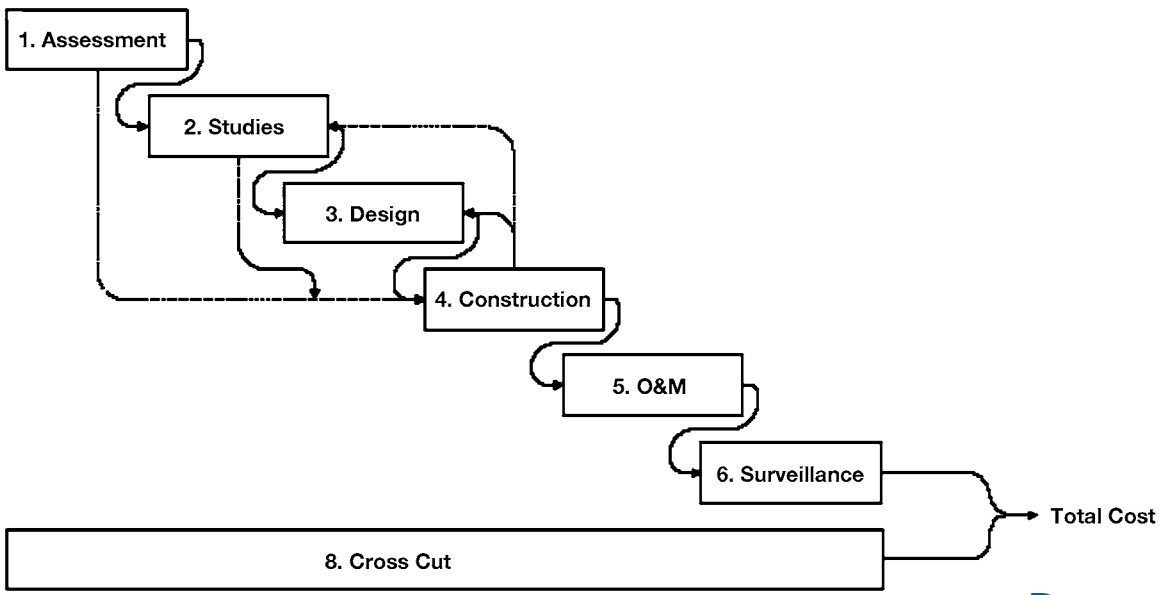

FIG. 2 Level 1 Cost Categories

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