AACE INTERNATIONAL RECOMMENDED PRACTICE

124R-22

PROJECT CODE OF ACCOUNTS – AS APPLIED FOR THE ENVIRONMENTAL REMEDIATION INDUSTRIES

AACE INTERNATIONAL

Rev. August 24, 2022 (Ed. Rev. August 22, 2023)

AACE® International Recommended Practice No. 124R-22

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TCM Framework: 7.1 – Project Scope and Execution Strategy Development
7.2 – Schedule Planning and Development
7.3 – Cost Estimating and Budgeting

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Note: As AACE International Recommended Practices evolve over time, please refer to web.aacei.org for the latest revisions.

Any terms found in AACE Recommended Practice 10S-90, *Cost Engineering Terminology*, supersede terms defined in other AACE work products, including, but not limited to, other recommended practices, the *Total Cost Management Framework*, and *Skills & Knowledge of Cost Engineering*.

Contributors:

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Corey Clemmons (Primary Contributor)
Dr. Dan Melamed, CCP EVP FAACE (Primary Contributor)
Bryan A. Skokan, PE CCP (Primary Contributor)
Edward E. Douglas, III CCP PSP FAACE Hon. Life
Nick Papadopoulos

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1. INTRODUCTION

As a recommended practice (RP) of AACE International, this document suggests a code of accounts (COA) for projects in the environmental remediation (ER) industries. While some systems exist, this RP provides a comprehensive list of cost elements unique to the life cycle of ER projects and programs.

AACE Recommended Practice 10S-90, *Cost Engineering Terminology,* defines a project code of accounts as:

> "A coded index of project cost, resource and activity categories. A complete COA includes definitions of the content of each account code and is methodically structured to facilitate finding, sorting, compiling, summarizing, defining and otherwise managing information the code is linked to. The information is used to support total cost management practices such as cost estimating, cost accounting, cost reporting, cost control, planning and scheduling."

A COA is typically implemented early in a project, as a cost coding structure, and is used for the duration of a project. This coding structure is an organizational and accounting tool made up of an alpha and/or numeric set of values which are assigned to every item within a schedule or budget. These unique identifiers, designated by a corporate and/or industry standard, remain constant through the life of the project and across the organization. This coding structure is then used to support project and program management in the development, collection, organization, and reporting of project data.

In the ER industry, the benefit of a standardized COA is significant for effective project and program management. Examples of how a COA can benefit are demonstrated early when initial costs are estimated. COAs, when used to organize cost, support the development of a project baseline, and provide a means to monitor for variations/trends as the project develops. Also, when reviewing projects, the ability to identify unique elements within a project is increased. As an example, and assuming the project COA is so coded, worker categories such as a radiation technician or technology types such as a geomembrane liner, can be quickly identified wherever it may occur in the project schedule or budget. The intent of this RP is to provide a recommendation for a standardized code of accounts

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for the environmental remediation industries promoting benefits such as project cost sharing, metrics, measurements.

2. PURPOSE OF THIS RECOMMEDED PRACTICE

The purpose of a COA is to categorize project characteristics such as labor, materials, systems, and organizational information, etc. For the ER industry, the COA can also be used to identify unique cleanup technologies and phasing. Challenges presented by ER projects differ from traditional capital construction projects by several factors:

- Most environmental projects operate within a legal and/or regulatory compliance framework, with extensive stakeholder involvement which can create schedule delays and work restrictions;
- The extent of contamination at a given site is difficult to define - this directly affects the scope, cost, and schedule of a cleanup project;
- Selecting, implementing, and effectively optimizing a specific treatment technology;
- Worker productivities are compromised due to requisite personal protection equipment and other requirements to comply with health and safety codes; and
    - These projects are under the scrutiny of a wide variety of stakeholders, including federal and regional regulatory agencies, environmental consultants, and local citizen action groups that review and approve the activities and oversee the work. This may result in delays and/or work restrictions at the site.

In comparison with traditional COA standards, the ER industry may require additional or more specific coding because some standard cost elements are not refined enough while others are completely missing. The source of codes for an environmental COA come from many sources. Some are created specifically for a project, others are created by their organizations or agencies, more come from standards such as Organization of Economic Co-operation and Development – Nuclear Energy Agency (OECD-NEA) and United States Army Corps of Engineers (USACE), and there are international standards such as ASTM International.

3. CURRENT LIMITATIONS

Charge numbers (i.e., accounting billing codes) are the primary vehicle for capturing and tracking costs on a project. The COA typically incorporates the work breakdown structure (WBS), cost breakdowns structures (CBS), phasing, and other pertinent information which are captured via these charge numbers and are engaged once actual project planning and remediation/construction is underway. Specific charge number composition is left to the organization/agency to define. Due to limitations of the individual accounting, timekeeping and related management systems, charge numbers may be restricted in size and structure. An example of how a COA value can be integrated with a WBS element is demonstrated in Figure 1.

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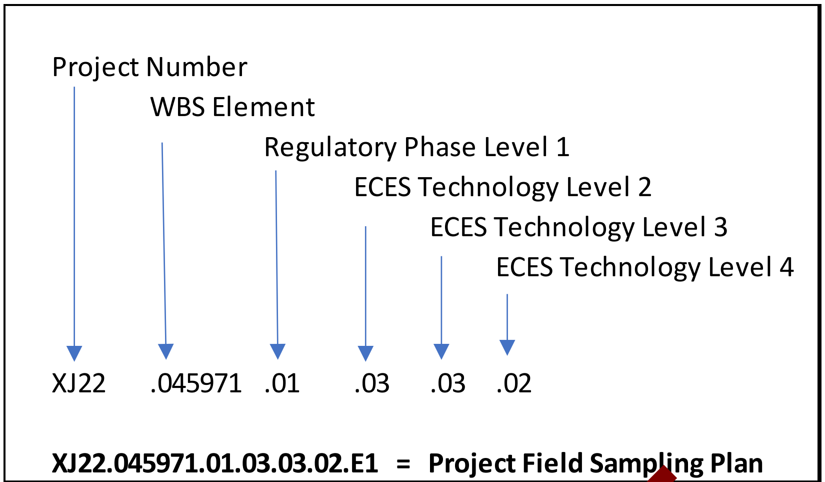

Figure 1. Example of a Coding Format Definition Key

Figure 1 demonstrates the immediate difficulty for the use of a COA where there is limited integer/space availability which is shared with organizational needs. An environmental cost element listing which contains a lengthy number of digits will be challenged to find acceptance into the pre-existing charge number configuration. Since a COA can be developed on a basis of numeric and alphabetic characters, this can offer a partial solution to digit limitation constraints. When using numeric values for a single digit within a charge number, there are only 10 values. Alphabetic options can contain 26 values but when combined as an alpha-numeric option, 36 values are available, greatly increasing the usability of a single digit within the charge number. A greater number of available digits within the charge number exponentially increases the values available for a COA. In the event there are restrictions, workarounds have been successfully employed on many environmental cleanup projects. In addition to accounting and timekeeping systems constraints on COA length, there may be additional constraints with respect to COA length and content imposed by specific project management tools that may also need to be considered for the environmental remediation industries.

Within the ER industries, the ability to cross reference projects, gather information, compare estimates to actual costs, and compare costs between various environmental cleanup projects is challenging. The ER industries recognize the need for a clear and consistent structure that allows for an analysis and comparisons of project costs and components. Several organizations developed environmental cost element listings with definitions for specific aspects of environmental cleanup. The USACE, with the help of several other agencies developed the Hazardous, Toxic, and Radioactive Waste (HTRW) work breakdown structure [4], which is applicable solely to Phase 4, Remedial Action. The OECD–NEA offering was further developed primarily for nuclear decommissioning projects. Joint efforts of United States (U.S.) federal agencies with environmental cleanup missions that formed the interagency Environmental Cost Engineering Committee (EC^2) in 1991, under the auspices of the Environmental Protection Agency (EPA) to share scarce environmental cost information and to mutually develop estimating tools.

EC^2 built upon these efforts and developed the Environmental Cost Element Structure (ECES).[1,2] This is a standardized, comprehensive, hierarchical list of elements that should be used to accomplish environmental projects throughout the life cycle of a project or program. It includes new and baseline technologies, environmental restoration, waste management, decontamination and decommissioning (D&D), long-term stewardship, and other tasks. This version of the ECES was further modified and incorporated by ASTM International as: ASTM Standard 2150, *Standard Classification for Life-Cycle Environmental Work Elements—Environmental Cost Element Structure*,

[1] The ECES is being used as the primary code of accounts example in this RP.
[2] See https://www.emcbc.doe.gov/Office/ProjectManagement.

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(ECES) a comprehensive and hierarchical list of cost elements required to complete an environmental project. [5]. With permission of ASTM International, the top two levels of the ECES are shown in Appendix I.

4. ENVIRONMENTAL COST ELEMENT STRUCTURE

This RP for the ER industries is consistent with RP 107R-19: *Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Environmental Remediation Industries* [3], which in turn refers to the ASTM Standard 2150. Like any standard COA, the ECES consists of a comprehensive list of elements (tasks, items, or products) that comprise an environmental project throughout its life cycle. Environmental clean-up projects are represented by six different regulatory phases, that with minor variations in the definitions, apply to most all environmental projects throughout their life cycle:

- Phase 1 - Assessment - Evaluation and inspection.
- Phase 2 - Studies - Characterization, investigation, risk assessment, development and evaluation of remedial options, as well as treatability studies.
- Phase 3 - Design - The engineering design and pre-construction activities of remediation alternatives. This includes the evaluation of remediation alternatives and the selection of the preferred alternative(s) for the cleanup.
- Phase 4 - Capital Construction - Construction of remediation alternatives (selected in Phase 3). Includes start-up but excludes all operations.
- Phase 5 - Operations and Maintenance – All operations and maintenance activities for the selected treatment or remediation alternatives.
- Phase 6 - Surveillance and Long-Term Maintenance - This phase includes post closure surveillance and long-term monitoring activities.

The ECES is a structure system which identifies multiple levels of detail of a COA. In the ECES system, ECES level 1 indicates the project phase. Cost categories are listed under these six phases of environmental projects, consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) regulations. While this RP applies within the United States, it is applicable to environmental regulatory frameworks in other countries.[3,4,5]

In addition to the six life cycle phases, there is also a crosscut cost category added to address costs that apply to multiple phases. In the ASTM version, this crosscut phase is identified by an "X". It serves to indicate overhead, project management, or other activities that are required to implement a specific environmental project. These level-one phases/cost elements are illustrated in Figure 2.

[3] For example, "Kovalick, Walter W., Jr.; Montgomery, Robert H.. 2014, *Developing a Program for Contaminated Site Management in Low and Middle Income Countries*. Latin America and Caribbean region Environment and Water Resources occasional paper series; World Bank Group, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/18631 License: CC BY 3.0 IGO." [Taken from the Internet August 24, 2021].

[4] See also International Atomic Energy Agency (IAEA) *Remediation Strategy and Process for Areas Affected by Past Activities or Events*, GSG-15, https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1969_web.pdf.

[5] Seek legal counsel in your jurisdiction for specific application of these principles.

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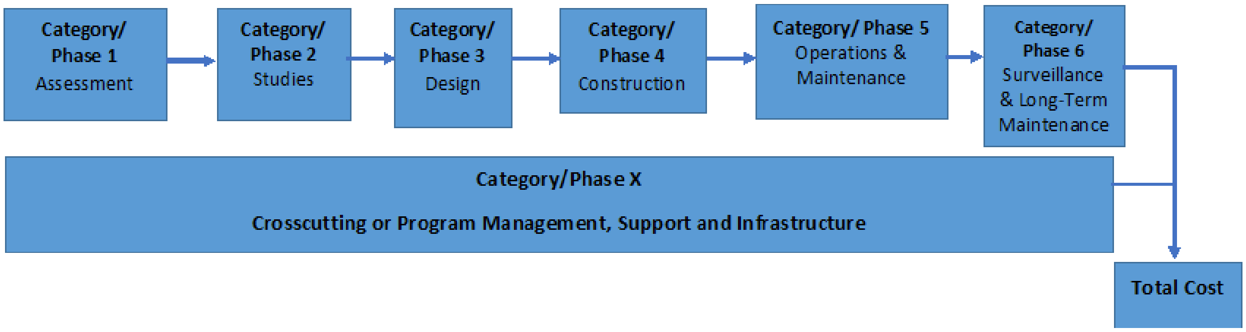

Figure 2 – High Level Life Cycle Phases

Figure 2 shows the life cycle phases required to complete an environmental project including the crosscutting category. It should be noted that this figure is an oversimplification, as these phases may not be linear, and may be repeated until completion and to meet regulatory requirements.

The ECES level 2 element lists the technologies or major work areas applicable to environmental restoration. Level 2 is at a summary technology level and is not intended to be all inclusive of the details of ER Industry activities but to identify major categories.

Additional detailed cost elements that provide refinement and greater classification for the level 2 elements and their definitions at ECES levels 3, 4, and 5, are contained in the E-2150 Adjunct to the Standard. By permission of ASTM, the level 2 summary cost categories from the E-2150 Standard are shown in Appendix I. Beyond these levels, organizations are then able to differentiate or continue to break down these elements into further levels identifying, with greater granularity, the attributable costs to the elements of interest to the organization. An advantage of having the regulatory phase as level 1, is that it economizes on the total number of cost elements otherwise required to describe a project's cost. For example, a single COA element such as *.07.09 Groundwater Sampling/Monitoring* can be used throughout the project's life cycle by simply changing the level 1 regulatory phase number.

When implementing the ECES as a part of a COA, a validation system needs to ensure that only acceptable codes are entered. These can be accomplished by simple manual checks by cognizant supervisors, as well as data management considerations applied for using this data in a cost data base (discussed in Section 7).

See the following section *An Example of the use of the ECES Applied to an Environmental Project* for a better understanding of how the ECES can be broken down to support a unique project.

5. EXAMPLES OF ENVIRONMENTAL REGULATORY FRAMEWORKS

In the U.S., there are two guiding regulations under which environmental remediation occurs. These frameworks define the nature of how projects and programs are designed, executed, maintained, and closed out. One is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This regulation supports federal response to abandoned and/or active contaminated/hazardous waste sites. The other is the Resource Conservation and Recovery Act (RCRA), which guides waste management and cleanup of hazardous waste/contaminated sites. Though both programs address different hazardous materials conditions, they provide a similar management framework. Figure 3 shows the life cycle phases required to complete an environmental project including the crosscutting category as applied to CERCLA.