AACE INTERNATIONAL RECOMMENDED PRACTICE

103R-19

PROJECT CODE OF ACCOUNTS – AS APPLIED IN THE MINING AND MINERAL PROCESSING INDUSTRIES TO FACILITATE BENCHMARKING

AACE INTERNATIONAL

AACE International Recommended Practice No. 103R-19

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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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INTRODUCTION

This recommended practice (RP) is an industry-specific addendum to AACE® International Recommended Practice 20R-98, *Project Code of Accounts* [1]. This document describes suggested code of accounts (COA) as applied to projects in the mining and mineral processing industries. However, it is limited to defining the coding divisions for the product or deliverable and the discipline or prime account elements. For purposes of this RP, the work breakdown structure (WBS) refers to product-oriented (functional) elements. It is recognized that in some usage, WBS incorrectly reflects broader content than just the product-oriented element.

This RP by reference defers to the Level 1 coding structure for the discipline or prime account direct cost elements in Table 7 of RP 21R-98 [2] Project Code of Accounts as Applied in Engineering, Procurement and Construction [EPC] in the Process Industries. However, this RP extends RP 21R-98 Table 7 to Level 2, primarily to highlight the importance of capturing the investment in mobile equipment for mining production (e.g., shovels) and infrastructure (e.g., rail engines) in the Equipment account.

This RP defines the mining and mineral process industries consistent with RP 47R-11, *Cost Estimate Classification - As Applied in the Mining and Mineral Processing Industries* [3]. That RP in turn refers to the Canadian Securities Administrators National Instrument 43-101 (NI 43-101) [4] definition of mining as "any exploration, development or production activity, including a royalty interest or similar interest in these activities, in respect of diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, coal and industrial minerals". This RP excludes subsea mining and also excludes coding for the oil and gas industries which is covered by ISO 19008:2016, *Standard cost coding system for oil and gas production and processing facilities* [5].

A mining and mineral processing facility may include, and this RP reflects, three broad types of integrated physical elements including the mine, process plant and infrastructure (on- and off-site including product transport). The main purposes of these three elements can be summarized as raw material extraction and handling, material processing, and facility support respectively. These three elements may reflect somewhat specialized sub-industries employing different engineering, procurement and construction (EPC) practices and different contractors. It is also common for owners to use their mining production resources to do some mine pre-development work. This

combination puts a premium on developing a well thought out program and project WBS. Users of this RP should be familiar with the other industry coding references that the parties to the project may be familiar with, particularly in respect to the processing plant and infrastructure.

Mine site processing plants may be considered a subset of the process industries as described in RP 21R-98. These industries have the primary characteristic of having processing equipment as the core or primary physical component of the facility. Mining and mineral processes usually involve more solid and slurry materials than oil, gas and chemical plants which in turn involves more mechanical processes such as crushing, filtering and conveyance, but less piping; some process steps might also be unique for the mining process, e.g. autoclaves and or calciners for pretreatment. Metallurgical processes are also typical. Users should note that some process plant contractors may be familiar with ISO 19008 coding (formerly Norsok Z-014) or similar breakdowns.

Major mining projects, particularly in remote locations, usually involve extensive civil and infrastructure work including developing or improving roads, railroads, jetties, water supply and treatment, power and gas supply, as well as camp facilities and various buildings. Recently, a coding structure for civil and infrastructure projects was promulgated by the International Construction Measurement Standards (ICMS) Coalition group. [6] This RP considers the ICMS, but does not incorporate it directly due to this RP's purpose to integrate mine, plant and infrastructure.

The primary reference for this RP was the product of a joint industry group including four major mining companies and coordinated by Independent Project Analysis, Inc. (IPA). [7] This RP is indebted to that effort, but because the RP will address comments received from the industry at large, it is a unique product.

PURPOSE (AND RELATIONSHIP WITH OTHER STANDARDS)

The purpose of this RP is to provide the mining and mineral processing industry with a product or deliverable oriented project WBS so that communication and information sharing is improved among all industry stakeholders. The sharing will mainly facilitate the practices of cost benchmarking and conceptual estimating. In that respect, the guideline also includes key physical measurements associated with the WBS codes so that cost benchmarking, validation and estimating ratios, metrics and key performance indicators (e.g., cost per unit of production) can be developed, shared and compared between projects. It is not intended as a guideline for project control, but it is related.

For those needing to meet the requirements of NI 43-101 (or equivalent), this RP will facilitate preparation and benchmarking of capital cost estimates by or for *qualified persons*.

The recommended code is hierarchical to three levels of detail. The levels roughly correspond with the classes of estimates established in RP 47R-11 and that RP should be considered together with this one. Level 1 in this RP corresponds with the minimum level of scope detail for a Class 5 (Scoping in NI 43-101) estimate structure, while Level 3 in this RP corresponds approximately with the level of scope detail of a Class 4 (Pre-Feasibility in NI 43-101) estimate. A Class 3 (Feasibility in NI 43-101) control level estimate typically requires further WBS breakdown than covered in this RP.

As mentioned previously, this RP defers to the Level 1 coding structure for the discipline or prime account direct cost elements defined in RP 21R-98 while extending some elements to Level 2. The combination of product and discipline coding is intended to support the typical level of breakdown used for benchmarking and conceptual estimating (e.g., cost for equipment in the in-pit crushing area).

This guideline recognizes that mining and mineral processing projects often include a complex combination of mine, process plant and infrastructure scope elements, and having a unified, hierarchical coding structure considering all

these parts together is of value (i.e., rather than relying on ISO 19008, ICMS or other codes that consider parts of the investment in isolation). As universal coding structures evolve, this RP is intended to serve as a reference to inform and guide those efforts in respect to mining and mineral processing.

It is understood that each project will develop a unique WBS for project control purposes, and as such, no standard WBS can be applied to every project. However, if each project were to develop its WBS in consideration of or informed by this guideline, translation of the specific project data to general industry metrics will be facilitated.

MEASUREMENT AND METRICS

The purpose for the structure includes facilitating development of mining specific cost metrics to be used in benchmarking and validating mining project estimates at different levels or preparing conceptual (Class 5) estimates. Examples of mining specific metrics at Level 1 include but are not limited to:

- Mine development costs ($ million) per ore resource basis (million tons [mt]) (for underground, open-pit, and open-cast)
- Mine development cost ($ thousand) per pit depth (m) (for open-pit and open-cast)
- Mine equipment costs per ($ thousand) annual ore production (million tons per annum [mtpy]) per mine depth (m) (for underground)
- Infrastructures costs ($ million) per mine capacity (mtpy), including ore and waste (for underground, open-pit and open-cast)
- Infrastructures costs ($ million) per ore production capacity (mtpy) (for underground, open-pit and open-cast)
- Processing plant cost per nameplate product production capacity (e.g., mtpy) (for entire plant or by unit)
- Process equipment costs per nameplate product production capacity (e.g., mtpy) (for entire plant of by unit)

At Level 3, the metrics would usually be in respect to the capacity of the functional unit (e.g., kW of power generation or volume of tanks, etc.). For disciplines the metrics would be key quantities by discipline (e.g., volume of concrete, area of buildings, etc.). Proposed key measurements are provided with the accounts.

BACKGROUND

An initial reference guideline that led to this RP's development was developed by the joint industry group (see ref: IPA, Inc.) That group used a practical approach rather than a theoretical one. Real breakdowns were gathered from the major owner companies in the initial working group and then dissected and organized into a consensus product. The actual breakdowns reviewed usually went to a lower level than that shown, but getting consensus at more detail levels was difficult, and less meaningful for benchmarking. This RP incorporates appropriate comments from the industry at-large.

It is important to note that the WBS in this RP includes separate accounts (6000 to 9000) for *common* and what are often called *indirect* costs based on the assumption that the various facility area accounts (1000 to 5000) are engineered and constructed as an integrated project wherein direct costs (and incidental indirects) are captured for each area and most major indirect costs are shared (e.g., overall camp, scaffolding and other support contracts for the site). However, if each area is executed as a separate project in a program, each with its own recorded indirect costs, it may be appropriate to capture some *common* and indirect costs as a discipline or prime account element. That is how RP 21R-98 is structured; it includes indirect cost categories with the prime accounts. That is also how

many contractors will capture their indirect costs. Owners may not have visibility as to contractor indirect costs (e.g., embedded in unit prices) except for major common facilities and support.

The challenge remains for the user to capture common and indirect costs, allocate them (or not) to the various areas to assure consistent benchmarking, validation and conceptual estimating application. It is essential that the treatment of these costs be documented in the basis of estimate or similar record of analysis.

DISCIPLINE OR PRIME ACCOUNT STRUCTURE

Table 1 lists the *direct* disciplines or prime accounts from RP 21R-98 for the process industries along with additional recommended coding at Level 2 for mining. *Mobile Equipment* is of particular added importance to mining.

21R-98 Primary Categories	103R-19; Level 2	Level 2 Description
Civil and Marine	Marine	Jetty, dock, breakwater/outfall or other offshore work
	Earthwork	Site investigation, preparation, general excavation, backfilling, etc.
	Civil	Site & infrastructure improvements such as piling, ponds, culverts, roads, rail, etc.
Concrete	See 21R-98	
Structural Steel	See 21R-98	
Buildings & Architectural	See 21R-98	
Equipment	Mobile Equipment	Surface and underground mining production equipment (e.g., trucks, shovels, etc.)
	Mechanical Bulks	Metallic and nonmetallic bulks (e.g., insulation, liners, refractory, etc.)
	Mechanical Equipment	Processing and materials handling equipment (e.g., pumps, crushers, mills, bins, separation equipment, dryers, etc.)
Piping and Process Air Ductwork	Piping	Pipe scope related to process plant
	Pipeline	Pipe scope related to transportation
	Ductwork	Sheet metal for process air, fumes, and gases (ducts, exhausts, vents, hoods, etc.)
Electrical	Electrical Equipment	High voltage equipment (e.g., substations, transformers, switches) and central systems (e.g., security, fire, communication, etc.)
	Electrical Bulks	Conductor, raceway, grounding, distribution switches and devices, etc.
Instrumentation/Process Controls	See 21R-98	
Protective Coatings	See 21R-98	

Table 1. Disciplines or Prime Accounts; Direct Field Costs

Table 2 provides suggested key quantities for the discipline accounts. Note that some disciplines are not meaningful in aggregate at the high level shown (noted by n/a) but may exist in a lower level, e.g. Level 3. For example, civil may or may not include piling which would be measured in number of piles, which is not meaningful if the site does not need piling.