AACE International Recommended Practice No. 21R-98

PROJECT CODE OF ACCOUNTS – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

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 guideline is an industry-specific addendum to AACE International's generic guideline for project code of accounts (Recommended Practice No. 20R-98). This document describes recommended practices for codes of accounts (COA) as applied to engineering, procurement, and construction (EPC) projects in the process industries. "Process industries" are those with facilities whose main function is to perform a process. This includes chemical, petrochemical, hydrocarbon, pulp and paper, pharmaceutical, power generation, thermal, metallurgical, assembly, fabrication, and other processing. The primary characteristic of these industries, as it relates to codes of accounts, is that process or manufacturing equipment is the core or primary physical component of the facility. Equipment differentiates these projects from commercial construction and infrastructure where the core component is a structure, from software development projects where the core component is programming code, and so on.

COAs are applicable to all phases of the asset life cycle, but this guideline specifically addresses the EPC for creation, modification, or termination of a process facility. This guideline does not apply to code of accounts to support ongoing operations of process facilities. Properly defining a work breakdown structure (WBS), and other project structures, and deciding how they should be structured are outside the scope of this document.

A project code of accounts is 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 the project information that is linked to the code. The information is used to support total cost management practices such as cost estimating, cost reporting, cost accounting, planning, and scheduling. Refer to 20R-98 for a more complete description of the principles of COAs.

PURPOSE

The purpose of this guideline is to establish a common understanding of the attributes of project COAs in the process industries so that communication is improved among all process industry project stakeholders. These guidelines are intended to help cost management practitioners create or modify a COA in a way that maximizes its value.

Common understanding is important because all projects are the product of team endeavors in which the timely and accurate flow of project cost, resource, progress, and other information is essential to project success. Industry experience has shown that a large amount of time and resources are wasted in the effort to reconcile disparate project records, and project failures are often traced to poor communication. The practice of benchmarking process industry project costs at a meaningful level of detail is a daunting task because of the lack of cost coding commonality.

A "standard" fully-defined, process industry code of accounts that meets every user's requirements is beyond the scope of this guideline, but, a basic guideline COA structure is provided. The basic guideline COA establishes a minimal level of cost information organization that a process industry COA should follow to achieve the objective of establishing common understanding.

GUIDELINE METHODOLOGY AND BACKGROUND

This guideline was developed using a practical approach rather than a theoretical one. Real COAs were gathered and dissected to identify core COA principles, prevailing attributes and characteristics of COAs as they are applied in process industry EPC projects today. The content characteristics that were most commonly used were tabulated and compiled into the basic guideline COA.

There are almost as many different codes of accounts as there are companies executing EPC projects in the process industries. For this guideline, 21 actual COAs were collected, analyzed, and summarized in table 1. Despite the differences, there is sufficient consistency of approach in the industry to provide confidence that the COAs collected are an adequate sample.

Process Industry Type	Organization	Type of Projects	Number
Oil & gas	Owner	EPC, maintenance	3
Oil & gas	Standards/professional	EPC, operating	1
Offshore oil & gas	Standards/owners	EPC, operating, maint.	1
Offshore oil & gas	Contractor/owner	EPC	2
Process-general	Contractor	EPC	4
Process-general	Standards/professional	EPC	2
Process-general	Benchmarking	EPC	1
Chemical	Owner	EPC, operating, maint.	1
Chemical	Contractor	EPC	2
Utility	Owner	EPC, maintenance	1
Utility	Contractor	EPC	1
Process - pulp & paper	Contractor	EPC	2
			21

Table 1 – Sample of Process Industry Code of Accounts Used in This Guideline

The detailed contents of the owner and contractor company COAs are confidential. Some of the sample COAs have been previously published, and a general description of these is included in Appendix A. The COA from the organization referred to as “benchmarking” is a format that 14 international owner companies had agreed to use for cost and resource benchmarking and metrics purposes.

After identifying the content characteristics of each COA, these characteristics were listed in tables that categorize them by their prevalence of use. The most prevalent characteristics were then compiled in a logical manner into the basic guideline COA. When determining the most prevalent (i.e., primary) content characteristics, each COA was given equal weight, with the exception of the “benchmarking” COA that was given double weight because many owner companies had agreed to this format for cost sharing purposes. Characteristics were categorized or ranked by prevalence of use as shown in table 2.

Characteristic Group	Percent Occurrence in the Sample COAs
Primary	Equal to or greater than 75 percent
Secondary	50 to 74 percent
Tertiary	25 to 49 percent
Other	Less than 25 percent

Table 2 – COA Characteristic Ranking Categories

While the practical approach described above is not specifically forward-looking, the core COA practices identified are expected to have lasting value. This and related guidelines will serve as a documented basis for AACE’s cooperation with other industry COA initiatives (particularly those of vendors and users of computer-aided engineering and design, enterprise and project planning systems, and accounting systems as they attempt to further integrate their products).

ATTRIBUTES OF PROCESS INDUSTRY CODES OF ACCOUNTS

The four basic attributes of a code of accounts as described in RPS-20R98 include:

- usage;
- content;
- structure and format; and
- standardization.

When evaluating a COA, these attributes should be considered within the context of the project system's circumstances and requirements. In the case of this guideline, the general requirements of the process industries are considered. Each of these four attributes is discussed in the sections that follow.

Usage

There are three primary groups who use project code of accounts in the process industries: asset owners, contractors, and consultants.

Asset Owner Companies
The primary use of COAs by process industry owner companies is for allocation of costs for financial budgeting and close-out reporting. Asset classifications such as cost center, area/unit, authorization for expenditure, and location, are frequently used by owners. Most owners contract out their construction work, detailed engineering, and bulk material procurement, and therefore, the owners perceive less immediate need for activity-based accounts as used for project control during execution. In many cases, owners do not have a COA that allows effective project control of their own internal activities, such as front-end engineering. Activity-based cost data is critical to owners for understanding their own long-term project cost performance and developing their own conceptual cost estimating and benchmarking capabilities, but many owners do not adequately understand its value.

Over 80 percent of process industry owners segregate capital, expense, and suspense cost types. Suspense costs are temporary holding accounts for items such as project material stock, contractor retention, and so on, which are cleared-out prior to closing the project. Expense costs are those that are written-off in the year they are incurred, while capital costs are those that depreciate over more than one year. About 70 percent of process industry owners have a code to classify capital cost of assets for taxation, capital cost allowance, and fixed asset accounting depreciation.

EPC Contractors
The primary use of COAs by process industry contractors is the allocation of costs for project control. Cost and resource data need to be captured by discipline/commodity and area/unit so that work progress can be planned and assessed. Asset classification and capitalization are minor issues (except to the extent that owners request this data). A special code that is often used by contractors, but not owners, is the billing code that indicates whether the relevant cost can be charged or billed to the client. General contractors and construction managers need to separate subcontractor costs from their own (they are also sometimes asked by owners to maintain overall project cost records, including owner costs).

Standards Groups, Benchmarking Consultants, and Others
The use of COAs by groups other than owners and EPC contractors depends on what role they are assuming in a project. However, consultants are often asked to assess or benchmark past cost performance or to predict, estimate, or validate future project costs. Performance evaluation and estimation both require an understanding of activities that comes from the discipline/commodity project control information collected by EPC contractors for execution. Standards groups tend to also focus on these same uses. Asset classification, capitalization, and taxation issues are usually secondary uses to these groups.

Content

In table 3 below, all of the content characteristics found in the process industry COA sample are classified into the primary categories as defined in the generic COA guidelines (see RPS-20R98 for further definitions of general content attributes).

Accounting and special	Geographical (where)	Physical (deliverable)	Resource (who and what)	Activity (how)	Timing (when)
Cost group	Location	Area/unit	Prime account	WCS/SAB	Phase
Project #	Country	System	Commodity	WBS	Budget year
Cost center	State/province	Project type	Discipline	Activity	Shutdown/non-shutdown phase
Capital/expense	City/town	Facility	Cost type	Work type	
Billing code	Plant	Commodity	Trade	Phase	
Asset class	Area	Process	Organization	Process step	
Tax jurisdiction	ISBL/OSBL	Component	Company	Sub-phase	
Change #	Site	WBS	Department	Discipline	
Contract #	Office	Direct/indirect	Material	Activity type	
AFE #			Contractor		
			Service		

Table 3 - Classification of Process Industry COA Content Characteristics

Table 4 ranks the process industry content attributes in terms of their prevalence of occurrence by organization type.

Type of Organization	Primary (75% +)	Secondary (50%-74%)	Tertiary (25%-49%)	Other (24% or less)
Owners	Capital/expense	Prime account Detail account Cost center Cost type Project number Plant/site location	Project type Area/unit Cost group Company Sub-account	WCS/SAB WBS Trade Fund Responsibility
Contractors	Prime account	Sub-account Detail account Cost type Cost group Area	WCS/SAB WBS System Billing status Commodity Project number Unit	Phase Customer job # Plant/site location Change # Responsibility
Standards and others	Cost type Prime account Sub account	Area Detail account Cost group	Project no. Project type System Unit Trade Plant/site location	Phase WCS/SAB Cost center Company WBS

Table 4 - Characteristics by Organization Type

Table 5 ranks the above process industry content attributes in terms of their prevalence of occurrence in the COA sample for all organization types combined.

Type of Organization	Primary (75% +)	Secondary (50%-74%)	Tertiary (25%-49%)	Other (24% or less)
All	Prime account	Cost type Area/unit Cost group Sub account Detail account	Project number WCS/SAB WBS Cost center Plant/site location	Work type/activity Trade System Project type Billing status Phase Company Asset class

Table 5 – Characteristics Ranked by Prevalence of Usage (All End Users Combined)

DEFINITIONS OF CONTENT CHARACTERISTICS

The text that follows provides definitions of the most prevalent content characteristics. Users should also refer the generic guidelines (RPS-20R98) for further definition.

Accounting and Special Codes

Cost Group (Secondary)
As the title implies, a cost group represents a high-level summarization used for general cost reporting as opposed to project control or asset accounting. A cost group may be a combination of cost type and direct/indirect characteristics (e.g., direct material, direct labor, and so on). Another cost grouping is field versus home office costs (field and home office are typically not geographic or organizational characteristics because they are general groupings that do not specify actual location or organization). Table 6 shows how different organization types tend to group or summarize costs at a high level.

Generic Group Name	Owners	Contractors	Standards/Benchmarks
Direct costs	Capital directs	Directs	Directs
Indirect costs	Capital indirects	Field indirects Home office	Field indirects Project management and administration Engineering
Expense costs	Expense		
Suspense costs	Suspense		
Other costs		Other costs	Other costs

Table 6 - Typical Primary Group Categories Used by Organization Type

Project Number (Tertiary)
The project number is rarely included as part of a COA dictionary but is normally included in the coding format. This allows organizations involved with more than one project to keep the costs of each project separate.

Cost Center (Tertiary)
A location, a machine, or an organization may be cost centers. Cost centers are also used in activity-based costing to allocate costs to a process-step or activity. This attribute is used more for accounting or cost analysis purposes rather than project planning and controls.

Product/Deliverable

In the process industries, the deliverable is a physical product such as a petrochemical plant, refinery, or one of the major parts of the facility. Equipment, materials, and labor are not products in this context. They are resources used to arrive at the final product. Equipment is easily related to the final product because it is the primary focus of the permanent installation. Bulk materials are more difficult but may be related to the final product. Labor may be allocated to the final product if the cost coding system is designed properly.

Direct/Indirect (Secondary)
Direct costs are those which are readily or directly attributable to, or become an identifiable part of, the final product (e.g., piping labor, and material). Indirect costs are all costs that cannot be attributed readily to a part of the final product (e.g., costs for managing the project). Indirect costs are sometimes called prorates or distributives because they are often allocated to direct cost categories to determine the total costs of a product or asset class. Indirect costs are occasionally called overheads, but overheads are generally considered a sub-type of indirect costs. This characteristic is often combined with cost type to form a cost group (e.g., direct materials, indirect labor, and so on). Owners and contractors commonly account for indirects differently. For instance, a contractor may account for employee salary as a direct cost and benefits as an indirect cost, but the owner is billed for total labor cost (i.e., all-in rate including contractor direct and indirect labor items), all of which the owner considers a direct cost.

Unit (Secondary)
Unit is more commonly known as process unit, but the word *process* is dropped to minimize field descriptors in software programs. A process unit is comprised of equipment, piping, process control devices, support structures, and associated materials. There may be several systems or a single system in a unit that make it a functional whole. A process unit typically changes the physical properties of whatever enters it, or it can be a utility process that enhances or improves the efficiency of the processing function. A unit code is commonly used in combination with an area code.

Work Breakdown Structures (WBS - Tertiary)
A WBS can be described as a hierarchical division of work scope divided into manageable parts that correspond to key deliverables, phases, or milestones. Work breakdown structures may be product-oriented (e.g., bridge section, building foundation, software program, aircraft wing), process-oriented (e.g., phase, step, activity), organization-oriented (e.g., contractor, department, team), or combined product/process/organizational hierarchies. Some organizations use WBSs only to divide work scope into manageable parts while others use WBSs as a replacement for COAs. Labels or identifier codes for WBS elements are commonly called cost codes because it is possible to predefine a dictionary of WBS elements in the same manner as for codes of accounts. Conversely, several organizations refer to their code of accounts as a WBS because the project breakdown is incorporated into the cost coding. Many organizations executing projects have some form of both. When an extensive WBS exists, there is reduced need for a fully detailed code of accounts. For example, if the WBS is broken down by discipline (e.g., civil, electrical), cost codes for discipline become redundant if costs are being charged to the WBS.

Resource

Prime Account of Discipline (Primary)
Prime account is the most common characteristic of all process industry COAs and is also applicable to the product and work type dimensions. Discipline, commodity, major account, work classification, header account, code of resource (COR), and activity type are other names used for this category. In project controls for EPC projects in the process industries, engineering is driven by discipline, procurement is driven by commodities, and construction is driven by discipline or type of work. The material and equipment costs for process industry projects range roughly between 40 and 80 percent of the total cost. That being the case, it becomes prudent to further break commodities down into major categories. Commodities are simply classes of common materials. Several commodity items are normally required to result in a product that is functional. In this context, a commodity also can be considered a resource

because it is a resource required for installation. Discipline is a type of work, craft, profession, or trade. Each discipline will employ a somewhat unique set of skills and knowledge and will tend to work with different types of materials (i.e., commodities) and resources.

Cost Type (Secondary)
Cost type generally refers to the type of resources such as labor, material (i.e., equipment and bulk materials), or subcontract (i.e., a combination of labor and material). This account type also may be used for organizational and accounting breakdowns. In organizational usage it may segregate owner costs from contractor costs and may further identify contract type (subcontract, service, turnkey supply and install, design, labor, and so on). In accounting usage it may segregate rental and lease costs from purchases. Also, asset owners need to separate capital costs from expense costs (e.g., demolition and software development are often expensed) because they affect depreciation, taxation, and ultimately profitability.

Some COAs have combined cost type and direct/indirect designations such that an account may be defined as “direct labor” for example. This means there are two distinct elements. One part is the designation of direct versus indirect cost, which is actually a grouping of prime accounts, and the other part indicates the type of resource (e.g., labor, material, contracts, or general costs). Not every organization uses both types of characteristics. Benchmarking analysis indicated that approximately 60 percent of the COAs separate cost type and the direct/indirect categories. It is therefore recommended that the two characteristics be separate rather than used together. This also allows for separate computerized sorting, selecting, summarization, and analysis (i.e., “slice and dice”). The combined cost type and direct/indirect indictor was referred to as “group code” in some COAs.

Organization
Organization refers to responsibility for a cost category. Formal organizational breakdown structures (OBS) are not often part of a project COA; however, contractors routinely make provision to accommodate external organizations’ cost categories, such as owner or subcontractor costs. Owner versus contractor costs is the highest level of organizational breakdown. If more than one contractor is involved, a separate code would be required for each contractor. Organizational codes may be used on timecards to record the discipline or trade involved. A similar approach is used for other organizational attributes such as coding of contractor invoices. Organizational attributes are often combined with cost type to achieve a hybrid cost type and eliminate extra coding requirements. Responsibility, company, department, trade, discipline, and internal/external are examples of organizational attributes.

Activity

Work Classification Structure (WCS), Standard Activity Breakdown (SAB), and Phase (Tertiary)
WCS and SAB represent the actions or types of activities required to execute the work scope (e.g., review drawing, fabricate equipment, erect pipe, and so on). Activity types for engineering work are commonly categorized by discipline. This account is a basic attribute of project control and activity-based costing. Phases are stages of project development and represent the highest level of summarized work process steps and activities. Tracking costs against phases can provide summary expenditure profiles and related cost performance indices when timing of the phases is known.

Location

Area (Secondary)
Area is a geographical location with a defined boundary and may include several process units and non-process parts of a plant. Non-process refers to roads, walkways, rail spurs, docks, ponds, landscaping, office buildings, and so on. For example, a “white oils area” in a lubricant plant may contain a hydrotreater unit, a hydrogen unit, dewax units, and some roads and walkways. “Area” is often used in combination with “unit”.

Plant/Site (Tertiary)
Projects that encompass multiple sites use a plant or site indicator to collect costs for each location. A plant is related to a location. Sometimes the term *plant* is used to describe an area within a plant complex. For example, the asphalt production of a refinery is often referred to as the asphalt plant even though it is part of the refinery. Facility is a generic term for plant. A facility could be larger or smaller than a plant or it also could be a building. In the process industries, a plant is a functional entity used to produce a sellable product as opposed to being used for shelter.

Timing

No timing attributes were found to be primary, secondary, or tertiary.

BASIC PRINCIPLES FOR COA'S APPLIED TO EPC IN THE PROCESS INDUSTRIES

A brief summary of basic principles is provided as a reference for the basic coding structure.

- A code of accounts should have no more or less detail than needed to meet stated requirements.
- Fewer account codes are required if a WBS exists that covers the product, activity, and/or organizational dimensions.
- The highest level of summarization below total project level should fit easily on one page.
- There are significant benefits to using multi-dimensional, hierarchical coding structures regardless of whether intelligence is built into the codes or not. A well-designed COA allows costs to be summarized, selected, and sorted by resource, prime account, cost type, end product, phase, etc.
- Each cost code item requires a clear definition of what is included and what is excluded. Three or four-word descriptions are only acceptable for summary-level codes when the full definition can be found by referring to the detailed items.
- It is acceptable to use either alpha or numeric or combined alpha/numeric characters for cost codes. There are some advantages to using alpha codes.
- On projects where a cost engineering or "project controls" function exists, this function is usually responsible for determining and maintaining the code of accounts. The project manager approves the project COA and any changes to it.

BASIC CODING STRUCTURE

Two tables are provided in this section. The two tables are often shown as a matrix (as in a spreadsheet) with the primary accounts and cost groups on the vertical axis and the cost types across the horizontal axis.

Primary Accounts and Cost Groups

Table 7 lists the prime accounts and groupings most frequently used in the sample COAs.

Primary Category	Brief Description and Comments
Direct Field Costs (*Cost Group)*	
Civil and Marine	Includes sitework, earthwork, clearing, excavation and backfill, fencing, landscaping. Marine is considered a separate prime category only in offshore work.
Concrete	Includes cast-in-place concrete as well as pre-cast items.
Structural Steel	Includes steel and other metal supports, ladders and platforms. May also include specialty structural materials such as plastics.
Buildings and Architectural	Includes buildings with all foundations, structure, HVAC, etc., where buildings are an incidental part of the project (i.e., control sheds, etc.). If the project includes a major building, building costs are best accounted for with a nonprocess COA.
Equipment	Includes process and mechanical equipment. This is commonly broken down into more categories. Includes refractory linings.
Piping and Process Air Ductwork	Includes pipe, valves, fittings, hangers, etc. Process air ductwork is considered a separate prime category in industries with extensive drying, combustion, and similar processes.
Electrical	Includes power, lighting, raceway, telecommunication, etc.
Instrumentation/Process Controls	Includes field instrumentation, control valves, control panels, instrument air tubing, instrument wiring. Raceway is usually included in electrical.
Protective Coatings	Insulation, paint, and fireproofing.
Indirect Field Costs	
Temporary Construction Facilities and Utilities	Includes temporary trailers, camps, roads, fencing, field fabrication shops, temporary power, water.
Construction Services and Supplies	Consumables, fuel, janitorial, medical, security, clean-up.
Construction Tools and Equipment	Cranes, hoists, trucks, welding machines, hand tools.
Construction Management Staff and Administration	Supervision, clerical, stationery, reprographics, furniture.
General Construction Overheads	Construction permits, duty, transportation, mob/demob, insurance.
	Note: when managing direct hire work, it is common to account for craft labor benefits and burdens as an indirect.
Commissioning & Start-Up	Direct labor and material for post-mechanical completion work until steady state production is achieved. Includes vendor reps and first fill catalysts and filter charges.
	Note: raw process materials are generally not a project cost.
General Project Indirects	
Project Management and Administration	Includes PM, project engr., cost, schedule, accounting, procurement, clerical, office stationery, travel, staff relocation.
Engineering and Design	All disciplines including process and models, travel, royalties, studies, staff relocation, as-builts. Includes engineering management (unless they also serve as project manager) and follow-up engineering support after release of drawings.
Special Project Costs	Project financing, permits, taxes, insurance, legal, fees, etc.
Contingency and Escalation	Estimate contingency, escalation & other estimate allowances.
	Note: no actual costs are charged to these but they hold budget costs that are allocated via a change management process.

Table 7 - Basic Coding Structure - Primary Accounts for EPC Projects in the Process Industries

Cost Types

Table 8 shows a cost type structure with a second tier that allows more detail.

Cost-Type - Level 1	Cost Type - Level 2
Labor	Internal External (contract)
Material/Equipment	Process equipment (may need 3rd level) Packaged units Nonprocess equipment Bulk material Construction consumables
Contracts	Supply & install (directs) Leasing and rentals Construction services (indirects)
General costs/overheads	Financing, contractor fees/penalty, taxes, permits, regulatory, bonds, insurance, etc.
Expense	Noncapital costs as defined by legislation and/or owner requirements
Suspense	Contingency, unallocated estimate allowances and escalation, backcharges, project stock, contract retention

Table 8 - Cost Type Hierarchy

Coding Format and Structure Characteristics

Coding Formats

A cost code usually contains a series or set of cost code elements. COAs for projects should include a key to the overall coding format which explain how the various code parts fit into the structure. Figure 1 illustrates a typical method used to illustrate this in COA documents.

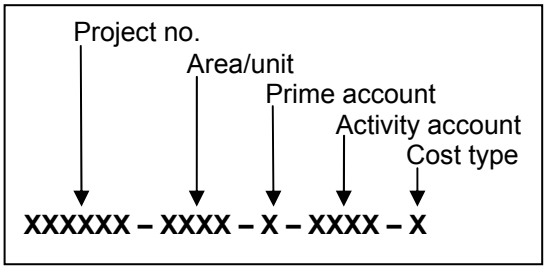

Figure 1 - Example of a Coding Format Definition Key

Alpha or Numeric Characters in Coding

In the COA samples evaluated for this guideline, there are about the same number of COAs with combined alpha/numeric codes as there are with pure numeric codes. Detail accounts tend to be numeric. Numeric codes are constraining because each character can only represent 10 breakdown categories (9 if zero is not used). More than 10 breakdowns requires the use of letters (i.e., alphas) or alpha-numeric combinations. Using only letters allows 26 categories (English alphabet) in a single character field. A combination of both numbers and letters yields 36 categories. One drawback of using alpha-numeric codes is potential confusion because of the visual similarity of some characters. (letter I vs number 1 or letter O vs number 0) Refer to Table 9 for the number of combinations per digit used. Alpha-numeric can reduce data processing and storage costs because increasing the number of fields or code categories increases database size. "Intelligence" is commonly designed into the coding to facilitate understanding learning and accuracy. For instance, ENG may stand for engineering, L for labor and so on.

# of Digits	Numbers only	Letters Only	Alpha-numeric
1	10	26	36
2	100	676	1296
3	1000	17576	46656

Table 9 – Number of combinations available by type of character

APPENDIX A: EXISTING STANDARDS

Existing standards included in the benchmarking analysis of process industry codes of accounts are described below.

The Association of Cost Engineers (UK) has produced a standard code of accounts as recently as 1994, which is intended to cover a variety of industries. It is very suitable for use in the process industries. The code structure is hierarchical and minimizes the volume of accounts required.

Norwegian petroleum industry operators have developed a coding guideline called Standard Cost Coding System (SCCS) in concert with the Norwegian Petroleum Directorate (NPD). The SCCS is an extensive three-dimensional model of hierarchical coding structures that covers resources, activity types, and physical components for both offshore and land-based installations. The NPD requires all companies operating on the Norwegian continental shelf to report costs prior to or with submission of a development plan and also report actual costs upon completion of each development project. There are specific statutory reporting requirements under the jurisdiction of the NPD. Both of the above-mentioned standards are included with the benchmarking and analysis of North American organizations.

In Canada, all oil and gas exploration and production organizations exchange project and operating cost information using the Petroleum Accounting Society of Canada (PASC) standard. Exchanging cost information is required because joint ventures are common practice in this industry. It is more of an accounting standard than a project standard so it is used on multiple small projects more often than on medium and larger-sized EPC projects.

Construction Specifications Institute's (CSI) MasterFormat is a widely used standard among the industrial/commercial/buildings/architectural construction and government contracting industries. Consequently, several estimating software packages use this format as well. It is a comprehensive, commodity-based specification format for bidding and administration of construction contracts, so engineering and some other indirect costs are not key considerations. For these reasons, it was not included in the benchmarking of COAs for EPC projects in the process industry. MasterFormat is occasionally used to form part of a COA by organizations in the process and utility industries. Most process industry projects could only effectively use three or four of the 16 primary MasterFormat divisions. The remaining categories would have negligible use (e.g., wood and plastics). Building costs typically make up about 15 percent of process industry project costs. However, as shown in table 9, the building industry could effectively use all of the categories commonly used in the process industries.

Process Industry Guideline	Suitability for Building Industry
Earthworks/civil	Primary equivalent
Concrete	Primary equivalent
Structural steel	Secondary (part of metals)
Buildings/architectural	Covers several primary equivalents
Equipment	Primary equivalent
Ductwork	Secondary
Piping and process air ductwork	Secondary
Electrical	Primary equivalent
Instrumentation/controls	Secondary
Protective coatings	Secondary - close to thermal & moisture protection
Construction indirects	Primary equivalent
Project management & administration	Secondary
Engineering and design	Not included
General project overheads	Secondary

Table 10- Suitability of Process Industry Prime Accounts for Use in the Building Industry

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