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IMPLEMENTING PROJECT CONSTRUCTABILITY

TCM Framework: 11.5 – Value Management and Value Improving Practices (VIPs)

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1. PURPOSE

As a recommended practice (RP) of AACE International, Implementing Project Constructability provides guidelines for developing and implementing constructability programs in all the phases of a project’s life cycle. This document is intended to provide a guideline, not a standard.

Constructability is the integration of construction expertise into all phases of the project to benefit cost, schedule, quality, and overall project objectives. The successful use of construction knowledge and expertise increases the probability of project success. Constructability reviews (CRs) should be conducted at key points in the project life cycle: in the planning phase, early in the design phase, prior to the procurement phase and again prior to the mobilization phase for construction. CRs should hold true to the designer’s intent, and the design concept is easiest molded to good constructability early in the design phase.

Constructability, as addressed in this RP, is applicable to projects in any industry in any location (e.g., architectural, process plant, transportation, utilities, offshore, etc.) that include construction work of any scope. In total cost management (TCM), constructability is one of many value improving practices (VIPs) such as manufacturability analysis; reliability, availability and maintainability (RAM) analysis; and so on. Constructability is also useful as a risk management practice that supports risk mitigation. However, these other VIPs and risk management practices are not directly included in this RP.

AACE is not the sole or even primary steward of recommended constructability practice; there are several leading organizations included in the reference section. However, constructability is a skill and knowledge area of cost engineering because, as a VIP, constructability practices require the assessment of cost, schedule, risks, uncertainties and other project attributes for which AACE is the leading organization. This RP highlights the role of cost engineering in the practice.

This RP will discuss how to implement a constructability program in order to maximize the positive impact on the project. It also provides project examples illustrating the success of those properly implemented efforts. Integrating constructability into project plans can result in better safety, lower costs, better productivity, earlier completion and start-ups for ultimately better project.

2. RECOMMENDED PRACTICE

Constructability is a term of art which has come to encompass a detailed review of design drawings, models, specifications, and construction processes by one or more highly experienced construction engineers or specialists, working with the project team (including cost engineering) before a project is put out for bids and also prior to construction mobilization. It is defined as “the use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives.” [4] The purpose of the constructability review is to identify the following five items:

- Design errors, in either material selection or dimensions.
- Ambiguous specifications.
- Project features that will be difficult or exceedingly costly to construct as designed.
- Project features that exceed the capability of industry to properly build.
- Project features that are difficult to interpret and will be hard to accurately bid.

Project “features” include both physical characteristics and planning attributes (e.g., execution strategy, schedule logic, etc.).

Constructability reviews add value to the project planning and development process through the following methods:
1. Strategies by which to implement improved constructability include these:
   - Use improved construction systems.
   - Simplify the design or combine elements.
   - Standardize the design and repeat elements.
   - Improve information availability and clarity.
   - Improve the construction sequence.
   - Improve the use of equipment and tools.
   - Improve constructor-designer communication.

2. Cost savings derive from:
   - Fewer delays.
   - Reduced direct construction effort.
   - Shortened duration of activities.
   - Less work at higher elevations.
   - Less material required.
   - Decreased likelihood of labor conflicts.
   - Early detection of design errors, omissions, and ambiguities.

3. One must initially invest to earn the cost savings from better constructability:
   - More effort for design and procurement.
   - More communication among builder, designer, and vendors.

4. Improve constructability and reduce costs by:
   - Mitigating the effects of adverse site conditions.
   - Implementing better design, building, or process technologies.
   - Offering assembly-line conditions.
   - Accelerating the schedule by decoupling sequential workface activities.
   - Reducing the number of workers and costlier skills.

5. Better constructability methods can include:
   - Prefabrication: Economies and quality via manufacturing process.
   - Preassembly: Join components into subunit at remote, better-controlled location.
   - Modularization: Assembly operations create the most effectively sized unit logistically possible; contains all components of final state. Modular Construction includes offsite construction of modules or building units completed in a controlled environment and then delivered to the jobsite.
   - Design: Designs tailored to available construction means and methods.
   - Safety: Enhanced safety of construction and post-construction operations and maintenance.

A comprehensive study of constructability in transportation posits that constructability is an integral part of the project development process where a project is divided into three phases: planning, design, and construction.[1,2,8] Its authors drew this process from the study of the implementation of constructability in the non-transportation sectors. So, constructability as presented in this RP represents not only the current thinking on this subject, but also a synthesis of current research making it generally applicable to any type of project.

2.1. Project-Oriented Constructability Review Process

The constructability review is incorporated into the project development process by defining parallel constructability phases such as constructability in planning, design, and construction. These three phases of constructability review are further divided into features of work based on the needs of the project in question. This format can be used to