

AACE
INTERNATIONAL
**RECOMMENDED
PRACTICE**

48R-06

SCHEDULE CONSTRUCTABILITY REVIEW

SAMPLE

AACE
INTERNATIONAL



AACE® International Recommended Practice No. 48R-06

SCHEDULE CONSTRUCTABILITY REVIEW

TCM Framework: 7.2 – Schedule Planning and Development
11.5 – Value Management and Value Improving Practices (VIPs)

Rev. August 28, 2009

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

Contributors:

Disclaimer: The opinions expressed by the authors and contributors to this recommended practice are their own and do not necessarily reflect those of their employers, unless otherwise stated.

Edward E. Douglas, III CCC PSP (Author)
Ricardo Accioly
Rodney B. Adams, CCE
Zia Akhtar
Kenneth Baker
Michael P. Bomi
Timothy T. Calvey, PE PSP
Paul L. Conant, Jr.
Douglas A. Findley, CCC PSP

Ricardo Garcia da Roza
John K. Hollmann, PE CCE CEP
John J. MacDonald
Robert C. Powell, CCE
Benjamin Price
Mahmoud M. Saleh
Hannah E. Schumacher, PSP
Donald F. Sulzer
Ronald M. Winter, PSP

SCHEDULE CONSTRUCTABILITY REVIEW

TCM Framework: 7.2 – Schedule Planning and Development

11.5 – Value Management and Value Improving Practices
(VIPs)

August 28, 2009

INTRODUCTION**Purpose**

This recommended practice (RP) is intended to serve as a guideline, not establish a standard for schedule constructability reviews. This recommended practice describes the schedule constructability review (SCR) process and some of the recommended planning that should be considered when developing a construction project execution-phase schedule. This recommended practice includes a suggested review process for the construction project schedule. This RP was written as a stand alone document however it can be used as a companion guideline with the AACE Recommended Practice 30R-03 *Implementing Project Constructability*.^[26]

RECOMMENDED PRACTICE

Construction contract schedule specifications frequently require reviews of the project baseline schedule with very little guidance about how that review process should be accomplished. There may be contract language that suggests the “schedule should be consistent with the project scope” and that there should be an appropriate level of detail to facilitate integration of the various contractors or trades.^[4] Numerous technical articles have been published that recommend analyzing the project cost and schedule. Several of those articles describe a recommended process for the detailed analysis of construction project cost estimates. It was difficult to locate comparable information from these technical resources that describes the process to analyze the construction project schedule. Constructability review checklists that were located assume an understanding of what is required by an SCR and barely mention the need to perform a construction schedule assessment. A schedule constructability review is performed to analyze and assess the feasibility of the construction plan. The SCR compares the planned sequence of work with the project scope as defined in the work breakdown structure (WBS), site requirements, and the specific needs of the client. This recommended practice will focus on constructability concepts influencing the construction execution planning and a suggested review assessment for the construction project schedule.

Background

The Construction Industry Institute (CII) and AACE International define “constructability [as] the optimum use of construction knowledge and experience in planning, design/engineering, procurement, and field operations to achieve overall project objectives.”^[4, 25]

A constructability review is a structured review of the plans and specifications with the focus on the buildability, biddability and efficiency of construction. Constructability reviews are performed to assure consistency between design, fabrication, and installation. These reviews identify errors, conflicts, and omissions and as a result of constructability reviews future costly field changes can be minimized.

The application of constructability concepts to capital construction projects have been reported to provide a return on investment of at least ten to one (10:1). Implementing project constructability concepts reduces project costs and schedule while having a positive impact on quality and safety.^[4]

A constructability review is the process of evaluating the construction documents (design drawings, and technical specifications) for clarity, consistency, completeness, and ease of construction to achieve overall project

August 28, 2009

objectives. The objective of this review is to provide clarity, consistency, and completeness of the contract documents to facilitate construction bidding, administration, and interpretation to achieve overall project objectives.^[6]

Several factors influence the effectiveness of a constructability review program: the project delivery system, project contracting strategy, procurement strategy for material and equipment, as well as the completeness of the project scope definition. Constructability reviews generally consist of:

- construction involvement during project design;
- detailed project scope review;
- detailed review of construction plans and specifications;
- execution plan development and review;
- detailed schedule and budget review; and
- development of identified alternatives.

Constructability reviews are performed as a cross check of construction documents for accuracy, completeness, and systems design coordination issues. "During the constructability review, the focus is on improving:

- consistency, clarity and completeness of the construction drawings and specifications
- consistency, applicability, enforceability, and comprehensiveness of the general condition ("front end" documents)
- applicability of construction installation technology, methodology or materials
- consistency between plans and site conditions
- identification of project-specific issues, their probable consequences, and proposed mitigation recommendation"^[23]

According to studies the implementation of constructability reviews and assessments at all stages of the project from conception to commissioning have been shown to provide opportunities to identify both cost and schedule savings for the project. Early involvement of construction industry experience can reduce or eliminate problems, by identifying potential conflicts and facilitating a balance between production requirements and building site constraints.^[18]

While the implementation of a constructability review program can be difficult it can be even more difficult to establish a formal schedule constructability assessment program.

Schedule Constructability Review

A project construction schedule should be a comprehensive and realistic plan that represents the specific activities, reasonable durations for the activities, and the planned sequence of work for the project. The logic or sequence of work activities should represent how the project will be built and how the various activities are interrelated. The primary objective of an SCR is to determine if the project schedule is "accurate, logical and achievable."^[1]

A schedule constructability review is intended to assess whether the construction schedule is comprehensive and complete. The focus of an SCR is to assess the following:

- consistency
- clarity
- completeness and reasonableness of the work sequence
- coordination of the schedule with the various engineering disciplines
- coordination of the schedule with the requirements for efficient start-up, and commissioning
- adequacy of lead time for material and equipment procurement
- site restrictions and adequacy of site access

August 28, 2009

The SCR is intended to disclose problems in the following areas:

- reasonableness of work sequence
- comprehensiveness and completion of construction planning
- coordination and interface among the various craft trades and engineering disciplines
- adequacy of lead time for material and equipment procurement
- site work restrictions and adequacy of site access

Schedule Constructability Reviews During the Various Phases of a Project

The expectations for accuracy, completeness, and the level of construction schedule detail will increase with development of the project through the various phases from the pre-construction planning time line through to the detailed execution schedule for construction. It has been recommended that the SCR process should be implemented in “vertical slices” for each discipline or major feature of work. For example a vertical slice through the site civil work would include all engineering and design disciplines as well as the civil and underground (mechanical & electrical) contractors. Changes and additions would then be implemented before reviewing the next vertical slice. The final review would encompass the entire project with all project participants, contractors, engineering design, and procurement represented. The conceptual or feasibility phase schedule could be expected to consist of a dozen key milestones and possibly a bar chart of the significant project activities. Later into the project pre-construction planning before the execution phase, there would be a high level of detail to identify the hundreds (or possibly thousands) of activities required to complete the construction and installation of the multiple features and systems for the startup and operation of that type of facility. In some industries such as the process industry, there would be a numeric classification assigned to the schedule as the project scope definition is developed.

Design Phase

As project planning and design progresses beyond the conceptual phase, schedule activities will be added to identify the important features of work: areas to be modified (cleared, excavated, shored, underground utilities, etc.); then key equipment to be installed and major systems to be operationally tested will be included as the schedule is developed during the design phase. Although the design phase construction schedule is intended to ultimately guide the construction contractor (or entity) who will perform the construction work, these schedules have a tendency to represent the work at a higher level (with less detail) and may not portray accurate estimated durations for construction success. The duration inaccuracies in the design phase may occur due to a lack of accurate quantity details. Design phase construction schedules will typically identify key construction milestones and construction phase activities that portray the overall plan for the client. However the phases within these schedules may overlap but generally do not link the specific detailed craft interfaces. Key equipment installations may be included at various construction points, but often the deliveries are inaccurately forecasted due to a failure to verify realistic equipment fabrication and delivery schedules.

The level of detail for a construction schedule can be expected to increase in complexity during the design phase for a construction project. An SCR can be performed at any of the key design completion phases: schematic design, detailed design, etc., corresponding with various stages of construction document completion (30%; 60%; 90% 100%). Traditionally a constructability review will be conducted after the construction documents are complete and prior to contractor bidding. Under an integrated project delivery (IPD) contract, the preconstruction phases are identified differently as follows: conceptualization, criteria design, detailed design, implementation documents, and buy-out phases; however the intent of the SCR at this phase has the same focus the identity of potential coordination issues, availability of specified materials, equipment and commodities, out of sequence work, missed work details, unrealistic activity durations, potential time delays, and inter-contractor coordination points prior to issuing project bid documents.