

Scheduling Management: Schedule Basis Memorandum

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Understanding how each schedule was developed, the information made available at the time of development, the parties involved in the development, and when the schedule was developed provides a great deal of information to the stakeholders of the project. Too many times, we neglect to capture the essence of the development of the schedule. By capturing why, how, who, when and what was used in the development of the schedule, we provide valuable historical information in reconciling current project schedules as well as supporting the development of future schedules. The schedule basis memorandum (SBM) is designed specifically to assist the project team in providing crucial information about the schedule and how it was developed.

Most failures in anything we perform can be contributed to a flaw in process design. By developing a robust development process and establishing a set of minimum conditions of satisfaction, the success of the project will increase substantially and consequently, the margin of error will decrease. If the project goes astray, we can look back at the historical information to better refine the schedule development process. This will enable us to eliminate the flaws in the process, allowing the users to prepare better schedules using the right information, and the right people with the right level of definition and details.

The schedule development process is as important if not more important than the schedule itself, because an improperly built schedule is perhaps worse than no schedule at all. By using the schedule basis memorandum, you increase the awareness of the development of the schedule.

This paper will not address the technical qualities of the schedule (open ends, use of constraints, etc.) or the adherence of sound scheduling practices. The schedule basis memorandum (SBM) was designed purely to capture the information available and provide an understanding of what was used to develop the schedule. The SBM substantiates why the end date is what it is. A separate process, such as a schedule quality assessment and schedule validation process / report should be used for determining the quality, validity and “do-ability” of the schedule.

SCHEDULE BASIS MEMORANDUM

The schedule basis memorandum (SBM) is a document that defines the basis for the development of the project schedule and assists the project team in identifying any key elements, issues and special considerations (assumptions, exclusions, etc.). The schedule basis memorandum further substantiates the confidence and degree of completeness of the project schedule in order to support change management, reconciliation, and analysis. This document also doubles as a tool for assisting any personnel who are transitioning into the project, specifically a new scheduler or project manager.

The schedule basis memorandum can be used across all industries. Other enterprises may want to use this document as a framework for developing a similar process and set of tools that correspond directly to their needs.

The scope of this section is to introduce the schedule basis memorandum. The document defines the following:

- project description, schedule process;
- scope of work (WBS, OBS);
- execution strategy;
- key project dates;
- planning basis;
- critical path;
- path of construction;
- scheduling threats;
- issues and concerns;
- risks and opportunities;
- assumptions;
- exclusions;
- exceptions;
- baseline changes/ reconciliation; and
- schedule reserve.

The following provides a further understanding of the requirements of the schedule basis memorandum.

Project Description, Schedule Process

This section of the SBM should briefly and concisely provide a description of the project. Also, since this document provides the basis for the development and control of the schedule, you should also describe the process and personnel involved in the development of the project schedule. A checklist should be

attached to indicate the available information (and the degree of completeness). This provides an understanding of the information used for the development of the schedule. Please see the attachment “schedule input checklist” for a complete listing of required deliverables.

Scope of Work

The scope of work should be documented (what the project scope of work includes, as well as what it excludes) and attached as a supporting document to the SBM. Also, the work breakdown structure, the organizational breakdown structure and the division of responsibility should be clearly and concisely identified to each and every portion of the scope of work. This will eliminate omissions to the project scope and minimize redundancy and overlap of existing personnel, contractors, etc.

Execution Strategy

The execution strategy should describe and identify five items.

- Briefly describe the type of work (new project, addition or expansion, revamp, relocation).
- Briefly describe the execution strategy, specifically whether the project is considered one of the following:
 - a. Standard execution (standard workweek, spot overtime, non-shutdown)
 - b. An aggressive execution approach (non-standard workweek, high overtime)
 - c. Fast-track approach (engineering incomplete at the start of construction plus aggressive execution)
 - d. Shut-down (planned shut-down, non standard workweek, high overtime)
- Briefly describe the contracting strategy.
 - a. Self perform, prime contractor, multiple contracts, alliance, joint venture
- Identify the cash flow profile (availability of funds) for the project.
- Identify the average and peak resource demand for the project, as well as the average and peak performance progress that the project can attain.

Key Project Dates

Describe the key milestone dates, such as the project start and completion dates, regulatory / environmental key dates, and key interface dates. If the schedule is prepared as a re-baseline, then a key project dates report identifying any significant variances between any previously “approved” schedules and the current schedule needs to be prepared and attached. Also, this section should identify the statutory holidays to be acknowledged, turn-around / shut-down dates, Christmas breaks, winter productivity loss dates, and summer extended workweek dates.

Planning Basis

Describe the methods and sources used for determining the project schedule, including:

- Identify resource planning methodology.
- Activity identification, duration estimating.
- Identify the funding source and cash release profiles.

- Identify source and methodology for determining logic and sequencing.
- Identify labor productivity adjustments, including congestion assessment, extended work hours, winter work.
- Identify construction equipment use plan.
- Document all production rates.
- Identify equipment, modular, fabrication and bulk delivery methodologies / strategies.
- Identify basis for any contractor schedules.
- Identify basis for start-up and sequencing requirements. And,
- Identify owner requirements (regulatory, environmental, quality / inspection requirements).

Critical Path

The purpose of completing this portion of the document is to inform the project team as well as others of the critical path(s) of the project. Note, depending on the required level of detail, the complexity of the project, and the geographical size of the project, you may have more than one critical path.

The amount of detail required to describe the critical path is at the discretion of the project team, however, you should provide enough detail so that all involved can focus on the areas that could potentially delay the outcome of the project. The critical path described here need not be a detailed CPM of the schedule, but rather a high level description. A detailed CPM schedule and near critical activities list should be attached to the schedule basis memorandum.

Path of Construction

Briefly describe the high level construction sequencing of the project, and the “area” paths of construction (routing of people and equipment while on the construction premises). Also, describe the construction accessibility, lay down and staging areas and temporary facilities. This will assist the project team in determining the prioritization or postponement of modules and installation of equipment to allow construction equipment and resources to be used more efficiently and effectively.

Scheduling Threats

Describe any sources of impending threats that may restrain the project from moving forward. Examples of schedule threats are internal craft availability, funding, etc. Schedule threats should be considered events that the company can control (internal to their organization). External threats such as extreme weather conditions, strikes, etc. are considered external conditions and should be identified on the risk log.

Issues and Concerns

A number of issues and concerns will surface during the development of the schedule. The purpose of this section is to identify any issues or concerns that could not be resolved prior to the approval of the schedule, or the turnover of the schedule to the implementation team, etc.

An issues and concern log identifying open as well as closed items should be provided to the project team for review.

Risks and Opportunities

This section is to provide an understanding of the critical risks that may occur during the execution of the project. The items presented here should indicate the magnitude (impact) and the probability of occurrence. A risk assessment should be completed and all risks should be identified on the risk event log.

Please note, any risk events that have a high probability (80 percent +) of occurring (and a medium to low impact to the project) should be managed as if the event will happen and therefore, the management team should apply the appropriate schedule reserves and buffers necessary for controlling the activities and the overall project.

Assumptions

Briefly describe the assumptions used while developing the schedule. Assumptions identify the parameters and conditions used for determining the outcome (project start to completion dates) of the project schedule.

Some examples of assumptions are: Fabrication shops will complete the required work as per our priorities and timing, the required craft is available, the project will not incur any over-time, all project funding is available at project start, etc.

Exclusions

Describe items that have not been included and therefore not supported during the development of the schedule. Some examples are:

- Specialty contractors / resources; and
- Shared construction equipment

Exceptions

This section should identify any significant deviations from the standard operating practice for developing schedules, including the process, reviews and acceptance of the project schedule. Any deliverables identified on the schedule input checklist (see attachment) that were not provided or did not meet the degree of completeness necessary for the proper development of the schedule should be identified as an exception.

Baseline Changes / Reconciliation

This section should be completed if and when a more detailed schedule has been developed, or the baseline has changed. Provide a high level understanding as to why the schedule has changed from its original or re-baselined schedule.

If there has been a change to the schedule and a recovery plan or a reconciliation effort has been completed, describe the events pertaining to the mitigation of the contributing factors to the delay or acceleration.

Schedule Reserve

Based on the completed risk assessment and the understanding of the expected completion dates, the project team can then determine the required schedule reserve for the successful completion of the project.

There are two ways of applying schedule reserve in order to ensure the team achieves their desired outcome (probability of success based on their confidence level and risk avoidance culture).

- **Quantitative Assessment**—Determine the optimistic, pessimistic and most likely durations for the activities in order to calculate the expected durations. This process identifies what the project team should expect in regards to activity durations.
- **Qualitative Assessment**—Based on the magnitude and probability of each risk event identified on the risk event log, add the appropriate amount of specific schedule reserve for each risk event that may impact the project.

As an attachment to the schedule basis memorandum, provide a table or schedule identifying what activity or event has schedule reserve, and the amount being applied.

The schedule basis memorandum is a document used to provide an understanding of how the schedule was developed, the information and project definition provided for the development, and the team members involved in the process. The schedule basis memorandum increases the awareness of the development of the schedule for executing the project to successful completion. This awareness provides an increased level of confidence, as well as an increased state of preparedness and readiness.

The use of a schedule basis memorandum provides the project team with the opportunity for improving the planning and scheduling process. The use of the schedule basis memorandum can positively contribute to the success of the development of the project schedule. Some of the benefits that may be realized by your organization are identified as follows.

- improved pre-planning efforts;
- improved understanding of project scope, deliverables and responsibilities;
- increased confidence in project execution;
- better cash flow use and capital investment;
- maximized quality and minimized rework;
- effective historical reviews and efficient validation process; and,
- increased profitability and return on investment (ROI).

The organization can anticipate an improvement to the effectiveness and efficiency in their ability to produce plans and schedules that are usable, reliable, and most importantly, provide predictability. This paper proposes a solution in applying due diligence to the development and control of an organization's approach to developing schedules and executing projects.

REFERENCES

1. Lewis, James P., **Project Planning, Scheduling and Control, Revised Edition**, New York: McGraw-Hill, Inc. 1995.
2. Wickwire, Jon M., et al, **Construction Scheduling: Preparation, Liability, and Claims, Second Edition**, New York: Aspen Publishers Inc. 2003.

3. Amos, Dr. Scott J., (Editor), AACE International, **Skills & Knowledge of Cost Engineering**, *5th Edition*, 2004.



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Attachments
 Schedule Input Checklist and Maturity Matrix (Attachment 1)

General Information	Maturity	Schedule Classification				
		Class 5	Class 4	Class 3	Class 2	Class 1
<i>Project Scope Description</i>		<i>General</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Plant Production/Facility Capacity</i>		<i>Assumed</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Plant Location</i>		<i>General</i>	<i>Approximate</i>	<i>Specific</i>	<i>Specific</i>	<i>Specific</i>
<i>Integrated Project Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Estimate</i>		<i>Class 5</i>	<i>Class 4</i>	<i>Class 3</i>	<i>Class 2</i>	<i>Class 1</i>
<i>Funding Strategy</i>		<i>General</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Work Breakdown Structure</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Contracting Strategy</i>		<i>Assumed</i>	<i>Assumed</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>
<i>Organization Breakdown Structure (OBS/WBS Cross tab)</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Division of Responsibility</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Fabrication / Modularization Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Communications Plan</i>		<i>General</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Housing Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Logistics Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Risk Management Plan</i>		<i>General</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Quality Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
Engineering Deliverables						
<i>Block Flow Diagrams</i>		<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>	<i>C</i>
<i>Plot Plans</i>			<i>S</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Process Flow Diagrams (PFDs)</i>			<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Utility Flow Diagrams (UFDs)</i>			<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Piping & Instrument Diagrams (P&IDs)</i>			<i>S</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Process Equipment List</i>			<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Utility Equipment List</i>			<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Electrical One-Line Diagrams</i>			<i>S/P</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Specifications & Datasheets</i>			<i>S</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>General Equipment Arrangement Drawings</i>			<i>S</i>	<i>P/C</i>	<i>C</i>	<i>C</i>
<i>Mechanical Discipline Drawings</i>				<i>S</i>	<i>P</i>	<i>P/C</i>
<i>Electrical Discipline Drawings</i>				<i>S</i>	<i>P</i>	<i>P/C</i>
<i>Instrumentation/Control System Discipline Drawings</i>				<i>S</i>	<i>P</i>	<i>P/C</i>
<i>Civil/Structural Discipline Drawings</i>				<i>S</i>	<i>P</i>	<i>P/C</i>
			<i>Study</i>	<i>Conceptual</i>	<i>Basic</i>	<i>Execution</i>
Stage Deliverables		Stage 1	Stage 2	Stage 3	Stage 4 / 5	
<i>Stage Scope Definition</i>		<i>Defined</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>
<i>Conceptual Study</i>		<i>Defined</i>				
<i>Design Basis Memorandum</i>		<i>Preliminary</i>	<i>Defined</i>			
<i>Engineering Design Specification</i>			<i>Preliminary</i>	<i>Defined</i>		
<i>Execution Plan</i>		<i>None</i>	<i>Preliminary</i>	<i>Defined</i>	<i>Defined</i>	<i>Defined</i>

Maturity Level Index

- A Deliverable not suitable for use. DO not use.
- B Deliverable incomplete to the degree of satisfaction as defined by the Schedule Classification table. Proceed with caution
- C Deliverable complete to the degree of satisfaction as defined by the Schedule Classification table. Proceed

Notes:

The above table maps the extent and maturity of schedule input information (deliverables) against the five schedule classification levels. This is a check list of basic deliverables found in common practice in the process industries. The maturity level is an approximation of the degree of completion of the deliverable. The degree of completion is indicated by the following letters.

None (blank) development of the deliverable has not begun.

Started (S): work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
 Preliminary (P): work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near Complete (C): the deliverable has been reviewed and approved as appropriate.

Table 1—Schedule Input Checklist and Maturity Matrix

The schedule input checklist and maturity matrix (table 1) identifies the required details necessary to develop the project schedule. All items italicized are taken from the AACE International Recommended Practice No. 18R-97 [3]. The maturity level index identified in the table provides the user with the ability to confirm and record the completeness, and therefore, the usefulness of each deliverable. The schedule input checklist and maturity matrix should provide confidence in the final output of the project schedule while increasing the level of accuracy.