

THE DRAPER & ASSOCIATES SCHEDULING METHOD

CRITICAL PATH METHOD (CPM) SCHEDULING

INTRODUCTION

This report will examine the Critical Path Method (CPM) as defined in The Project Management Body of Knowledge, Third Edition, ANSI PMI 99-001-2004, and the Draper & Associates (Draper) Method of Scheduling, as described in a Report of Gary Draper, March 28, 2001 and a Draper & Associates Project Planning and Scheduling Guide, February 14, 2000. Criteria associated with each methodology will be identified and a comparison of the Draper Method with the parameters contained in the ANSI PMI 99-001-2004 CPM will be made to determine if the Draper Method is a Critical Path Method.

DRAPER HISTORY

Draper & Associates (Draper) has more than 40 years experience assisting general contractors and owners in developing and administering Overall Project Schedules required on large construction projects. Specifications often require these schedules to be prepared as Critical Path Method (CPM) network diagrams. The Draper Method uses the Overall Project Schedule (OPS) as the core project management tool. The OPS is augmented by a system of job coordination meetings and Progress Reports that include section for project summary, project status, near term schedules, trend charts, an action item agenda and material status reports (MATSTAT).

THE PMBOK METHOD

Definitions from the Glossary of *A Guide to the Project Management Body of Knowledge (PMBOK Guide), Third Edition, 2004*. The *PMBOK GUIDE* is Published by the Project Management Institute, Four Campus Boulevard, Newtown Square, Pennsylvania 19073-3299 USA.

- **Critical Path Method:** *A schedule network analysis technique used to determine the amount of scheduling flexibility (the amount of float) on various logical network paths in the project schedule network, and to determine the minimum total project duration. Early start and finish dates are calculated by means of a **forward pass**, using a specified start date. **Late start and finish dates** are calculated by means of a **backward pass**, starting from a specified completion date, which sometimes is the project **early finish date** determined during forward pass calculation.*
- **Critical Path:** *Generally, but not always, the sequence of schedule activities that determines the duration of the project. Generally, it is the longest path through the project. However, a critical path can end, as an example, on a schedule milestone that is in the middle of a project schedule and has a finish-no-later-than imposed date schedule constraint.*
- **Project Schedule Network Diagram:** *Any schematic display of the logical relationships among project schedule activities which is always drawn from left to right reflect project work chronology. It also defines a **Time Scaled Schedule Network** as: Any project schedule network diagram drawn in such a way that the positioning and length of the schedule activity represents its duration. Essentially, it is a **bar chart** that includes network logic.*

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Max Wideman, www.maxwideman.com/issacons, says that there are two systems of Network Analysis Techniques; Activity Oriented Systems and Event Oriented Systems. He lists PERT as the only Event Oriented System. Under Activity Oriented Systems, he describes Activity as Arrow and Activity as Node with the Arrow Diagram as the basis for Activity as Arrow System and the Precedence Diagram as the Activity as Node System. He also reviews the relative merits of Bar Charts, Arrow Diagrams and Precedence Diagrams. He concludes that, a Precedence Diagram, in the hands of a competent scheduler is the best method for establishing and calculating the network and the Precedence Method is used by most computer programs and, may be presented as a bar chart when done.

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- The Draper OPS is a time-scaled precedence diagram which graphically depicts the relationship between activities. The time scaled bars are drawn against a timeline such that their length represents the duration of each activity and the activity bars are positioned and / or connected by arrows indicating dependency (logic) relationships.
- The OPS is a CPM network that portrays individual work activities, their duration and the relationship between activities.
- The schedule calendar is customized for each project to include calendar days or work days, holidays, blackout dates, and normal inclement weather.
- Schedule activities are shown time-scaled and (usually) depict their early start dates.
- Layout of the schedule activities for a base building type flow from left to right and from the bottom of the page upward. This approach allows the foundation activities to be near the bottom of the page and the roofing activities to be near the top of the page.
- The entire OPS is normally produced on one sheet of paper (occasional exceptions).
- Activities are developed to provide a unique activity portrayal for the various construction trades.
- Work activities by sub-trade (when applicable) or project functional area / floor are clustered.
- Sub-nets, when applicable, are provided within the OPS or as separate referenced and included schedules.
- Major project milestones are shown within the schedule and along the calendar lines at the top and bottom of the OPS.

The OPS is prepared following completion of project “buy-out” by the general contractor or when the Notice to Proceed (NTP) is issued. By the time the General Contractor has established an overall approach to the project but needs to obtain detailed input from subcontractors and vendors on how they would like to approach their scope of work and its interrelationship with other work activity (identification of predecessor

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and successor activities). This meeting is usually announced by a letter of invitation stating the overall scheduling goal, the building divisions (floors, functional areas) to be used in the data collection and a request that each trade be represented by a decision maker who is sufficiently familiar with the project to give their activity / work titles by area, activity duration and manpower requirement and predecessor activities.

Meeting attendees include all key vendors, the project manager and superintendent for the general contractor, the architect, subcontractors and the owner. Participants should be staggered. Staggered participation is achieved by clustering trades in groups such as underground and site work, structure, MEP, building enclosure, interior walls and ceilings and interior finishes.

At the beginning of the data collection meeting, the General Contractor's Project Manager or Superintendent will describe the planned work flow and pre-determined milestone dates necessary to complete the project by its scheduled end date.

Once the OPS has been established, the overall work plan for a project is set in place. However, the implementation of this plan occurs through a series of near-term commitments by project subcontractors and participants. The Near Term Schedule is a short term (6-9 weeks) planning tool that is also a time-scaled precedence diagram that represents the "commitments" given by participants in the scheduled biweekly or weekly Job Coordination Meetings. It contains more activity detail and intermediate milestones to assist subcontractors in understanding and controlling their work flow, coordination responsibilities between trades, testing and inspection targets, and activity completion needs.

The near term schedule contains a sufficient level of detail to document the progress noted by the on-site progress inspection prior to the meeting as well as any adjustments and / or work plans required to maintain the goals of the OPS. The near term schedule updating is accomplished by soliciting input and a discussion of problems and objectives with each trade at the Job Coordination Meeting. Finally correlation of the updated information to the OPS is done at the end of the meeting for determination of overall schedule compliance and status.

Though a near term schedule can be redrafted after each Job Coordination Meeting, normally a Near Term Schedule should be relevant for at least two but not more than three biweekly meetings. If the Near Term Schedule significantly changes at a meeting, it is an indication that events are controlling the contractor rather than the Contractor controlling events.

CONCLUSION

After comparing the Draper Method of Scheduling against the definitions established by the Project Management Institute, it is clear that the Draper method of scheduling is a Critical Path Method of Scheduling in that it is a technique using a time scale precedence diagram for a graphic display of the work plan and can be used to determine the duration of a project and identify activities that are critical to the completion of the project.