

**Phase Scheduling**  
LCI White Paper-7  
April 27, 2000  
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LCI recommends using pull techniques and team planning to develop schedules for each phase of work, from design through turnover. The phase schedules thus produced are based on targets and milestones from the master project schedule and provide a basis for lookahead schedules.

A pull technique is based on working from a target completion date backwards, which causes tasks to be defined and sequenced so that their completion releases work. A rule of "pulling" is to only do work that releases work to someone else. Following that rule eliminates the waste of overproduction, one of Ohno's seven types of waste.<sup>1</sup> Working backwards from a target completion date eliminates work that has customarily been done but doesn't add value.

Team planning involves representatives of all organizations that do work within the phase. Typically, team members write on sheets of paper brief descriptions of work they must perform in order to release work to others or work that must be completed by others to release work to them. They tape or stick those sheets on a wall in their expected sequence of performance. Usually, planning breaks out in the room as people begin developing new methods and negotiating sequence and batch size when they see the results of their activities on others.

The first step of formalizing the planning and the phase schedule is to develop a logic network by moving and adjusting the sheets. The next step is to determine durations and see if there is any time left between the calculated start date and the possible start date. It is critical that durations not be padded to allow for variability in performing the work<sup>2</sup>. We first want to produce an 'ideal' schedule.

The team is then invited to reexamine the schedule for logic and intensity (application of resources and methods) in order to generate a bigger gap. Then they decide how to spend that time: 1) assign to the most uncertain and potentially variable task durations, 2) delay start in order to invest more time in prior work or to allow the latest information to emerge, or 3) accelerate the phase completion date. If the gap cannot be made sufficiently positive to absorb variability, the phase completion date must slip out, and attention turns to making up that time in later phases. **The key point is to deliberately and publicly generate, quantify, and allocate schedule contingency (float).**

Once the team has agreed on the phase schedule, the schedule and the activities represented on it have the force of contract and can only be changed under three conditions: 1) the prime contract changes, 2) activities on the schedule cannot be performed without violation of Last

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<sup>1</sup> Workable backlog tasks may not release work, but are only to be used as necessary to maintain resource utilization and continuity, and is not to be used if doing that work now makes later work more difficult or hazardous.

<sup>2</sup> It is standard practice to try to build as much float as possible into the duration of tasks for which you are responsible. This results from lacking a mechanism for coordination. The Last Planner system will eventually create confidence both that interests will be protected and that work flow will be managed. Consequently, designer and builder specialists can provide unpadded durations for their assigned tasks, confident that uncertainties will be buffered and that unfair burdens will be rectified.

Planner rules<sup>3</sup>, or 3) someone comes up with a better idea and all team members can be persuaded to agree. This may involve a transfer of money or at least promises of future money transfers across organizational boundaries, as changes in the phase schedule will not likely benefit all parties equally.

Member companies are encouraged to use try the following phase scheduling process and to share results. For further information, please contact Glenn Ballard at 888/771-9207 or via email at <ballard@ce.berkeley.edu>.

### Purpose of Phase Scheduling

To produce a plan for completing a phase of work that maximizes value generation and one that everyone involved understands and supports; to produce a plan from which scheduled activities are drawn into the lookahead process to be exploded into operational detail and made ready for assignment in weekly work plans.

### Participants

Representatives of those with work to do in the phase. For example, a team working to schedule a construction phase would typically involve the general contractor and subcontractors, and perhaps stakeholders such as designers, client, and regulatory agencies.

Participants should bring relevant schedules and drawings including the master schedule and maybe the contract.

### Process

1. Define the work to be included in the phase; e.g., foundations, building skin, etc.
2. Determine the completion date for the phase, plus any major interim releases from prior phases or to subsequent phases.
3. Using team scheduling and stickies on a wall, develop the network of activities required to complete the phase, working backwards from the completion date, and incorporating any interim milestones.
4. Apply durations to each activity, with no contingency or float in the duration estimates
5. Reexamine logic to try to shorten the duration.
6. Determine the earliest practical start date for the phase.
7. If there is time left over after comparing the time between start and completion with the duration of the activities on the wall, decide what activities to buffer or pad with additional time.
  - which activity durations are most fragile?
  - Rank order the fragile activities by degree of uncertainty.
  - Allocate available time to the fragile activities in rank order.Note: this is contingency you intend to spend, unlike budget contingency.

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<sup>3</sup> Allow scheduled tasks to advance in the lookahead window only if you are confident they can be made ready when scheduled. Allow assignments into weekly work plans only if you are confident they will be completed as scheduled.

8. Is the team comfortable that the available buffers are sufficient to assure completion within the milestone(s)? If not, either replan or shift milestones as needed and possible.
9. If there is excess time available, decide whether to accelerate the schedule or use the excess to increase the probability of on-time completion.

Techniques to consider

- ❑ reduce batch sizes
- ❑ do First Run Studies
- ❑ sequence for flow
- ❑ structure for resource continuity
- ❑ historical PPC analysis