

Fundamental Neutron Physics Beamline

Lessons Learned

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Introduction

The Fundamental Neutron Physics Beamline (FNPB) M.I.E. was completed on schedule, on budget, and met all technical baseline specifications. The 16 major milestones were met on or ahead of schedule with the exception of two that were delayed by SNS operations. Most project activities were carried out successfully and with no more than normal difficulty. The FNPB project team identified two issues that rise to the level of a “lesson learned” that may be applicable to other DOE projects.

External Building Cost

A major cost element of the FNPB (TPC \$9.2M) was an external building that is immediately adjacent to the SNS target building. The initial specification called for a building with a floor area of $>175\text{m}^2$. The baseline estimate for this construction, including design was \$1360k including design. The final cost was \$2320k. Approximately \$300k of this cost increase was due to a formally approved baseline change to increase the area and height of the building to accommodate updated users requirements. Nonetheless, the remaining cost increase of \$660k was significant and represented nearly $\frac{1}{2}$ of the *overall* project contingency. It is therefore instructive to understand how the original estimate was in error.

The original estimate was performed by a professional construction estimator (subcontractor) with extensive experience as a member of the SNS project team. This was a highly detailed estimate that apparently conformed to conventional standards for construction cost estimation. It was, however, found to be flawed due to incorrect assumptions concerning overhead costs for construction subcontractors. This was a particular issue for the FNPB which was an addition to the SNS but was not included as part of the SNS project baseline.

When actual bids for building construction were received, it was clear that even with corrected overhead rates, the cost estimates were significantly low. Following extensive discussion with ORNL procurement personnel it was concluded that this was due to a combination of factors which include:

1. The relatively small size of the building contract implies that the additional fixed costs associated with construction on a DOE reservation represent a much larger fraction of the total cost.
2. Compared with commercial construction, there were fewer bidders due to the additional paperwork required for national laboratory procurement.

Lesson Learned

1. Assumptions concerning overhead rates should be carefully reviewed. This is especially important for modest upgrades to major facilities.
2. Absent significant changes to procurement policies, conventional construction of small to modest scale should be assigned significant additional contingency to account for cost risks which are not accounted for in standard methodologies.

Annual “Bottoms-up” Re-planning Exercise

From the initiation of the FNPB project, the project team established a policy of performing a “bottoms-up” re-planning exercise to critically and objectively assess the status of the project. This exercise include a review of all completed work and a detailed estimate of the cost to complete. This exercise included a review of all outstanding cost estimates at the lowest level that they exist within the project WBS. This exercise provided a multitude of benefits that included:

- 1) By providing an independent verification of the degree to which work has been completed, the accuracy of the monthly project tracking tools could be assessed.
- 2) By developing up to date cost estimates, based on experience to date as well as updated quotes, or more refined engineering estimates, a much more reliable estimate of the cost to project completion could be made.
- 3) The results of the exercise could be used to allow the early and strategic allocation of contingency. This policy significantly reduced the amount of time required by the project team, the area office, and HQ to devote to baseline changes by collecting many smaller baseline changes in larger more “global” changes which focused the attention of all stakeholders and insured that such contingency allocations were considered with an eye to the ‘Big Picture.’
- 4) By scheduling the re-planning exercise in advance of the annual project review, the project team was able to present external reviewers with the most accurate and up to information about the status of the project. This helped significantly in allowing focused and productive reviews.

Lesson Learned

1. A judiciously scheduled, internally directed “bottoms-up” project re-planning exercise proved to be extremely useful in maintaining the integrity of the project plan, in focusing the attention of project stakeholders to potential project issues, and to the realization of productive external reviews.