

Metropolitan Council

Managing Project Risks through the Establishment
of Effective Project Controls

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Patrick Watz, AECOM's Project Manager

“By having those processes structured it has helped us streamline things, and give us visibility into where a process is.”



ABSTRACT

This paper will focus on the Metropolitan Council's (Minneapolis/St. Paul's Metropolitan Planning Organization and Federal Grantee) approach to project controls to manage and mitigate cost and schedule risks in the delivery of the Central Corridor Light Rail (CCLRT) project. The Central Corridor Light Rail Transit Project is a \$956.9MM Federal Transit Administration (FTA) New Starts project. The 11-mile Central Corridor Light Rail Transit (CCLRT) project will link downtown St. Paul and downtown Minneapolis along Washington and University avenues via the State Capitol complex and the University of Minnesota. The Metropolitan Council was granted entry into Preliminary Engineering (PE) in December 2006, Construction began in 2010 and revenue service will begin in 2014. We will explore challenges, best practices and lessons learned in establishing the Project Controls organizational structure, developing effective management plans and systematic business processes, and leveraging the technology tool kit employed by the Central Corridor Project Office (CCPO). This paper focuses on:

- Project Controls organizational structure necessary to support FTA New Starts projects

- Strategies and tactical steps the Metropolitan Council employed to manage the largest federally funded public works project in the history of Minnesota
- The key components a project management system must provide transit agencies and how these components mitigate risks of cost overruns and schedule delays

INTRODUCTION

The FTA requires diligent project management and controls from the grantee to maintain eligibility for FTA New Starts funding. In order to retain funding for CCLRT, the Metropolitan Council needed to meet the FTA's stringent oversight requirements and frequent evaluations – a fact that made establishing effective project controls vital. As such, the CCLRT Project Controls unit was established in the CCPO at the beginning of the PE phase of the project. The organization consists of a seamless integration of agency and consulting staff. The Project Controls unit will be explored to identify organizational structure, key resources, responsibilities

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and other factors leading to an effective Project Controls organization. The paper will also discuss the integration of Project Controls staff within the project management team and design development process.

Change is inevitable for large scale transit projects; however, managing change through the development and enforcement of comprehensive management plans and effective business processes was imperative to ensure the CCLRT project could be delivered within the defined project budget and schedule. Upon entry into Preliminary Engineering, the CCLRT project team established a baseline project definition against which change would be measured. As the project progressed, this baseline definition was refined through the evaluation of various design alternatives and resolution of key technical issues. Configuration management, change management and schedule controls were developed and utilized as effective means of controlling project cost and schedule risks. Additionally, the CCPO leveraged the issuance of Limited Notices to Proceed (LNTPs), as authorized by FTA Letters of No Prejudice (LONPs), to manage both schedule risk and cost risks to the project. By awarding critical construction contracts under this LONP/LNTP strategy, the CCPO was able to avoid exposures associated with cost escalation and capitalize on a favorable bidding environment.

The CCPO standardized on a number of technology platforms to support project controls functions, organization and processes. In addition to standard scheduling and estimating software packages, the CCPO implemented e-Builder, a web-based capital program and project management system, to support collaboration of the project team and streamline business processes during construction. The paper will review CCPO's Project Management challenges before e-Builder, Project Management successes after implementing e-Builder, lessons learned and recommendations for successful deployment.

STRUCTURING THE PROJECT CONTROLS ORGANIZATION

The key to successful project management is the integration of Project Controls into the project team. Successful projects require constant open communication between team members. CCPO Project Controls has had a seat at the table with CCLRT's Project Management Team (PMT) since the beginning of the project. Project Controls supported design alternatives analysis and issues resolution during the preliminary engineering phase of the project. Project controls processes were integrated into the design development process so that any proposed changes received the proper scrutiny to ensure the most cost effective solutions were employed.

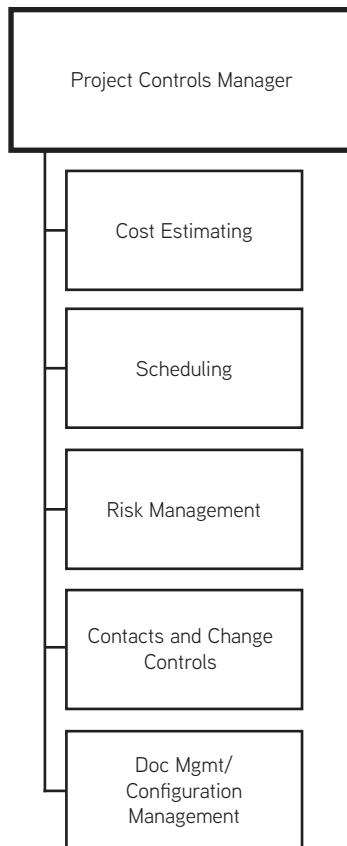
The CCPO Project Controls unit, a seamless combination of agency and consultant staff, was established in the early phases of the project. The Project Controls unit is lead by the Project Controls Manager. In addition to this key management position, CCPO Project Controls organization includes professional estimators and schedulers. The addition of consultants to the Project Controls organization brought specific scheduling and cost estimating expertise to the project team and provided the Metropolitan Council the flexibility to increase and decrease staffing as the project demands fluctuated. While the number of staff members in the Project Controls unit varied over time, the general structure and responsibilities are identified in Figure 1.

ESTABLISHING BUSINESS PROCESSES FOR CONSISTENT AND PREDICTABLE RESULTS

The CCPO Project Controls unit is the owner of many of the critical processes and procedures. CCPO Project Controls unit has primary responsibilities for processes include scheduling, cost estimating, configuration management / change controls, risk management

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and contingency management. The Federal Transit Administration requires stringent oversight to maintain eligibility for FTA New Starts funding. The Metropolitan Council's existing processes, while adequate to support existing capital projects, were not sufficient to meet requirements for FTA New Starts projects. The revamped processes have resulted in a more structured, measurable, and standardized approach to project management. Stakeholders have also gained visibility that proves invaluable in ensuring the project stays within the defined budget and schedule.

SCHEDULE CONTROLS

Project scheduling is necessary to adequately plan for a logical flow of all design, procurement and construction activities. A well planned schedule will ensure delivery under the project's prescribed timeline. Performing these services requires not only staff who are well versed in Primavera scheduling software, but who are also skilled construction schedulers familiar with the type of construction planned for project. The primary goal of the scheduling staff is to maintain the integrity of the schedule so that it can be used to monitor progress, provide accurate status, project upcoming work, identify issues, analyze impacts and mitigate delays accurately and contemporaneously.

CCPO developed an Integrated Master Project Schedule (IMPS). The IMPS was developed over the course of the project beginning with a summary level schedule during preliminary engineering outlining key program phases, activities and milestones. As the project progressed, planning level construction schedules were established for each of the construction bid packages.

CCPO Project Controls staff analyzed construction staging and phasing and developed planning level construction schedules to identify key interface points between contracts, ensure the project could be constructed under the planned timeline and assist in

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developing the most feasible and economic design. The Project Controls staff developed multiple alternates for the staging and phasing of construction work, and used those to develop planning level/preliminary construction schedules. These schedules allowed the project team to identify interfaces between contracts that would require the contractors to complete various milestones by a prescribed date. Early involvement of Project Controls worked to the advantage of CCPO by resolving several uncertainties and lowering risks - thereby resulting in a successful and favorable delivery of the project.

As the construction contracts were awarded, baseline schedules developed by the Contractors and reviewed by Project Controls for conformance with the contract specifications. CCPO Project Controls was responsible for the review of the contract baseline, monthly project schedule updates and integration of the contract schedules into the IMPS. Integration and interface between construction contracts were identified, inter-project relationships established and the construction schedules integrated into the IMPS. The fully developed IMPS assisted in identifying the work a contractor needs to complete before turnover can occur for the next contract. The IMPS also allowed CCPO to identify when delays in one contract could

impact follow-on work. CCPO implemented cost and resource loaded schedules as a contractual requirement on several of the construction contracts. Progress payments were linked to the monthly update of the project schedule rather than bid item unit prices. This process allowed the construction field staff to focus on pertinent issues rather than the measurement of quantities in the field for payment applications. The inclusion of cost loading on the project schedules provided CCPO with the ability to track progress and quickly identify if the Contractor was ahead or behind

schedule. Resource loading allowed the CCPO to identify if the Contractor was adequately staffing the job to deliver on the prescribed schedule.

ISSUANCE OF LONP/LNTPS TO CONTROL RISKS

In 2010, the CCLRT design phase was nearing completion and the Metropolitan Council was preparing bid documents for the major construction packages. The agency and their funding partners wanted to manage schedule and cost risks associated with waiting for the Full Funding Grant Agreement (FFGA). Accepting the local risks associated with advancing the project prior to receipt of an FFGA, the agency and their local funding partners proceeded with obtaining a series of Letters of No Prejudice (LONP) from the FTA. The CCPO managed the financial risk through the issuance of Limited Notices to Proceed (LNTPs), as authorized by FTA Letters of No Prejudice (LONP). By awarding critical construction contracts under this LONP/LNTP strategy, the CCPO was able to avoid exposures associated with cost escalation and capitalize on the favorable bidding environment.

COST ESTIMATING

The CCPO cost estimators within the Project Controls unit were responsible for preparing construction cost estimates from the earliest conceptual design alternatives to the final engineer's estimates for the six construction contract packages. The total construction cost of the CCLRT project is in the neighborhood of \$450MM. This cost estimating group also has responsibility for the development of independent cost estimates (ICE) for contract change orders. Accuracy in cost estimating requires knowledge of the local construction market and how the Contractor's costs

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are impacted by bidding environment, working conditions and constraints, staging/phasing of work, pricing and availability of materials, temporary conditions, labor, transportation and other direct and indirect costs. CCPO's cost estimating staff consists of former construction estimators who understand the local labor market and know the local suppliers and subcontractors that ultimately drive the general contractor costs. They have the pulse of the bidding environment and understand the variables that drive Contractor's costs/bids.

All CCLRT cost estimates are prepared from a Contractor's perspective using a bottoms-up methodology to ensure all direct and indirect costs are captured in the estimate. Labor, materials, equipment, productivity, subcontractor, general conditions, bonds, insurance, overhead and profit/risk are considered for all cost estimates – rather than reliance on inaccurate or inappropriate historical unit prices. The cost estimating unit developed credible cost estimates at all required design milestones for the CCLRT project. The accuracy of the cost estimates allowed the Metropolitan Council to forecast budget requirements and cash flow throughout the course of the project and award all construction contracts at 5% below the construction budget leaving the project contingency 100% intact. Structured Change Management

PROCESSES

Change is inevitable; however, managing change through effective business processes has kept the CCLRT project on time and under budget. Upon entry into Preliminary Engineering (PE), the CCPO established an initial baseline definition for the project. As the project advanced, the baseline definition was refined through the evaluation of design alternatives and resolution of key technical issues. Configuration Management was implemented to ensure the design criteria remained intact, changes in the baseline definition were documented and any documents impacted by a particular change were modified and tracked.

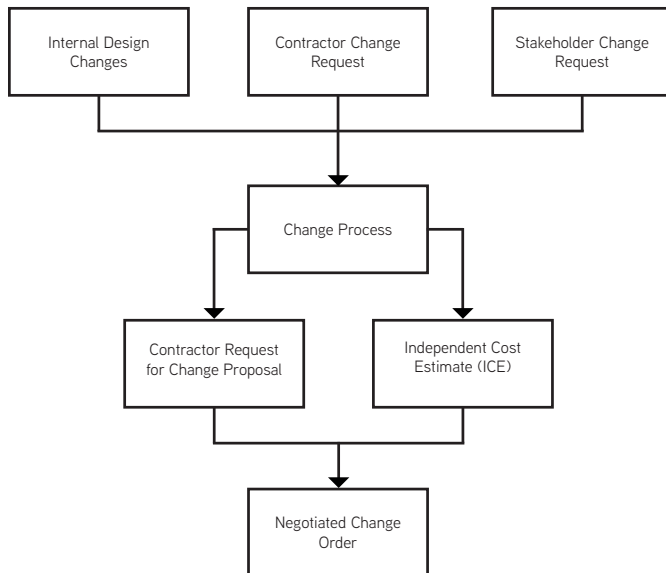
The CCLRT construction change control process is complex. A change request may come from multiple different parties (e.g., internally from operations or the design team, externally from stakeholders, or from a contractor). Once the change is identified, they are typically reviewed by a Change Control Group (CCG), who can authorize the change to proceed. If it is a construction change (site conditions) then the construction staff will review and vet the particular change. Design documents are developed and the change request is turned into a change process, which then spawns a request for change proposal and a request for independent cost estimate. The request for change proposal goes to contractor and the request for independent cost estimate goes to Project Control's estimating group so they can proceed in parallel. These two documents come together at a point where the change is reviewed by construction and negotiations proceed with the contractor. The CCPO utilizes a project management system, e-Builder, to manage this change process which is discussed later in this paper. A simplified illustration is provided in Figure 2.

RISK-BASED PROJECT MANAGEMENT

From the early phases of the project, the CCPO adopted a risk-based project management approach to the CCLRT project. In addition to the FTA's required risk management reviews as part of its New Starts Evaluation process, CCPO performed a risk assessment on the project. During preliminary engineering, the CCPO engaged AECOM's risk management group to facilitate risk identification meetings and workshops. The consultant interviewed key project individuals and lead workshops to identify key risk events and their impact on project cost and schedule. From these meetings a risk register was developed. An integrated cost and schedule risk model was developed and using Monte Carlo simulations the impacts of the identified risk events were quantified. The results from this self-performed initial risk assessment compared favorably with the FTA risk management reviews.

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The risk assessment identified potential impacts of major risk events, drew the project management team's attention to those critical risk events, identified the impact of the events and determined the adequacy of the project budget and schedule. The project team was able to use the output from this evaluation to establish contingencies and mitigation strategies to reduce the impact of the individual and cumulative risk events. It was through the early risk assessments that CCPO developed the Letter of No Prejudice (LONP) cost and schedule risk mitigation strategy discussed earlier in this paper.

DEALING WITH COMPLEX PROCESSES

The Project Controls unit enabled strict controls by leveraging several software tools. Primavera's Project Management (P6) software was used for scheduling. The estimating team uses HCSS HeavyBid and On-Screen Takeoff. Additionally, the e-Builder project management tool enabled a structured approach to process and information management for the entire project team.

While Metro Transit had construction processes and procedures in place, to apply these on the grand scale required for the CCLRT project would have been challenging, cumbersome and would expose the project to additional risk and delay. The Central Corridor Project Office (CCPO) needed a way to track risks and exposures – a system to track and report changes and their impact to schedule and budget. Therefore, cost controls and change management were vital, as was increasing visibility to allow stakeholders to stay on top of the project's progression and reduce the likelihood for preventable cost overruns and schedule delays.

The CCPO worked to define a set of structured processes that were integrated into the design and construction phases of the project. The team worked through an iterative process during the early stages of the project to establish the project processes and procedures. Through involvement on other large programs and given the scope of the CCLRT project, the Project Controls team recommended that a project management system be implemented to help streamline complex processes, monitor and manage communications and project information (document control, process control, workflow, and tracking of issues in the project) and gather documentation generated on the project.

With a functioning project management system in place, the Met Council team would be better equipped to handle the project's unique challenges. CCPO issued a Request for Proposal (RFP) for

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a web-based project management system which was responded to by several leading system providers. The evaluation panel selected e-Builder as their system of choice and set out to implement the system in advance of major construction contracts. The early construction contracts were used as pilot projects to prove out the system and establish the proper document folder structure, cost account structure, business process and reports.

The CCPO now has a platform that provides the required controls, process management, and reporting requirements to satisfy the FTA's requirements for New Starts projects. Many of the complex business process have been codified using the e-Builder Business Process automation module. e-Builder is used to manage and streamline complex construction processes. It helps the project team track budgets, from the aggregate for the program down to the individual projects, down to individual line item commitments at the cost account level. e-Builder is used for requests for information (RFI), submittals, change process, correspondence, issues tracking, meeting minutes, construction field observations, quality control documentation, prevailing wage/certified payroll review and budgets.

Processes like RFIs and submittals typically create problems on projects as things get lost in the shuffle. Use of the e-Builder system has brought these processes under control. "In the past, I've seen things take far too long to get resolved" says Patrick Watz, AECOM's Project Manager. "By having those processes structured it has helped us streamline things, and give us visibility into where a process is, who has ownership so that we can push those people as needed to get things moving. I've been on other projects where an RFI might take on average 20 days to turn around; we're averaging less than a quarter of that time on an RFI response".

"The biggest thing for me, from a manager's perspective, is being able to have visibility into the project at any moment in time. I can see an independent cost estimate. I want to see whose court it's in, what the estimates are, and if it's something I need to follow up on" said Christine Beckwith, CCLRT Deputy Project Director.

In addition the system's documentation capabilities – documents, correspondence – helps mitigate against claims. "We know by date and time when information and documentation is submitted" adds Beckwith.

The CCPO had to ensure that changes to the baseline plans and specifications across all contracts were effectively communicated. "With thousands of plan sheets and hundreds of individual specifications to maintain and dozens of changes affecting the project baseline each month, it is absolutely imperative that all project participants receive those revisions so everyone is working from the most up to date versions of the contract documents" says Beckwith. Failure to communicate changes efficiently could result in changes being overwritten or superceded by improper revisioning, or designers working off of incorrect plans and specifications for future changes, or worse, "the contractor could proceed with constructing something the CCPO did not intend to be built" adds Beckwith.

Luke Van Santen, Project Management Systems Administrator, said "For us to try and drop back to the world of offline processes and manually maintain logs, either handwritten or in a spreadsheet, and trying to make sure we are meeting document retention requirements when everything is stored in multiple, separate email folders, just wasn't going to be feasible – especially on a project this size".

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CONCLUSION

Complex large scale projects such as the CCLRT require diligent, hands-on management and oversight. The requirements that come with FTA's New Starts funding bring an even greater level of complexity. Effective projects controls ensure from the beginning of a project all the way through closeout that appropriate processes are developed and managed to control costs, schedules, risk and changes to the project baseline. The CCLRT has utilized its Project Controls unit as an interface with and between its Design and Construction units to advance project activities in a disciplined way which in turn benefits all project participants. In addition, the CCPO, through its Project Controls unit, has leveraged technology to implement these multiple complex processes. With the proper Project Controls organizational structure, processes and technology in place, the Metropolitan Council will achieve their goals to remain within the \$956.9MM budget and open the CCLRT line for revenue service in 2014.



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