

Mayo's Commissioning Process

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Synopsis

The discipline of commissioning building mechanical / electrical systems and equipment has evolved significantly at the Mayo Clinic Rochester, Minnesota. The first commissioning related effort had begun well over ten years ago, with assistance from an outside consultant – Sebesta Blomberg. From the earlier successes realized in this effort, a permanent position was created at Mayo Foundation to guide and cultivate this process from within.

About the Author

Steve Rasmusson is a Commissioning Coordinator in Facilities Operations at Mayo Clinic. In this role, he is responsible for managing and cultivating the commissioning process at the Mayo Clinic. Prior to this assignment, he was involved with the maintenance/operational aspects of building facilities for over eighteen years. He holds a Master "A" Electrician license, Class "A" Boiler Operator license, Universal Refrigerant Certification and lastly, has just complete studies allowing him to receive a Bachelor Science Degree in Business.

Where did we begin?

Commissioning at Mayo Clinic Rochester is a combined effort between two separate divisions organized under the Department of Facilities & Systems Support Services. These two divisions are Facilities Project Services and Facilities Operations. The Division of Facilities Project Services represents our architectural, mechanical & electrical design building intentions while the Division of Facilities Operations manages the wide variety of maintenance needed on portable equipment, communications, electrical & mechanical systems and equipment.

While each division has specific assignments, they both have common goals regarding our construction projects. These goals include quality workmanship and fully functional equipment provided at the best value.

When this joint venture was being established there was a need to define what commissioning is to Mayo. We recognized the need to fill gaps in the continued growth of our building systems, to improve the building delivery process, and to reduce the number of times a space is occupied before systems are in working order. Our definition of commissioning is; “The systematic process of ensuring and documenting all building systems perform according to specification and design intent, consistent with Mayo’s operational needs.” This definition clarifies that we will rely on the designer consultants to provide a functional design, the contractors to work with this design and the operational staff to live with the results. To work within our definitions, everyone needs to participate in the design intentions set at the beginning of a project.

What was the initiative to provide “in-house” commissioning?

Beyond the basic need for review and assurance of proper systems performance, at the technical level, we found maintenance staff becoming increasing, “out of the loop”. Previous to the Cx process, we had few methods to communicate between the two divisions mentioned. This allowed mechanical and electrical systems to be modified with minimal awareness to the people assigned to take care of them. This condition created the potential for “after construction” modifications of these systems invariably costing more than original construction. The catalyst for change was predictably, facility project managers and construction managers looking for a better project turnover method as well as maintenance supervisors requesting the same.

Description of implementation

All construction being done at Mayo is initiated by Facilities Project Services. In realizing there are a number of approaches that they could use to implement the uses of a designer’s plan, commissioning is one method to facilitate what is listed in the specifications. The beginning of our projects is the most critical time to implement a successful commissioning process.

Typically, Facilities Project Services has utilized four milestones in their project implementation and construction process. We have collectively incorporated commissioning in these same steps and it has worked well in doing so. These steps are:

1. **Approval to plan** – In the beginning of a project, one of Mayo’s internal Project Managers begins to organize what systems will be impacted by this prospected project. They begin to employ outside consultants to assist in design. These design consultants are made aware of Mayo’s documented building control standards. They utilize these standards unless they have a better solution to control. The solution is then made available for discussion and interpretation between Facilities Project Services and Facilities Operations.

These design consultants also stay abreast of the Mayo Standard Design Guidelines, and Mayo’s General, Mechanical, & Electrical Specifications. We have them start with the Mayo specifications, utilize these whenever possible, and explain when they need to deviate from these specifications. We’ve taken the time to document issues important to us and we need to know when any changes are made.

A commissioning plan is then established between Facilities Project Services and Facilities Operations upon the completion of plan/project development. This document identifies certain systems and/or equipment that we will have a committed focus on in order to achieve complete confidence of equipment’s functionality.

2. **Program approval** - Facilities Operations, Facilities Project Services, the design consultants and contractor (if known), reach a consensus of the kind of systems that are to be installed and how are they going to operate. Time is taken at this point to detail a “Description of Operation.” In knowing that this can be a serious time commitment by all, attention is lent to major systems/equipment installations of newer and unfamiliar design or when there can be more than one approach to operation.

Examples of when we would need to collaborate on the appropriate “Description of Operation” would be:

- VAV with reheat, without reheat, constant volume, dual duct system?
- Will steam heat or hot water be used on radiation or reheat systems?
- What will the ambient temperature conditions be?
- Air exchange per hour?
- Noise conditions?
- Will new electrical or communications systems be installed or will existing ones be utilized?
- Was adequate electrical capacity considered and/or how will the new and old system integrate?
- Emergency power conditions?
- Lighting levels?
- Elevator primary-alternate floor recall?
- New communications systems or extend existing, how will it integrate?

The verification tests are written from the description of operations decided on for the systems/equipment at this time.

An honest “quality review” is given to the project before construction plans are issued for bidding.

The commissioning plan is available at pre bid or items are brought to the attention of the appropriate contractors at this time. This does not automatically become a reason to increase project cost. It may become a cost factor if an outside commissioning

consultant would be utilized. The intention of commissioning is to ensure system/equipment is working as designed. Commissioning is one method to work towards this goal.

3. **Construction approval** – At this time the Mayo Construction Managers ensure that the design consultants and the contractors responsible for each of the systems are getting together to clarify any unresolved questions and are being answered in a timely manner as job progresses.

The Facilities Operations staff has the opportunity during construction to generate Construction Observation Reports as a tool to define issues regarding functionality, maintenance and access of equipment. It is not a method or avenue to be used for "back door" design. It is meant to be a non-conflicting tool to express concern, add value, and look at systems and/or equipment from a different perspective than construction and design while recognizing at times issues cannot be resolved as requested.

Verification testing begins after the contractors complete their installation and preliminary checkout. This testing is usually performed with the responsible contractors and two or more Operations staff. The Contractor is there to assist with manipulation of the system. Facilities Operations does the "hands on" testing and documents their findings.

Maintenance staff have Corrective Action Reports they use as a method of documenting deficiencies revealed during the testing rigors. They are collected by the F/O Support Coordinator, assigned a number, and then sent on to Construction Manager with intentions that discussions will be made with appropriate Contractors for action. When the Contractor corrects the deficiency and comments on equipment status through the Corrective Action Report document, it is sent back to the Construction Manager. The Construction Manager informs Operations for retest if needed.

A system or piece of equipment is considered "commissioned" when all testing has been completed and any Corrective Action Reports generated are satisfactorily addressed.

4. **Closeout** – The timely collection of as-builts, O&M manuals, and final test & balance reports are somewhat subjective depending upon the magnitude of the project. We make significant efforts to collect this information within the two-week timeframe of what the contractor would consider substantial project completion. While we have made a great deal of progress in getting more thorough documentation because of the implementation of formal closeout checklists and someone shepherding this effort, we still have a long way to go in consistently getting complete and appropriate information on a timely basis.

At times a formal closeout with the design firm may be helpful. On larger complex building projects, they can provide explanations of what was the thought process of installation and how systems/equipment can best be maintained. If this is a consideration, the request can be made when securing the scope of work for the designer. Some of our designers even consider this process a normal part of their project task.

The successes we have realized since implementation of these steps outlined above have been significant. Constructing projects through this process has gained awareness and buy-in from many people originally skeptical on the values that commissioning can provide.

Lessons learned and future challenges

We are committed to expanding our knowledge base and gaining more experience everyday by utilizing the commissioning process defined. There are a number of efforts “penciled in” for the future that we will likely include.

To name a few:

- Establishing a process to develop commissioning plans for smaller miscellaneous projects (under \$30,000)
- Scanning/recording/storing as-built and O&M manuals.
- Apply the selected document management software for all commissioning related projects.
- Increase technical training support from vendors as well as contract personnel.