State Capitol Building
Helena, MT

BUILDING SYSTEMS RETRO-COMMISSIONING
A/E #2012-50-01

Retro-Commissioning Summary

In 2010 the Legislative Services Division (LSD) retained the services of CTA Architects Engineers (CTA) to develop a Master Plan specifically applicable to the Legislative Branch areas within the Capitol.

While the purpose of the Master Plan was to guide the Legislative Branch with respect to long-term capital needs, during the process of investigation it was determined that several interim actions could be taken to more immediately improve the environmental conditions within the existing Capitol spaces.

The most significant of these included the retro-commissioning of the Capitol and the Capitol Boiler Plant mechanical systems. This document reports the results of the retro-commissioning implemented from December 2011 through 2012. The primary objective of this project was to improve occupant comfort by enhancing performance of the heating, air-conditioning, and ventilation systems serving the Capitol and to identify areas of potential energy savings.

Objectives for the commissioning process included:

1. Verify that the necessary mechanical system components have been installed to meet the required control sequence of operation.
2. Perform tests on all aspects of the control systems to verify that the specified sequence of operation performed properly.
3. Perform tests on the building's systems in the summer (cooling) and winter (heating) seasons.
4. Make recommendations to improve overall system performance and /or comfort levels, or to save energy.

Retro-Commissioning findings include the following:

1. 35% of all hot water valves are not functioning properly
    a. Existing valves are an insufficient quality so as to not function as needed; they require costly regular maintenance. The controllers are outdated and not compatible with current building automation systems.
    b. All valves and controllers should be replaced.
2. 15-20% of all chilled water valves are not functioning properly
    a. Existing valves are an insufficient quality so as to not function as needed; they require costly regular maintenance. The controllers are outdated and not compatible with current building automation systems.

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    b. All valves and controllers should be replaced.
3. Fan coil deficiencies
    a. Fan coil units with deficient valves are heating and cooling at the same time.
    b. 263 fan coil deficiencies have been identified and logged.
    c. 10-15% of all fan coil units have excessive fan noise
    d. Replace deficient valves and repair units to reduce fan noise.
4. Air handling systems are operating correctly. They could be more effective and efficient.
5. Air balancing - typically good throughout building (within 15% of design)
6. The existing building control system is antiquated and should be replaced with a modern, Direct Digital Control (DDC) system.
7. The Central Plant is operating effectively, well maintained, and there is no reasonable payback for upgrading these systems at this time.
8. Seal openings that connect the mechanical rooms to the steam tunnel that presently decrease the building pressurization. A slightly pressurized building will reduce drafts.

In conjunction with the Energy Study Report for the Capitol (prepared for DEQ under a separate agreement) CTA has identified the following recommendations:

1. Upgrade the temperature control system; replacement the hot and chilled water valves. Approximate project cost $622,000. Simple payback within approximately 15 years.
2. Remove and replace the existing air-handling system with VAV (variable air volume) system. Install “chilled beams” in the hearing rooms to offset sudden fluctuations in occupant loading. Approximate project cost $350,000. Simple payback within approximately 6 years.

The total estimated cost of the proposed upgrades to the Capitol building would be approximately $1M with a 10-year simple payback.

CTA proposed several other minor recommendations. Many of these have been, or are planned to be, addressed by the General Services Division of the Department of Administration.

In conclusion we feel that the above recommendations will improve the quality of the work environment, visitor’s experience, and energy efficiency of the Capitol Building.

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