

## DIGITAL CONTROLS AND COMMISSIONING PROJECTS

As a part of *ERA's* regular consulting activities, the firm has taken on numerous digital controls and building automation assignments, and, frequently related thereto, commissioning assignments as well. As is discussed below, many of these assignments were (an important) part of a larger task. A sampling of these assignments includes:

- **John Muir Medical Center - Recommission and Expand Building Automation System.** John Muir Medical Center found itself in the early 1990's with an "orphan" building automation system that was largely dysfunctional. While the majority of the hardware was sound, unfortunately the equipment manufacturer departed the west coast market, stranding many customers of their former installing dealers.

At first *ERA* attempted to oversee digital control upgrades and additions done by contractors. Quickly, though, the contractors demonstrated their inability to address a product not currently in their inventory and failed to perform. Understanding *ERA's* staff's design/build and controls background, the Director of Plant Services requested that *ERA* begin a systematic overhaul and re-commissioning of this 1,000 point building automation system. Over the period of the next two+ years, *ERA* inspected the entire building automation system, replaced failed components, reprogrammed each controller, had the factory visit and upgrade every stand-alone controller to the latest specifications, trained staff in the operations and maintenance of the system and created a site- and system-specific operation, maintenance and programming manual for the facility.

Following the re-commissioning period, *ERA* then embarked on numerous expansion projects which ultimately resulted in every HVAC system in the facility coming under the control of this building automation system.

- **John Muir Medical Center - Chiller Plant modernization and Expansion.** This major chiller plant renovation project was designed by designed and administered during construction by *ERA*. This project included re-constructing and enlarging the hospital's main cooling plant and integrating its operation with the other plant., creating a **Virtual Central Plant**<sup>™</sup> for the medical center, as discussed at length in the article published in *Energy and Environmental Management* (a Penton Media publication) - this article is available on *ERA's* web site. *ERA* provide two very important additional services on this project:
  - First, *ERA* designed, installed (less conduit, wiring and enclosure mounting, done by an electrical contractor), wired, energized, checked out, programmed, and provided operator-terminal graphics for the hospital's new **Virtual Central Plant**<sup>™</sup> !.
  - Second, *ERA* further commissioned not only the controls but the entire chiller plant, including its four chillers, four cooling towers and its unique tertiary or "cascade" chilled water distribution system.

*ERA* continues to perform control work for the medical center, with a total of more than 50 *ERA*-fabricated and *ERA*-installed digital control panels throughout the facility.

- **John Muir Medical Center - Health Education Center Comfort Investigation and Correction.** This HVAC system was originally ill conceived and utilized a mis-applied cooling-only HVAC system -- and allowed the outside air economizers for three air handling systems to attempt to share the same supply and exhaust ducting from the basement to the roof. *ERA* investigated this system and identified the fundamental problems involved.

In early-2000 work commenced to implement the corrective work and included the installation of reheat coils for all VAV terminal boxes, new digital controls on the three air handling units, and new pneumatic controls for each VAV terminal box and zone. Given the modest size of the project and its “maintenance” nature, *ERA* prepared plans for use by a hand-picked contractor to install the reheat piping and coils.

On its own, *ERA* installed, started up and calibrated all the controls work in-house. During the controls installation, *ERA* was able to identify specific, localized comfort problems and make on-the-spot balancing and control system calibration changes to meet the occupants’ needs.

- **John Muir / Mt. Diablo Health System - Digital Controls and Building Pressurization Remediation at the System Administration Headquarters.** Joining forces in the mid-1990's John Muir Medical Center and Mt. Diablo Hospital acquired a modern office building close to both facilities in which to house its administrative and financial functions.

*ERA* has performed two projects in this facility.

The first was to design and install a digital control system in the facility as it was being remodeled for its new use as a medical administrative center. This work was completed in 1998.

The second was to investigate, design and provide construction management for an HVAC retrofit project to cure the severe building pressurization that resulted for the mis-design of the building’s original HVAC system. This project was described in an article published in *HPAC Engineering* magazine (a Penton Media publication) and is available at *ERA*’s web site [www.eraenergy.com](http://www.eraenergy.com).

Unfortunately the remodel project overlooked some significant HVAC infrastructure problems, including inadequate return air pathways, inadequate building relief capability and inadequate cooling. *ERA* performed a detailed evaluation including direct building pressurization measurements and return air pathway identification and analysis and developed a remediation scheme which re-used much existing building equipment to correct the problems. In mid-2004 this project proceeded into final design and construction, including *ERA* acting as the commissioning agent, and installing all the new controls required.

- **Zone 7 Water Agency - Del Valle Water Treatment Plant HVAC Upgrade.** The Zone 7 Water Agency is a public agency which provides domestic water service to the Livermore/Pleasanton/Dublin Tri-Valley region. The Del Valle Water Treatment Plant is comprised of office and industrial spaces built in 1974 and a laboratory built in 1990. The original building’s HVAC equipment gradually deteriorated over time in terms of physical

condition, performance and efficiency; thereby requiring replacement. Space temperature control was unreliable and noxious fumes from the undersized diesel boiler were infiltrating the building creating a potential health hazard. The chiller service the laboratory building was experiencing frequent and costly repairs. The laboratory HVAC control system was antiquated, difficult to use, and employed unreliable control strategies.

*ERA's* first task was to perform a complete evaluation of the HVAC system including system airflow measurement by a certified test and balance firm and examination of the primary equipment (air handling units, chiller and boiler) by senior service technicians. From this investigation, a \$1,100,000 remediation and renewal program was developed.

Shortly after completing the evaluation and presenting the findings, *ERA* was further engaged to prepare construction documents for this work in two packages, for budgeting purposes.

Phase One included:

- new high-efficiency air-cooled chiller, distribution piping and pumping

Phase Two included:

- new high-efficiency heating plant (housed in new equipment building), including redundant boilers and variable flow pumping
- two new air handling units, one of them variable air volume
- addition of new high-performance variable volume zone terminal boxes, including oversized heating coils
- modifications to high pressure ductwork, installation of new terminal boxes and revisions to low pressure ductwork to add 14 additional temperature-controlled zones throughout the original building
- digital controls and building automation to the occupied zone level - constructed to process control standards - throughout the facility
- complete commissioning of the new HVAC system

As part of pre-construction services, *ERA* assisted the Agency in pre-qualifying both control systems sub-contractors and prime mechanical contractors, allowing a very finely-tuned bidding process.

Phase One project was successfully bid, awarded within budget, completed and commissioned in April 2003.

Phase two was designed and bid mid-2003 and completed construction in early 2004. A special added service above and beyond *ERA's* traditional construction administration, was to work as the Owner's commissioning agent during the final stages of construction.

- **Alameda County Water District - Headquarters Building HVAC System Replacement.**  
The Alameda County Water District (ACWD) is a public agency (separate from the county itself) which provides domestic water service to the Fremont/Newark/Union City region. Built in 1985, the original building's construction program took a heavily first-cost-oriented approach to the project, with the result that the HVAC system in the building never actually served that building very well (comfort complaints were endemic from virtually the building's

first occupancy) and the HVAC equipment suffered greatly from the ravages of weather and time.

*ERA's* first task was to perform a complete evaluation of the HVAC system, including system airflow measurement by a certified test and balance firm and examination of the primary equipment (chillers and boiler) by senior service technicians. From this investigation a \$1,600,000 remediation and renewal program was developed.

Shortly after completing the evaluation and presenting the findings, *ERA* was further engaged to prepare construction documents. The scope of this project included:

- new high efficiency air-cooled chillers (one now, one future), distribution piping, variable flow pumping and an architectural soundwall for the chiller yard
- new high-efficiency heating plant, including redundant boilers and variable flow pumping
- provisions in the cooling and heating plants to accommodate a planned building expansion
- five new rooftop, penthouse-style, variable air volume air handling units
- investigation of structural deficiencies and repair and reinforcement of the roof structure for the new air handling units
- replacement of zone terminal boxes with new high-performance variable volume boxes, including oversized heating coils
- revisions to reheat coil heating hot water piping to accommodate the new boxes (original interior boxes did not incorporate reheat coils)
- modifications to high pressure ductwork, installation of new terminal boxes and revisions to low pressure ductwork to add roughly 15% additional temperature-controlled zones throughout the building
- digital controls and building automation to the occupied zone level - constructed to process control standards
- complete commissioning of the new HVAC system

*ERA* played a strong role during construction on this public-bid project, including detailed review of the controls contractor's programming and commissioning of the digital control system, which resulted in the project being successfully completed in mid-2003.