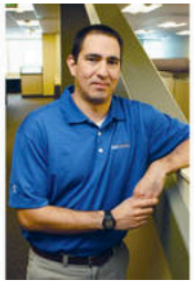
Battling the complexity of designing government facilities

The government can be a tough customer, and the projects that state, municipal, federal, and military entities approach engineers about are highly complex. Here, engineers with experience tackling such tall orders offer advice on how to execute successfully.

Consulting-Specifying Engineer
12/28/2016

Share


Respondents:

Mohamed Abdelmoneim, PE, Peng, LEED AP BD+C, Senior Electrical Engineer, EYP, Washington, D.C.

Raymond Krick III, PE, LEED AP, Project Manager, RMF Engineering, Baltimore

Allen Poppe, PE, MBA, Principal Mechanical Engineer, Mechanical & Chemical Group, Manager, Stanley Consultants, Muscatine, Iowa

Rick H. Troberman Jr., PE, LEED AP, CBCP, Mechanical Engineer, EEA Consulting Engineers, Austin, Texas Lindsay

Zanders, PE, PMP, Sr. Project Manager/Director of Projects, Primera Engineers Ltd., Chicago

CSE: What's the No. 1 trend you see today in the design of government, state, municipal, federal, and military facilities?

Events

Recent News

- Your facility is mission critical: Resiliency, electrical commissioning
- Grounded and ungrounded electrical and power system design
- Lighting webcast: Designing lighting systems with LEDs
- Selecting and sizing transformers to achieve energy efficiency
- Transformer case study
- Weekly merger, acquisition, deal update: June 16
- How NFPA 99-2015 changes affect mechanical design
- Your questions answered: Combined heat and power
- Smart lighting industry set to transform the commercial and residential landscape
- Transformers:

Raymond Krick III: The No. 1 trend in the design of government projects has been the shift from design-bid-build projects to design-build projects. While the design-build process presents its own issues, a single source of procurement can save the government time and money and allows agencies to award the project to a team as a package rather than sourcing each component. Having an integrated design team from the start also ensures that the project's scope of work is not lost in translation.

Rick H. Troberman Jr.: In my opinion, the No. 1 trend in federal and military facilities are energy and sustainability requirements with ASHRAE 189.1: Standard for the Design of High-Performance Green Buildings, LEED certification, and U.S. Army energy-reduction mandates.

CSE: What other trends should engineers be aware of for government, state, municipal, federal, and military facilities in the next 1 to 3 years?

Lindsay Zanders: One major initiative for military bases is becoming independent of the power grid. This involves a combination of a substantial decrease in energy reliance through highly sustainable design and the production of onsite power. Operating independently from the grid allows these facilities and military bases the ability to operate during a catastrophic state of emergency.

Troberman: The design-build acquisition method appears to be a highly preferred contract vehicle for many federal and military facilities. This vehicle can be an advantageous contracting method for government agencies, as it results in the management of one contract as opposed to multiple contracts to complete a project. BIM is another trend that federal/military government agencies are picking up. Many solicitations are starting to use phrases such as "highly preferred" regarding BIM services and even requiring BIM design and submitting the BIM model to the to the owner for their use. Agencies are starting to see the value in this and are paying for this service.

Krick: With the recent boom in smart technology for the residential sector, government, state, municipal, federal, and military facilities will place a bigger emphasis on controls and integration. As the popularity of retro-commissioning grows, we will see more implementation of the latest controls and control strategies into existing systems as a means for energy savings.

Zanders: We currently are tasked with mechanical, electrical, plumbing, fire protection (MEP/FP), and lighting design for the renovation of the U.S. Marshal Office in Chicago's business district. The office occupies the 24th floor of the Mies van der Rohe-designed Dirksen U.S. Courthouse building. As a protected landmark building, the team is prohibited from modifying any perimeter system appearance including fin tube radiators (FTRs) or lighting. The team employed creative mimicking solutions to meet federal design and energy requirements, such as LED tube retrofits. The original hot deck/cold deck with localized mixing-air boxes was converted in a previous project to 100% cold supply, since perimeter FTR met the heating demand load. The team added variable air volume (VAV) boxes and thermal registers to provide thermal control to individual spaces. The U.S. Marshal space houses administrative offices and conference rooms, physical and educational training centers, a central command center, and prisoner detention. The detention element became the critical element for both secure design and construction phasing. Security and safety are the top goals. As a result, operations centered on the prisoners must remain in service throughout the project; therefore, complex phasing of holding areas and secure pathways was generated. Though the high-rise building houses a number of other government agencies with independent functions, the HVAC and electrical infrastructure are shared among all of the tenants. Primera's challenge was to design modifications to the space with no or minimal disruption to the other spaces also served by the same MEP infrastructure.

Troberman: We are currently in the construction phase for an unaccompanied enlisted personnel housing (UEPH Barracks) project at Joint Base San Antonio-Fort Sam Houston located in San Antonio. We designed an HVAC system comprised of 100% dedicated outside-air units (DOAS) with energy recovery along with variable refrigerant flow (VRF) systems for local zone heating and cooling. This project is required to achieve LEED v2009 Silver certification. The project was also designed using BIM.

Krick: We recently completed a successful lab renovation at the National Cancer Institute in Frederick, Md. The facility has 2 floors of laboratories and an attic that houses its mechanical and electrical equipment. The renovation included a full replacement of the MEP systems serving the first floor and phasing to keep the second floor operational during construction. Among the major challenges were adding redundant systems in the already cramped existing space and maintaining the operation of the sanitary system serving the second floor while the complete subslab piping system was removed and reinstalled.

ensuring efficient electrical system design
» More Featured Content

CSE: Describe your experience working with the contractor, architect, owner, or other team members in creating a BIM model for such a project.

Troberman: The architect on the barracks project created the base building model and then incorporated the other disciplines' models into the master model. The architect was responsible for managing updates, and all disciplines were responsible for using the most updated model to incorporate their respective updates. BIM was very useful on this project because we were constrained above ceiling and the government had very specific standards for clearances. We used the BIM model to drive decision making during design so that we could identify the best systems for that exact space. The project is currently in the construction phase, and we are now seeing the success of BIM in that the constructability of our design is of a much higher quality, minimizing clashes. Additionally, when I was a mechanical engineer with the Army Corps of Engineers and worked on a large hospital project being built in 2010, a significant effort was put into clash detection using BIM, and the value of this was fully realized during construction.

CSE: Have you designed any such projects using the integrated project delivery (IPD) method? If so, describe one.

Troberman: We have not as yet been involved in an IPD project in the strictest sense, but an aspect of EEA's design philosophy is to include all stakeholders and members of the design team early on in the design process. In many ways, our design-build projects tend to function much like an IPD project. From a client-side perspective, I think this is the way to go-better value, better coordination.

CSE: What unusual requirements do government, state, municipal, federal, and military facilities have from an engineering standpoint?

Allen Poppe: The Department of Defense (DoD) projects have their own set of unique requirements. The Unified Facilities Criteria (UFC) program documents these requirements. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings includes requirements that minimize the likelihood of mass causalities from terrorist attacks. Included are requirements for site planning and structural, architectural, electrical, and mechanical design. Some projects have technical security requirements per UFC 4-010-05 Sensitive Compartmented Information Facilities Planning, Design, and Construction. This document includes requirements for perimeter construction, sound attenuation, and utility penetrations. Many of these projects also have special physical security requirements. These unusual requirements all necessitate special consideration at the planning phase and multidiscipline coordination during the design phase.

Zanders: Since these projects use public funding, the design must be transparent. Public funds are to be used for the good of the public, and waste generated in one project can result in funding being revoked from other projects. Engineers are asked to be deliberate with design and weigh system and equipment application, cost, and appropriateness. As a result, these projects are all unique. Budgets and stakeholder reviews are two challenges engineers/consultants face for these types of projects. Budgets are defined and are typically modest to protect the taxpayers' investment and avoid shuttering other public welfare projects. To keep the costs low, even if a particular product is perfect for the application, transparent design often requires that multiple manufacturers bid to encourage competitive pricing. The other challenge is stakeholder review. Depending on the composition of the "owner," stakeholders are often distributed across a state or even country. These stakeholders consist of both subject matter experts, such as experienced HVAC operators, and users, such as federal marshals. Input from both parties is essential in developing a suitable design. However, getting all of the key stakeholders in the same room is an impressive feat. For these types of projects, consultants need to plan for additional time and fee allocation during the design phase to account for adequate research of equipment and collection of stakeholder input.

critical: Resiliency, electrical commissioning
- **Grounded and ungrounded electrical and power system design**
- **Lighting webcast: Designing lighting systems with LEDs**
- **Selecting and sizing transformers to achieve energy efficiency**
- **Transformer case study**
- **Weekly merger, acquisition, deal update: June 16**
- **How NFPA 99-2015 changes affect mechanical design**
- **Your questions answered: Combined heat and power**
- **Smart lighting industry set to transform the commercial and residential landscape**
- **Transformers:**

Krick: One of the unusual requirements for government projects is the antiterrorism standards. It is eye-opening to see the types of threats that need to be considered during the design phase, and from an engineering standpoint, these standards impact the design of items like equipment locations, air-intake locations, pressurization, HVAC zoning, and controls.

Troberman: When I worked for the Army Corps of Engineers, we tended to require more "tried-and-true" systems in designs as opposed to the "latest-and-greatest" technologies. Part of this is due to managing taxpayers' money wisely. The government can't afford to test new equipment only to find out in a few years that it doesn't work as well as the earlier technologies. Also, the criteria for doing federal/military work is very prescriptive, which doesn't give a lot of flexibility to engineers specifying equipment. The design criteria effectively limit the types of systems that can be specified. An exception to this, however, is if a military agency requires a new technology to complete a specific mission. In these scenarios, the latest-and-greatest technologies are welcomed.

CSE: Describe the commissioning process for a government, state, municipal, federal, or military project. At what point was your team brought in, and what changes or suggestions were you able to implement via commissioning?

Troberman: Most of my experience has been with federal military projects. In my opinion, the military has developed very well-defined commissioning requirements. Typically, the commissioning authority (CxA) is brought in during the design phase; however, this certainly depends on the type of contracting method and whether the CxA is contracted under the general contractor or directly under the government. The commissioning process is aligned with the best practices as defined by ASHRAE, Associated Air Balance Council, National Environmental Balancing Bureau (NEBB), International Certification Board/Testing, Adjusting and Balancing Bureau, and Building Commissioning Association.

Poppe: We perform commissioning services on state and military facilities. Many of these services are provided on LEED projects where the client is seeking LEED EAc3: Enhanced Commissioning. To achieve this credit, the commissioning authority must be independent of the project team and contractor. EAc3 requires that the commissioning authority be involved early in the process to conduct design review. For many of these projects, we provide design-phase services as a commissioning authority. These services include documenting the owner's project requirements, developing the basis-of-design document, implementing the commissioning plan, developing commissioning specifications, and conducting design reviews. The design reviews have resulted in suggested design changes to improve system operability, maintainability, constructability, or value-engineering options. Sometimes, there is no separate budget or contracting mechanism for an independent commissioning authority. Projects should be planned with the intention of hiring an independent commissioning authority to take full advantage of the process and achieve maximum LEED credits.

ensuring efficient electrical system design

More Featured Content