



Design greener, cleaner and environmentally responsible churches

How to achieve maximum energy efficiency in church building design.

So you have your sights set on not only building a new church but making it as energy efficient as you possibly can. Where do you start? Jerry Lawson, national director for the Environmental Protection Agency's (EPA) ENERGY STAR Congregations division, has accumulated a wealth of information for churches (www.energystar.gov). Here are a few steps to take in order to achieve energy efficiency in your next building project.

Start right by setting your goal

Setting a definitive and measurable energy performance target is an important step in designing sustainable buildings that reduce operating costs and prevent pollution. Once your goal is set, a method to achieve it is required.

- Set an energy performance target by using the EPA Energy Performance Rating — Target Finder — for design projects.
- Use energy design guidance to help choose energy-efficient strategies and technologies that will achieve your target.
- Tour local facilities to understand how design and energy strategies were successfully implemented.
- Consider financial and environmental impacts by using Target Finder to assess the cost of target energy use and the associated greenhouse gas emissions for the design.

Assemble design team

Achieving superior energy performance requires assembling a multi-disciplinary team that works together from goal setting to building operation. The team should investigate energy performance design strategies and determine how these strategies can be integrated in the design.

- Select a multi-disciplinary team early in the process including architects, energy consultants, engineers, state and local government officials, construction contractors, commissioning agent and operations and maintenance staff.
- Adopt an integrated design approach by using a front-loaded, research-intensive process to determine strategies for creating buildings that achieve energy performance goals.

Develop a plan

The conventional design process usually introduces energy-efficient technologies during design development. However, the greatest opportunity for cost-effective energy measures occurs earlier in the design process. The pre-design stage is when the team investigates energy-related design concepts that consider the

environment, climate, building orientation and other features that will impact performance well into the future.

- Develop a plan and a method for delivering a top performing energy-efficient building. Determine requirements needed to start schematic design.
- Develop scope of work, project budget and schedule, which include energy-efficient strategies and your performance target.

Schematic design

As the team's ideas are taking form during schematic design it's important to conduct preliminary simulations of various energy options and technologies. Compare the results to your energy target to know which strategies meet your goal.

- Analyze the site based on how it will affect energy and determine building orientation that enhances energy performance. Use natural shading features to reduce cooling load. Consider using daylight to reduce electrical lighting requirement and the air-conditioning load.
- Use energy design guidance to select the technologies that help deliver superior energy performance and indoor environmental quality. Ensure compliance with energy codes and standards during schematic design rather than tweaking the design later in the process.
- Include an energy expert to review the selected energy strategies and provide preliminary costs and benefits for various design options.
- Compare estimated energy use to design target using Target Finder. Make adjustments and integrate energy performance strategies in building design to achieve your performance target.

Design development

Refine the project in design development and confirm that your energy performance target can be achieved. Include the energy performance goal in specification language.

- Prepare energy performance specification with estimated energy use target, anticipated outcome, and compliance schedule. Include the Building Energy Performance Specifications in construction documents.
- Identify energy-efficient design elements that require careful specification and assemble resources that explain >>



- installation, operation and any other requirements.
- Gather manufacturers' technical literature for energy systems and components to include in construction documents and for use during building commissioning. Supplement literature with design team's summaries of intended operation.

Construction documents

It is important to select a qualified construction team that is able to execute the specified energy efficiency strategies that meet your design target. Seek a contractor who has a track record for constructing buildings that achieve superior energy performance.

Include Statement of Energy Design Intent (SEDI) from Target Finder, which shows the intended energy performance outcome for your design in final construction documents and bid package.

- Specify design team participation during construction to ensure that energy performance features are incorporated and to help produce a more comprehensive set of as-built documents.
- Include approval process for change orders to methods and materials prior to construction, or require design team supervision during construction.
- Document construction methods associated with specific energy-efficient products and materials by including manufacturers' literature and contact information for local technical reps. Include design team's summaries of energy-efficient features in specifications and drawings.
- Select qualified manufacturers and do not accept unapproved alternatives for installing/constructing key energy-efficient features/systems.
- Seek incentives for meeting your energy performance goal. Local utility companies may offer incentives to offset costs for the design team/owner to explore options that achieve the desired energy performance target.
- Communicate your superior energy design intent by placing the "Designed to Earn the ENERGY STAR" graphic on final drawings that achieve 75 or better in Target Finder.

Commissioning process

Commissioning is the process of verifying that a new building functions as intended and communicating the intended performance to the building management team. This usually occurs when the building is turned over for occupancy. In practice, commissioning costs aren't included in design fees and often compete with other activities. As a result it is seldom pursued properly. It is critical that the building is commissioned to ensure that energy performance and operational goals are met.

- Communicate your energy performance goal during commissioning to ensure that the design target is met. Encourage energy-use tracking that will allow performance comparisons to be made over time.
- Specify detailed commissioning activities in your project contracts. Seek separate funding for commissioning work to

ensure that it is given the appropriate level of importance.

- Hire experts that specialize in building commissioning. Include the commissioning firm as part of the design team early in the project.
- Finalize and transfer a set of technical documents including manufacturers' literature for systems and components.

Tracking, measurement and verification

Building automation systems in commercial buildings allow users to track actual energy consumption over time. In contrast, the EPA Energy Performance Rating allows users to evaluate overall annual building performance using a 1-100 scale.

- Communicate the energy performance target (of your design) to the M&V team and make sure they understand specific performance expectations for the new building.
- Document how sustained energy performance compares to the design intent and best practices from the project design.
- Use EPA's Web-based Portfolio Manager once the building has been operating for 12 months to track and rate annual energy performance.

The ENERGY STAR for commercial buildings

New buildings created using an integrated design approach with emphasis on energy performance will be strong candidates to meet the design team's target of 75 or better and qualify for the ENERGY STAR. Architects can follow up with the building owners and encourage them to measure the building's energy performance using Portfolio Manager and gain EPA recognition for superior energy performance.

As soon as a building has one year of utility data, its energy performance can be compared to an industry benchmark of similar space types. Buildings that achieve a score of 75 or higher are eligible for the ENERGY STAR label. The entire process can be completed at EPA's ENERGY STAR Web site using Portfolio Manager.

- Compare the building's actual energy consumption to the industry benchmark.
- Apply for the ENERGY STAR.
- Communicate the success of the building design team/firm and their energy design strategies in case studies and other outreach materials. Promote the fact that the building and the design team have achieved superior energy performance that earned the ENERGY STAR.

Your church can be designed and built to be energy and resource efficient. All it takes is a willingness to start with a goal, and assemble the right team to make it happen. The result will be a well designed, functionally efficient building that is a "living" example of stewardship in action.

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