

# **REQUEST FOR PROPOSAL (RFP)**

Brigham Young University Civil & Environmental Engineering

Temple Steeple Design for the Church of Jesus Christ of Latter-day Saints

## **Statement of Purpose**

This project will involve designing a steeple for a temple for the Church of Jesus Christ of Latter-day Saints. The temple is located in an area of high seismic activity. The goal of the project is to produce a structure that meets performance and architectural requirements while optimizing cost. A comparison between the tower design approaches as outlined by the ASCE seismic code should also be performed.

## **Background Information**

The Church of Jesus Christ of Latter-day Saints is a religious organization with more than 14 million members. The church is actively involved in hundreds of engineering projects worldwide, which range from local meetinghouses to temples and educational facilities. The church employs engineers to design and erect these structures and design review is done by in-house engineers. A major goal of the church is to provide members globally with access to temples where members can make covenants and perform service.

## **Scope of Work**

This project involves designing a steeple for a temple of the Church of Jesus Christ of Latter-day Saints. The purpose of this project is to provide members close and easy access to a temple. The temple is located in a high seismic zone. The group must develop a structural framing system that meets the given seismic loading and performance criteria. Students must also provide rough cost differences between the various solutions.

The objective is to balance cost with seismic performance. The structure must remain safe for the Maximum Considered Earthquake (MCE) and only suffer minimal damage under the Design Basis Earthquake ( $2/3$  MCE). The team must study whether to design the tower using a two-stage approach outlined under ASCE 7-10 Section 12.2.3.2 or as a component using ASCE 7-10 Chapter 13. Both methods will be analyzed for a variety of earthquake resisting systems with their corresponding Response Modification Factors (R). Once the pros and cons of each system and design approach are compared and discussed, students will make recommendations that best achieve the objective.

The main constraint affecting design (aside from cost and seismic performance) is architectural. The design must consider all architectural aspects, e.g. windows, angel Moroni, exterior cladding, while maintaining the performance requirements.

Key milestones for the project are as listed:

- Data gathering and preliminary design
- Comparison of ASCE 7-10 design approaches
- Discussion of possible structural systems listing advantages and disadvantages, selecting 3 systems to study further
- Determination of R factors for each system
- Cost analysis for each system
- Comparison of each system based on performance and cost
- Recommendation of seismic resisting system
- Calculations showing that chosen system meets the performance criteria
- Multiple drawings showing tower framing configuration, coordination with architectural cladding, windows, and Moroni Statue
- Report submission and poster presentation

An architectural profile (cladding, tower cross section) of the tower will be provided, along with the properties of a generic temple structure. The ground accelerations for site will also be supplied.

It's recommended that at least one student within the group have a background in seismic steel design. Knowledge of structural optimization methods and software is also recommended. At least two students on the team should have a fundamental knowledge of steel design.

The use of Mathcad is required for all design calculations. Students will also be required to use AutoCAD or Revit to provide structural drawings. Correspondence between students and mentor and/or project sponsor should be documented.

Though a site visit isn't mandatory, the group is encouraged to make visits to existing temples located within Utah. Additionally, at least one visit to the sponsor's office is required. This meeting will be scheduled according to the sponsor's availability. Group members must be willing to coordinate their schedules so all group members may be present for this meeting.

## **Requirement for Proposal Preparation**

The proposal should be concise and written in language appropriate to the target audience. Three copies of the proposal must be submitted. The proposal must be written in Microsoft® Word. The following are required within the proposal:

- A cover letter in memo format including at minimum: project introduction, project aim, proposal contents, contact details and group signature.
- Executive summary containing a brief statement of the problem, background information, concise analysis and main conclusions. This section must not exceed 1 page
- Statement of Qualifications (SOQ) summarizing the background, experience, education, and organizational structure of the team. This section should include a discussion of how you plan to become a high functioning team in the course of completing the project. Any outside consultants (professors or others) that will help should also be included. The SOQ must not exceed 2 pages.
- Work plan outlining the approach to solving the problem and how the team will work together. A weekly work schedule indicating the hours each member will contribute and the time span the team will work together is also required. The work plan must not exceed 2 pages.
- A brief (probably just a few lines) summary indicating any tools, data and equipment necessary to complete the project.
- Schedule forecasting important project milestones. This schedule must not exceed 1 page.
- An Engineering Design Budget specifying the estimated amount of individual and group time needed to complete the project and the corresponding billing rates. This section must not exceed 1 page.
- A 1 page résumé for each team member in the proposal appendix.

Proposals that fail to include the required information may be excluded from review.

## **Outcome and Performance Standards**

All work provided will be "as is" meaning that there is no engineering stamp certifying the work. However, our ability to continue receiving help from outside sponsors will be contingent on the quality of your work. You represent the BYU Civil & Environmental Engineering Department and are expected to interact in a professional manner at all times with your mentor and project sponsor, treating them with the utmost respect and consideration of their busy schedules.

While successful completion of the design project is fundamental objective of your work, it is expected that you also learn important team dynamics and leadership principles. This means that in the process of completing the project you are also seeking to help each member of your team grow and develop confidence in their engineering abilities.

## **Deliverables**

A report with design alternatives for the project that include economic and environmental considerations must be supplied at the deadline. The report must include a summary of the scope of work, problem statement, analysis and conclusions of the project. All methods and calculations used in the design must also be presented along with relevant drawings and spreadsheets.

Students awarded the project will present their design and recommendations at the end of the winter semester. At minimum a poster and handouts that summarize the project, your work and recommendations should be exhibited. Students should have an in-depth understanding of the project and competently field guest questions.

## **Payments, Incentives, and Penalties**

Your effort and performance will be graded according to the following breakdown:

- 10% - Time Card (putting in the requisite time)
- 10% - Project Notebook (demonstrating productivity in the hours spent)
- 20% - Milestones met (each project will outline the expectations for milestones)
- 35% - Final report
- 10% - Poster/Presentation
- 10% - Teamwork Portfolio and Peer evaluation
- 5% - Cooperation

## **Contractual Terms and Conditions**

The duration of the contract is January 04 – April 19, 2011 or winter semester. Students are expected to work a minimum of six hours per week per student with at least three hours working together as a team. The project deadline is set at the beginning of April and work submitted after

the deadline is late and will receive no credit. There will be no monetary compensation with respect to the work completed, and all work is completed and delivered on a "best effort" basis.

## **Evaluation and Award Process**

Your team's proposal will be evaluated by a panel of students and professors who will grade your proposal according to the following criteria and points:

- 20 points - Firm Resources/Ability/Experience
- 20 points - Key Project Personnel
- 40 points - Work Plan and Understanding of the Project
- 20 points - Technical Proposal and Presentation

Proposals will be ranked by points and the highest scored proposal shall be awarded the project.

## **Process Schedule**

October 31, 4:00 pm - Request for Proposals will be available online at <http://cecapstone.groups.et.byu.net/Winter2012.htm>

November 7, 4:50 pm – Question and Answer period with respect to the proposal and submission procedures.

\*November 21, 4:00 pm – Three copies of the proposal must be submitted at the beginning of class

\*November 21, 4:00-5:30 pm – 5 minute interview (presentation) by your team of the proposal

November 30 – Award notification.

\*The review committee reserves the right to reject any proposal or presentation that is not submitted in a timely fashion.

## **Contacts**

Include a complete list of persons with name, title, responsibilities, and the different ways to contact them for information regarding the RFP itself or any questions.