



Associated Schools of Construction

Student Competition - Sparks, Nevada
February 11 - 13, 2010

Open Problem Statement
Leadership in Energy and Environmental Design (LEED)



Introduction

Skanska USA Building strives to create projects all over the world that have minimal, if any, impacts on the environment throughout their construction and lifecycle. Utilizing the programs set forth by the U.S. Green Building Council, along with forward-thinking project teams assembled over the years, we have sought to move farther down the path of “green building” using all methods available. With your help, our goal over the next few days will be more than simply the creation of many outstanding proposals and presentations. Our hope is that you will move forward with a greater understanding and appreciation of the green building methods that we, as individuals in the construction industry, can employ in our day-to-day operations. More than that, we hope that you will look to implement these ideas into your future careers in the construction industry.

Project Description

The MultiCare ED Expansion (Expansion) project is a five-story health care facility on the Tacoma General Hospital's campus in Tacoma, WA. The building is approximately 175,000 square-feet of occupied spaces, a small area of parking, two sky bridges that connect to an adjacent building and a connector tower with two elevators that serve the project and the two existing buildings. The site had a church located on the south portion of the lot that was demolished by Skanska to make room for the new building.

The first floor is an expansion of the hospital's cancer treatment center and contains one linear accelerator vault, exam rooms, renovation of existing space, 30 parking stalls and some mechanical/electrical rooms. The second floor is an expansion and renovation of the hospital's emergency department including roughly 40 exam rooms, 11 trauma rooms, security desk, reception, waiting area and renovation of the existing emergency department. The third floor contains an urgent care space with more exam rooms, both for adult and pediatric patients. This floor opens to the street on the West side and connects to L wing on the East side via the sky bridge. The fourth floor is an extension of the cancer treatment facility with infusion stations, blood draw area, exam rooms and offices. The fifth floor is entirely mechanical space and houses the air-handling units, exhaust fans and other miscellaneous equipment.

The facility is being built in such a way that at some point in the future MultiCare can elect to extend the building up another 2 floors. The connector tower that houses elevators and a stairwell will be built the full eight floors under the scope of this project.

The Owner for the project is the MultiCare Company. The organization is chartered as a Not-for-Profit entity with the State of Washington. It has several campuses and locations throughout the State and Tacoma General Hospital is one of those facilities.

The problem you are working on is a real project in the design and construction process. The decisions made at the beginning of a project have the greatest impact and often determine the feasibility and overall success of a project.

Scoring Overview

The judging panel will be made up of four or more members from the hospital Owner, project architect and general contractor. Point scales will be assigned to several elements of the written and oral presentations as follows:

	<u>Available Points</u>
• <u>Prequalification</u> : Your firm's history, personnel, experience and commitments to sustainable design and green building, presented as a pre-conference submittal.	5
• <u>Problem Statement 1</u> - Whole life cost evaluation of a considered optional item for the project	15
• <u>Problem Statement 2</u> - Financial evaluation of projected energy savings and presentation as an equivalent revenue source for the client	10
• <u>Problem Statement 3</u> - Evaluation of water efficiency strategies and calculation of potential savings	15
• <u>Problem Statement 4</u> – Evaluation of energy efficiencies and evaluation of alternate design strategies	20
• <u>Problem Statement 5</u> – Calculation of embodied carbon in the construction process and analysis of alternate materials	15
• <u>Oral Evaluation</u> : Oral group presentation on benefits of sustainable design and construction in the healthcare environment	20
Total Possible Points	100

Schedule

The LEED problem statement will be presented to the participating schools as follows:

- **Thursday, January 14, 2010**
 - 2:00 p.m. - Pre-qualification submittal delivered to Skanska USA Building Inc.

- **Thursday, February 11, 2010**
 - 6:00 - 6:30 a.m. - Teams will attend a LEED Charrette for the selected project.
 - 6:30 – 6:45 a.m. - Distribution of Problem Instruction and Materials.
 - 6:45 a.m. - 8:59 p.m. - Preparation of Problem Statement responses.
 - 9:00 p.m. – Written responses to Problem Statement and documentation due; issuance of oral presentation description and requirements

- **Friday, February 12, 2010**
 - 6:30 a.m. - Turn in all oral presentation materials including handouts, electronic presentation media and other materials to specified room
 - 6:35 a.m. – Oral presentation schedule published
 - 7:30 a.m. - 5:00 p.m. - Oral presentations. 5 minutes setup, 15 minute presentation, 5 minute questions and answer period and 5 minute breakdown period.
 - 6:30 p.m. - Debriefing of project as-built.

- **Saturday, February 13, 2010**
 - 12:15 p.m. - Awards Luncheon

Required Materials for Problem Solution

See pre-qualification statement for requirement.

Submission Guidelines

In keeping with sustainable practices, all proposers will provide a “Paperless” submission. Email attachments, flash drive and/or Compact Disks (CD) are the only acceptable means of submission materials. All electronic submissions must be in the form of a PDF, MS Imaging file, JPG, TIF or other electronic format. PDF is the preferred file format for submission.

Requests for Information:

A blank form for Requests for Information (RFI) is included as an attachment for use in submitting questions. Two question and answer periods will be scheduled during the day for informal questions, but all teams must submit written questions if a formal response regarding the problem statement is requested.

Format of Submission:

In addition to the requirements for electronic submission noted above, the following proposal formats must be adhered to:

1. 12-point Times New Roman font
2. 1-1/4” border around all documents, left justified
3. All text single spaced
4. Maximum submission of 25 pages, including cover page, cover letter, schedules or other documentation necessary to support your submission.
5. If CD submission is utilized, 4 copies are required clearly indicating your firm’s name, problem statement and submission date.
6. Internet accessibility is allowed and required for your research and submission assistance.

A ten (10) point deduction from the overall team score will be assessed for pages in excess of the page limit described above.

Problem Statement Overview

Problem Statement 1

Whole life cost evaluation of a considered optional item for the project

15 points possible

Intent: As a donation opportunity for a hospital benefactor, prepare a detailed analysis of the costs and LEED benefits associated with the installation and maintenance of a captured rainwater system.

Required: The solution shall be provided in two parts:

Part 1: Cost Analysis – 12 points

- a) To aid the benefactor and the owner in the decision-making process, prepare a detailed cost analysis for the captured rainwater irrigation system including capital expenditures, operations expenditures, and potential cost savings. As a supplement to the detailed cost analysis, provide detailed explanation for basis of subcontractor selection.
- b) Submit your findings in a written persuasive presentation for the potential benefactor incorporating information from Part 1a.

Part 2: LEED Scorecard Impacts and Benefits – 3 points

Perform an analysis of which LEED NC version 2.2 credit(s) will be impacted through the use a captured rainwater irrigation system. Please provide a written narrative describing potential impact(s) to other LEED credits by the installation of this system or possible LEED credits that can be achieved through minor modifications to the building design.

Description	Value
Analysis Period (years)	20
Maintenance/Service (as a % of total cost per year)	2%
Water Rate (cost/unit; 1 unit = 748 gallons)	\$1.564
Wastewater Rate (cost per hundred cubic feet)	\$4.3837
Annual Utility Rate Increase	3%

Problem Statement 2

*Financial evaluation of projected energy savings and presentation as
an equivalent revenue source for the client*

10 points

Intent: Provide financial projections for the management of the facility to show benefits from a proposed energy savings opportunity.

Required: The solution shall be provided in two parts:

Part 1: Equivalent Revenue Calculation – 3 points

The Tacoma General Hospital has an average gross profit margin of 3.4 percent on total annual sales of \$160,000,000. The new Expansion is expected to use \$4.86/SF annually for energy. Calculate the equivalent revenue (sales) for the project in support of a mechanical system alternate that provides expected annual energy savings of \$110,000.

Part 2: Financial Value and Payback of Energy Savings – 7 points

The mechanical option noted in Part 1 has an expected 15 year life and requires an initial investment of \$450,000. External financing will be used for the improvements being considered. Calculate the Payback Period (in years) of the proposed change given the following information:

Description	Value
Analysis Period (years)	15
Discount Rate	8 percent
Depreciation Method	Straight Line
Depreciation Period (years)	10
Financing Period (years)	15
Cost of Capital (interest rate)	5 percent
Tax Rate	41 percent
Projected Annual Energy Cost - Year 1 (without improvement)	\$850,500
Annual Energy Cost Increase	3 percent

Problem Statement 3

Evaluation of water efficiency strategies and calculation of potential savings

15 points

Intent: Test specific knowledge of the Water Use Reduction credits and demonstrate a return on investment analysis for each of the two credits.

Required: The solution shall be provided in three parts:

Part 1: Water Efficiency Credit 3 (LEED NC v2.2) – 5 points

Provide details and calculations to support achievement of LEED NC 2.2 Water Efficiency Credit 3, Water Use Reduction.

- a. Calculate the FTE for the project.
- b. Calculate the project's baseline water usage. Show all calculations and assumptions used in this calculation.
- c. Show the project's calculated design case water usage. Provide a detailed matrix of fixture type, fixture manufacturer, fixture model, flush rate in gallons per flush (GPF) or flow rate in gallons per minute to substantiate your results.

Part 2: Water Efficiency Credit 3 (LEED NC 2009) – 5 points

Provide details and calculations to support achievement of LEED NC 2009 Water Efficiency Credit 3, Water Use Reduction.

- a. Calculate the FTE for the project.
- b. Calculate the project's baseline water usage. Show all calculations and assumptions used in this calculation.
- c. Show the project's calculated design case water usage. Provide a detailed matrix of; fixture type, fixture manufacturer, fixture model, flush rate in gallons per flush (GPF) or flow rate in gallons per minute to substantiate your results.

Part 3: Supporting Information – 5 points

Provide a written narrative describing the methodology for each of the above answers used to calculate the project's baseline water usage and the potable water reduction strategies to be employed by the project.

Problem Statement 4

Evaluation of energy efficiencies and evaluation of alternate design strategies

20 points possible

Intent: Provide financial projections for the management of the facility to show benefits from a proposed energy savings opportunity.

The project is considering utilizing a ground source heat pump system in lieu of the cooling towers, water cooled chillers, air cooled chiller and heat source specified. Using the provided construction documents and the following parameters, determine the feasibility of a GSHP system.

- Assume the specified air handling units are large heat pumps with integral condensing coils.
- The Owner desires a vertical loop system.

Required: The solution shall be provided in four parts:

Part 1: System Summary – 5 points

Using the Equipment Schedules provided, determine the required load capacity of the proposed ground source heat pump system in Btu/Hr for both the heating and cooling seasons. (Note: The steam to hot water heat exchangers are redundant):

Part 2: System Design – 5 points

Assuming 3/4" polyethylene piping is used with soil conductivity of 0.75 Btu/hr*ft*F, determine how many feet of bore are required. For the calculation assume the following:

- Ground water temperature is an average of 55F.
- In the cooling mode the water temperature in the pipe will be 80F.
- In the heating mode the water temperature in the pipe will be an average of 40F.
- The process is steady state.

Part 3: System Design – 5 points

Due to site restrictions, the system must fit under the project's new Short Term ED Parking area.

- a) Using proper spacing, determine the required quantity and depth of vertical wells.
- b) Is this a reasonable system?
- c) If not, what area would be required?

Part 4: Written Narrative – 5 points

Provide a written narrative summary of advantages / disadvantages of a GSHP system versus the specified system.

Problem Statement 5

Calculation of embodied carbon in the construction process and analysis of alternate material suppliers

15 points possible

Intent: LEED Pilot Credit 1/ID Credit: Calculate embodied carbon and evaluate impacts associated with embodied carbon.

Required: As a leader in sustainable building, Skanska projects has studied the embodied carbon in material supply chains. In alignment with the intention of LEED Pilot Credit 1: Lifecycle Assessment of Building Assemblies and Materials, Skanska has chosen the MultiCare ED Project to conduct an isolated study on the impact of the supply chain to embodied carbon. Determine the following:

Part 1: Credit Knowledge (LEED NC 2009) – 5 points

Identify construction phase LEED credits that could contribute to reducing the embodied carbon created during construction for this project and briefly describe their impact.

Part 2: Embodied Carbon Calculation (LEED NC 2009) – 10 points

Skanska has identified the manufacturing, supply, and installation of concrete as a major contributor to embodied carbon. There are three concrete suppliers being considered for selection on the project.

- a. Calculate the embodied carbon contribution for each subcontractor and complete the Bid Form for each in submitting a bid for the project.
- b. If subcontractors are required to purchase carbon offsets for their supply chain embodied carbon contribution, determine which subcontractor would be low bidder.

Refer to exhibits and attachments for supplemental information to be used in answering the problem.

Oral Evaluation:

Oral group presentation

20 Points

Intent: Prepare and present a persuasive argument and recommendations.

Required: The Owner of the project is concerned about the “value” of green and the additional construction expense during a depressed economy on greening their hospital. Beyond the traditional benefits of green building, such as energy efficiency and environmentally friendly features, prepare a presentation to address this concern and list other tangible and intangible benefits provided to the hospital user groups associated with building a green hospital.

Teams will be allowed a five (5) minute set-up period. Teams will be allotted fifteen (15) minutes in which to present their team, approach to the problem statement, and their recommendations to the Executive Committee. A five (5) minute question and answer period will follow the presentation. Five (5) minutes will be allowed for breakdown. A computer projector, an overhead projector and screen will be provided for presentation to the committee. Any other presentation materials required are to be provided by the team.

ALL ELECTRONIC AND HARDCOPY PRESENTATION MATERIALS ARE TO BE DELIVERED AT 06:30 PST TO THE PRESENTATION ROOM ON THE MORNING OF FEBRUARY 12, 2010.

Problem Reference Documents and Attachments

1. MultiCare ED Anticipated Occupant Loads – 1 page
2. MultiCare ED Contract Documents – Volume 1 (Part 1) Architectural, Civil, Landscape Drawings – 178 files
3. MultiCare ED Contract Documents – Volume 1 (Part 2) Architectural, Civil, Landscape Drawings – 142 files
4. MultiCare ED Contract Documents – Volume 1 (Part 3) Structural Drawings – 119 files
5. MultiCare ED Contract Documents – Volume 2 (Part 1) Mechanical Drawings – 146 files
6. MultiCare ED Contract Documents – Volume 2 (Part 2) Electrical Drawings – 89 files
7. MultiCare ED Contract Documents – Volume 3 Structural and Architectural Specifications dated September 26, 2008 – 638 pages
8. MultiCare ED Contract Documents – Volume 4 Landscaping, Mechanical and Electrical Specifications dated September 26, 2008 – 818 pages
9. MultiCare ED Contract Documents – Volume 5 Equipment List dated September 26, 2008 – 58 pages
10. Request for Information (RFI) Form undated – 1 page
11. Subcontractor Bid: Underground Tank undated – 2 pages
12. Subcontractor Bid: Underground Tank undated – 1 page
13. Plumbing fixture catalog cuts and submittal information undated – 28 pages
14. Problem 5 Information Summary – 2 pages
15. Concrete Mix Designs – 3 pages
16. Apache Concrete Proposal Form – 3 pages
17. Blackfoot Readymix Company Proposal Form – 3 pages
18. Chinook Cement Proposal Form – 3 pages