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Associated Schools of Construction

**Student Competition - Sparks, NV
February 4 - 7, 2015**

National Problem Statement:

Sustainable Building & LEED



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Introduction

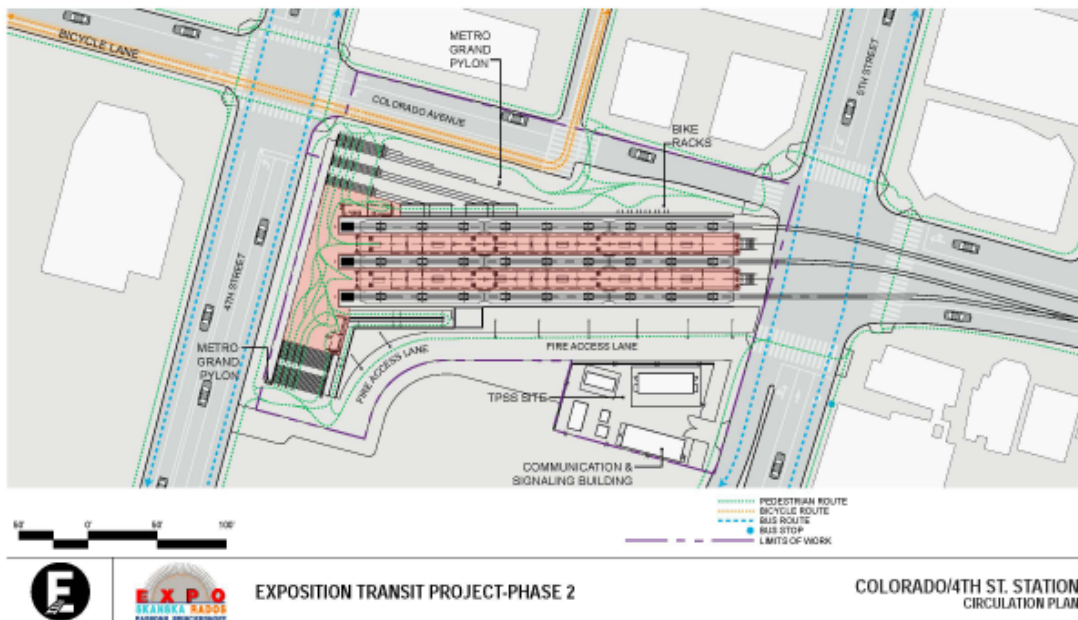
Welcome to the 2015 ASC National Problem Statement focusing on Sustainable Building and Leadership in Energy and Environmental Design (LEED®) projects.

As one of the top Contractors of sustainable construction projects, Skanska USA has strived to create projects 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, the International Living Future Institute, and other green certification agencies, along with forward-thinking project teams and design partners, we have sought to move farther down the path of “green building” using any and all methods available. With your help and participation in this problem statement, we hope that you will gain understanding and appreciation of the green building methods that 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 daily lives outside the workplace.



Project Description

Los Angeles is well-known for its traffic. But soon, Angelenos will have the option to travel between downtown Los Angeles and Santa Monica in approximately 45 minutes – even during rush hour. Currently under construction, Phase 2 of the Exposition Line will extend light rail service from the current terminus in Culver City to Santa Monica, with 7 new stations serving popular destinations along the Westside. The Colorado – 4th St. terminus includes significant concrete and site work to accommodate the three light rail platforms.



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Scoring

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

	<u>Available</u>
	<u>Points</u>
• <u>Prequalification</u> : Your team's; actual resumes, personnel experience and commitments to sustainable design and green building, presented as a pre-conference submittal.	5
• <u>Problem Statement 1</u> – Comparison of LEED credit - V3 to V4.	10
• <u>Problem Statement 2</u> – Life Cycle Sustainability Analysis.	15
• <u>Problem Statement 3</u> – Carbon Foot printing.	15
• <u>Problem Statement 4</u> – Water Capture / Gray Water Use.	15
• <u>Problem Statement 5</u> – On-site Renewable Energy.	20
• <u>Oral Evaluation</u> : - Prepare and present a persuasive argument and recommendation for a problem unrelated to the written problems.	20
Total Possible Points	100



Schedule

The problem statement schedule is as follows:

- **Monday, January 19th, 2015**
 - 2:00 p.m. – Pre-qualification submittal delivered to Skanska USA.

- **Thursday, February 5th, 2015**
 - 6:30 - 6:45 a.m. - Teams will attend a Sustainable Building & LEED Problem Overview for the selected project and distribution of problem instructions and materials.

 - 6:45 a.m. - 8:59 p.m. - Preparation of written Problem Statement responses.
 - 9:00 a.m. – RFI Session #1
 - 2:00 p.m. – RFI Session #2
 - 5:00 p.m. – Final RFI's due, no RFI's will be accepted after this time.

 - 9:00 p.m. – Written responses to Problem Statement and documentation due.

- **Friday, February 6th, 2015**
 - 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. – Presentation of Oral Presentation Schedule.

 - 9:00 a.m. - 4:30 p.m. - Oral presentations. 5 minutes setup, 25 minute presentation, 5 minute questions and answer period and 5 minute breakdown period.

 - 6:30 p.m. - Debriefing of project Problem Statement.
 - 7:00 p.m. to 8:00 p.m. – Hospitality Event

- **Saturday, February 7th, 2015**
 - 12:15 p.m. - Awards Presentation



Required Materials for Problem Statement

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 RFI’s if a formal response is requested. All RFI requests received will be provided as a response to all teams.

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. 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 1: LEED 2009 vs LEED v4 Assessment

10 Possible Points

Intent: The Owner is analyzing whether to register the Project under LEED 2009 or the new LEED v4. They have asked for an assessment of the impact of each rating system on particular credit requirements.

Part 1: Overall Project Review – 3 Points

Utilizing the LEED 2009 and LEED v4 Rating System Reference Guides and provided LEED checklists, please provide a cursory assessment of LEED rating level achieved under each system based on available Project Documents.

Part 2: Materials Category – 2 Points

Please outline the major differences in documentation and compliance under the Materials category, based on review of overall changes in the rating systems. Provide pros and cons of each.

Part 3: Recommendation of Rating System – 5 Points

Based on the above analysis, please provide a recommendation of which rating system the Project should register and comply with, and a proposed level of certification (Certified, Silver, Gold, or Platinum)? Please provide rational and documentation to support your decision in your conclusion.

Additional Information

Attachment #3 – LEED 2009 Rating System Reference Guide

Attachment #4 – LEED v4 Rating System Reference Guide

Attachment #5 – LEED Checklists



Problem Statement 2: Life Cycle Sustainability Analysis - Lighting

15 Possible Points

Intent: The Owner is analyzing lighting options with the goal of reducing energy use and life-cycle costs. Based on the contract documents and attached lighting cut sheets, conduct an analysis comparing the life-cycle of the specified light fixtures (X-6A, X-6b and X-6C) vs. the attached LED alternate. Assume light fixtures will operate 24/7.

Part 1: Annual Energy Use – 2 Points

What is the annual energy usage of each of the lighting options? (Provide in kWh)

Part 2: Life Cycle Analysis – 6.5 points

Utilizing the provided subcontractor bids, complete a life-cycle analysis, over a 10 year cycle, of the two lighting options. Include material purchase, installation costs and maintenance costs in your analysis. Identify the criteria and or formula used to process.

Part 3: Subcontractor Selection – 2 points

What subcontractor would you select?

Part 4: Incentives & Rebates – 3.5 points

Are there any available incentives or rebates to assist with the more efficient technology?

Part 5: Incentives & Rebates – 1 point

Based on the above analysis, what light fixtures does your team recommend? List supporting evidence in your conclusion.

Additional Information

Attachment #6 – Lighting Bids

Attachment #15 – Lighting Cut Sheets



Problem Statement 3: Concrete Carbon Footprint

15 Possible Points

Intent: Analyze the carbon footprint of the concrete used in the 4th Street Station, as well as the commute carbon footprint of the pour crew.

Required: State all assumptions and sources of information used in solving the problem.

Part 1: Bid Comparison – 10 points

1. How many cubic yards of concrete will be required for the 4th Street Station?
2. What is the total price for each supplier? Which is the least expensive?
3. What is the carbon footprint of each supplier? Which supplier has the smallest footprint? Include transportation of the cement, aggregate and fly ash from the source to the batch plant, and transportation of the ready mix concrete from the batch plant to the project. Ignore sourcing of water and admixtures.
4. Due to the sustainability goals of the client, each ton of CO₂ produced has a cost to the project of \$40/ton. Update the bid comparison from #2 with this information and recommend the best value supplier for the project.

Part 2: Local vs. Out of Town Labor – 5 points

1. There are 11 concrete placements scheduled. On average, each lasts 1 day and is done by a crew of 4 laborers and 3 finishers. Of the 7 workers on the crew, 2 live in L.A.(16 MI), 3 live in Riverside (70 MI) and 2 live in Oceanside (93 MI). What is the carbon footprint of the crew for all placements?
2. By how many tons of CO₂ could the carbon footprint be reduced if all laborers lived within 15 miles of the job?
3. By how many tons of CO₂ could the carbon footprint be reduced if the out of town workers carpooled (i.e. one carpool from Oceanside and one carpool from Riverside)?

Additional Information

- Assume 7% additional concrete, beyond neat line quantity, will be ordered to account for waste.
- Assume personal vehicles get an average of 20 miles per gallon of gasoline.

Attachment #7 – Station Takeoffs

Attachment #8 – Mix Designs



Problem Statement 4: Water Collection and Usage

15 Possible Points

Intent: Demonstrate understanding of water consumption and collection principles.

Required: The project team intends to capture rainwater from the platform, track and plaza areas and store it in a cistern to be used to irrigate the landscaping areas at the 4th St. Station.

Part 1: Irrigation Consumption – 6 Points

1. What is the estimated total water usage by month for the fourth street station based on the station landscaping?
 - a. Assumptions
 - i. Assume a Plant coefficient of .5

Part 2: Rain Water Collection – 6 Point

1. In order to reduce potable water usage, the project would like to collect rain water from the 4th St. station site and reuse it for irrigating the landscaped areas.
 - a. What size cistern (in gallons) would be necessary in order to not require supplemental water at any point during the year? The station will be opening on January 1st and the cistern will be completely empty.

Part 3: Cistern – 3 Point

1. The only area available for cistern storage is under the area labeled bike module "C" at the north end of the station. The maximum excavation depth is 12 feet below the plaza precast pavers and the concrete tank would require 1 foot thick walls, and 1 foot thick horizontal slabs.
 - a. What is the capacity of the cistern?
 - b. Based on this capacity, how much supplemental water would be required by month?

*To allow for partial credit, please clearly state any formulas used in solving this problem.



Problem Statement 5: On-Site Renewable Energy

20 Possible Points

Intent: To evaluate opportunities to offset energy output and to exhibit an understanding of how to maximize renewable energy sources on the 4th St. Station project.

Required: State all assumptions and sources of information used in solving the problem. Show all work.

Part 1: Solar Panel Design - 12 Points

Evaluate the three attached solar panel cut sheets to determine the best option to propose to the owner as a means of offsetting the energy output for the 4th St Station. The parameters are as follows:

1. The only available surfaces for the solar panels are the TOS booth roof and the C/S Building roof.
2. Assume standard test conditions when evaluating the output energy
3. Assume an annual average solar radiation of 6.1 kWh/m²-day.
4. Assume a default Performance Ratio of 0.75 (this factors in the shade provided by the parapets).
5. Utilize the proposed design energy demand summary provided in the drawings for the TOS booth. Assume a proposed design energy demand of 240 kBtu/sqft-yr for the C/S building.
6. Pricing (includes material and install costs)
 - a. Sunpower X21-345 model – **\$465/panel,**
 - b. Sunmodule Plus SW275 Mono model - **\$450/panel**
 - c. Grape Solar GS-Start-100W model - **\$150/panel**

Address the following:

1. Provide the quantity of panels required for each option to offset at least 8% of the total output energy of the TOS booth and the C/S building, as well as marked-up drawings showing your recommendation for the solar panel layouts (use the roof layout details in the drawings).
2. Which solar panel option provides the best value to the customer (please provide supporting narrative justifying your decision with a cost analysis)
3. Determine the optimal orientation variables for the above identified panel array:
 - a. Direction for the solar panels to face at this location (North/South/East/West)
 - b. Using magnetic declination, determine the true angle the solar panels need to face to optimize the energy returns (using °E)
 - c. In order to maximize the amount of sunlight captured, the panels need to be tilted at least twice a year. Identify the two optimal adjustment dates for the location of the project as well as the optimum panel angle for each period.



Part 2: Additional Renewable Energy – Options to Net Zero – 6 points

This client is requesting a design build proposal for achieving Net Zero Energy for this portion of the project, though they understand it is not feasible within current area limitations of the site. As an incentive toward a more energy efficient project, the City has offered the client a small parcel of land directly adjacent to this portion of the project at no cost. It is a small (~4 acre site) with no existing structures, ground coverage, or contamination issues. The owner is offering this parcel as a courtesy, on a 10 year no cost lease, as it is not viable for development at this time. The closest border of the parcel is 50 meters from the project site.

Evaluate the project and adjoining parcel to provide a net zero energy option to the client using the adjacent parcel, using one of the 3 previously specified solar options (selected panel manufacturer may change from Q1), provide the cost/savings of this option on a ten year cost analysis. For purposes of this analysis, cost of capital and depreciation shall be assumed to be zero (given this is a public owner).

Please detail the following:

- Product chosen, with quantity and cost of solar panels installed
- Cost estimate of panel supporting structure and any other ancillary construction scope; please itemize all scope items separately.
- Payback period for solar installation, including assumptions made in cost analysis.
- Projected maintenance cost of a system over its projected life (include any other maintenance cost projections i.e. adjustment of automated tracking system, if selected)

Part 3 – Alternative Renewable Energy Sources – 2 Points

Other than traditional photovoltaic panels, evaluate the following alternative renewable solutions for viability onsite. Please limit yourself to the listed considerations, and provide your rationale for selecting or rejecting the provided alternative.

- a. Biofuel-based electrical systems
- b. Geothermal energy systems
- c. Hydroelectric power systems
- d. Micro wind turbines

Additional Information

Attachment # 9 – Sunpower PV panel cut sheet

Attachment # 10 – Grape Solar PV panel cut sheet

Attachment # 11 – Sunmodule PV panel cut sheet



Oral Evaluation

Oral Group Presentation

20 Possible Points

Intent: Prepare and present a persuasive argument and recommendations.

Required:

Since the 1950's America and the world has increasingly become a "throw-a-way" society. On average, each American generates 4.38 lbs. of garbage every day (source: U.S. EPA, 2012.) Recycling plans alone cannot eliminate the problems created by this waste stream. The national recycling rate is at 34%, and some items, such as many plastics, cannot be easily recycled. Watch the attached TED Talk by Charles Moore and read the attached articles, "How We Became a Throw-away Society" and "Waste Not Want Not", for additional insight into our "throw-a-way" society.

A recent European Union study identified construction and demolition waste accounting for approximately 30% of all waste generated in the EU. The impact of reducing waste in the construction industry would have a dramatic effect on the overall waste stream.

Source reduction or waste prevention is one method to reduce the amount waste that will later need to be recycled or thrown away. Prepare a presentation that identifies at least two waste streams typically found on a construction project and describe innovative ways in which these waste streams could be reduced or eliminated through source reduction or waste prevention. Points will be awarded for innovative/creative ideas, feasibility, and thorough explanation of how the ideas will help reduce or eliminate the waste stream and make the construction industry a smaller contributor to the "throw-a-way" society.

Presentation Timeline:

- Teams will be allowed a five (5) minute set-up period.
- Teams will be allotted fifteen (25) minutes in which to; introduce their team, present their information, and explain the expected challenges.
- A five (5) minute question and answer period will follow the presentation.
- Five (5) minutes will be allowed for breakdown.
- A computer with MS PowerPoint, a 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 AM PST TO THE PRESENTATION ROOM ON THE MORNING OF FEBRUARY 6, 2015.



Attachments to Problem Statement

1. Expo Phase 2 Drawing Package (1File / 141 Drawings)
2. Blank RFI Form (1 File)
3. LEED 2009 Rating System Reference Guide (1 File / 674 Pages)
4. LEED v4 Rating System Reference Guide (1 File / 817 Pages)
5. LEED Checklists
6. Lighting Bids (1 File / 3 Bids)
7. Station Concrete Takeoffs (1 File / 17 Pages)
8. Concrete Mix Designs (1 File / 11 Pages)
9. Sunpower PV Panel Cut Sheets (1 File / 2 Pages)
10. Grape Solar PV Panel Cut Sheets (1 File / 2 Pages)
11. Sunmodule PV Power Cut Sheets (1 File / 2 Pages)
12. Charles Moore TED Talk (1 MP4 File)
13. "How We Became a Throw-away Society" (1 File / 2 Pages)
14. "Waste Not Want Not" (1 File / 2 Pages)