

ASCE MID-PACIFIC REGIONAL CONFERENCE



ASCE
MID PAC 2017
California State University, Chico

MAILER I





October 15, 2015

Mid-Pacific Regional Conference Participants,

The American Society of Civil Engineers at the California State University, Chico is pleased to announce the 2017 Mid-Pacific Regional Conference! We are ecstatic to welcome you all to our community and thankful for the chance to host this conference.

This mailer is the first of three that will be released over the next several months. Each mailer will concern various information regarding the competition, and will be updated with each successive mailer. **Please do not delete this mailer**, as it contains valuable information for your various competition teams. Included in this mailer are:

- Receipt Confirmation
- Summary of Deadlines
- Tentative Conference Agenda
- Competition Rules and Contacts

Please confirm you have received this mailer by emailing or mailing the enclosed form by November 13th, 2016 to the address listed. The school registration deadline is December 4th, 2016. The conference shall take place on April 20th -22nd, 2017. If there are any questions, or comments about the content of this mailer, please feel free to email us at midpac2017.chico@gmail.com.

The current Mid-Pac website is under new construction! In the coming months, this website will contain vital competition information so please keep an eye out!

www.ascemidpac.org

Us here at Chico State are very excited to be hosting the conference this year! We cannot wait to show all of you our little town and all what it has to offer. We hope this mailer answers all current questions and gets all of your teams excited for this year's competition. We all look forward to seeing you in April!

Sincerely,

Lauren Pitcher

2017 Mid-Pacific Regional Conference Coordinator



TABLE OF CONTENTS

Deadline Information	Page 4
General Conference Schedule	Page 5
Receipt Confirmation	Page 6
School Registration	Page 7
Competition Details	
Concrete Canoe	Page 8
Steel Bridge	Page 9
Mini Games	Page 10
Daniel W. Mead Paper	Page 14
Geo-Wall	Page 19
Water Research Paper	Page 46
Water Treatment	Page 50
Transportation	Page 71

DEADLINE INFORMATION

DATE	INFORMATION DUE
October 15, 2016	Mailer I Released
November 13, 2016	Mailer I Receipt Confirmation
December 4, 2016	School Registration
January 15, 2017	Mailer II Released
January 29, 2017	Mailer II Receipt Confirmation
March 16, 2017	Attendee Pre-Registration
March 18, 2017 <i>Postmarked</i>	Concrete Canoe Technical Paper Transportation Technical Paper Water Research Paper Mead Paper Water Treatment Technical Paper
March 26, 2017	Mailer III Released
April 2, 2017	Mailer III Receipt Confirmation
April 13, 2017	Attendee Registration
April 15, 2017	Concrete Canoe Presentation Geowall Design Poster Geowall Design Paper Professional Paper Presentation Transportation Project Presentation Water Research Presentation Water Treatment Presentation
April 20 TH -22 ND , 2017	Mid-Pac!!



GENERAL CONFERENCE SCHEDULE

<p>Thursday April 20th, 2017</p>	<p>Registration Welcome Meeting Individual Team Meetings Presentations: Concrete Canoe Water Treatment Geo – Wall Steel Bridge Aesthetics Judging</p>
<p>Friday April 21st, 2017</p>	<p>Transportation Poster Display Concrete Canoe Display Steel Bridge Competition Water Treatment Competition Presentations: Transportation Mead Paper Water Research YMF Social</p>
<p>Saturday April 22nd, 2017</p>	<p>Concrete Canoe Races Geo-Wall Competition Mini Games Business Meeting Banquet</p>



RECEIPT CONFIRMATION

Mail: 2017 ASCE Mid-Pacific Regional Conference
Department of Civil Engineering
Attn: ASCE Langdon 202
California State University, Chico Ca 95929-930

Email: Lauren Pitcher
midpac2017.chico@gmail.com

Please print or type the information in this form:

School Name: _____
Mailing Address: _____

Faculty Advisor: _____

F.A. Contact Information: _____

Student Conference Contact (For receiving conference emails)

_____	_____
Name (First, Last)	Phone Number

Email Address	

This receipt confirms that we have received Mailer I regarding the 2017 Mid-Pac Regional Conference



SCHOOL REGISTRATION

School Name: _____

____ We are attending the 2017 Mid-Pacific Regional Conference

____ We are not attending the 2017 Mid-Pacific Regional Conference

Our school will be participating in the following events:

FEES:

- | | |
|---|------------------|
| <input type="checkbox"/> Concrete Canoe | \$100 per school |
| <input type="checkbox"/> Steel Bridge | \$100 per school |
| <input type="checkbox"/> Geo-Wall | \$100 per school |
| <input type="checkbox"/> Water Treatment | \$100 per school |
| <input type="checkbox"/> Transportation Project | |
| <input type="checkbox"/> Professional Paper | |
| <input type="checkbox"/> Water Research Paper | |
| <input type="checkbox"/> Mini-Games | |

****For all participating schools: There will be an additional charge, upwards of \$200, for each team participating in the Steel Bridge Competition due to the purchase of traveling conference weights. You will be notified of this charge after we get the total amount of teams participating****

Attendee Information (Optional, if you think you have a pretty solid idea)

FEES:

_____ Total Number of Mid-Pac Attendees (faculty and students) \$80/Attendee

Please make checks payable to:

2017 ASCE Mid-Pacific Regional Conference, Chico State Student Chapter

Mail to:

2017 ASCE Mid-Pacific Regional Conference Department of Civil Engineering

Attn: ASCE Langdon 202

California State University, Chico Ca 95929-930



CONCRETE CANOE

Competition Date: Friday, April 21st, 2017
Saturday, April 22nd, 2017

Competition Location: Chico State Campus
TBA

Summary:

The Concrete Canoe competition is to provide civil engineering students an opportunity to gain hands- on experience, leader ship skills, knowledge of concrete design and mixture, creativity and stamina. Organizers, sponsors and participants are dedicated to building awareness of concrete technology and application, as well as the versatility and durability of concrete as a construction material, among civil engineering students, educators, practitioners, the concrete industry and the general public.

Resources:

Rules and Mix Design regulations for the competition will follow ASCE 2017 National Rules. It can be found on ASCE website at

<http://www.asce.org/rules-and-regulations/>.

Contact:

Concrete Canoe Coordinator

Eric Enkh

midpac17chico.canoe@gmail.com



STEEL BRIDGE

Competition Date: Thursday, April 20th, 2017

Friday, April 21st, 2017

Competition Location: Chico State Campus

Summary:

The steel bridge competition will consist of making a bridge that meets the rule requirements and dimensions of the proposed statement and construction layout. Each member of the bridge must fit within a rectangular prism of 36"x4"x6" and satisfy for the connection requirement. For further details please see the link below.

Resources:

Use the tabs as a directory on the left side of the page after searching the link below

<http://www.aisc.org/content.aspx?id=780>

Contact:

Mid-Pac Steel Bridge Coordinator

Jose Barajas

chicosteelcoordinator@gmail.com



MINI-GAMES

Competition Date: Saturday, April 22nd, 2017

Competition Location: TBA

Summary:

At the 2017 Mid-Pacific Competition hosted by California State University of Chico, we will happily include mini games competitions for teams to do on their downtime in between contests. This year, Chico chose to have the following mini games available for fun: Tug-O-War Rope, Volleyball, Concrete Bowling, 2 by 4's Jenga, and a Scavenger Hunt that all teams will compete in. These games are meant to be allow schools to be competitive, engage with others, and most of all enjoy your time here at California State University of Chico.

Contact:

Mini Games Coordinator

John Pollock

cuchicominigames@gmail.com



Rules:

Concrete Bowling Rules

Participation:

Each school may enter one team in the competition. Each team must have 2 members with 1 male and 1 female participant.

Rules:

1. Standard ten-pin bowling rules will apply to the physical competition.
2. Each team will complete 6 frames, with each participant bowling every other frame. No tenth frame extension.
3. The team with the highest combined score wins.

Design:

1. The bowling ball must be spherical in shape.
2. The bowling ball must NOT exceed 8.5 inches in diameter (approximately 26.7 inches in circumference).
3. The bowling ball must weigh between 8 and 16 pounds.
4. No resins may be used.
5. The ball must be made from concrete.
6. Bowling balls from prior events may NOT be used.

Presentation:

1. Each team must submit a poster board on the day of the competition that can stand on its own on the ground.
2. The poster must identify:
 - School name -
 - Team members ' names
 - Mix Design
 - Construction materials and techniques

Judges:

1. 2 judges will preside over the competition.
2. The judges will determine the concrete bowling winner according to the total number of points earned

Concrete Bowling Scoring Category Points

- Bowling 60
- Engineering Mix Design 10
- Construction Methods 10
- Bowling Ball Aesthetics 10



- Poster Board Aesthetics 10

Total 100

The top five teams will be awarded points based on the score they received.

Volleyball Rules

Participation: A team must consist of 6 players.

Rules:

1. A player may NOT:

- Lift or catch the ball.
- Touch the net at any time of play.
- Touch the ball twice in succession.
- Cross onto the opposing team's side under the net.
- Attack a serve.

2. A team can only contact the ball a maximum of 3 times in order to return the ball to the other side

3. A player in the back row cannot attack the ball within 10 feet of the net.

Scoring:

1. A point is earned when a team wins the rally.

2. Each game is won when a team reaches 11 points, with a margin of 2 points.

3. One game per match.

The top five teams of the bracket will be awarded points

Tug-O-War Rules

Participation: The team must consist of 6 members, 3 male and 3 females. No substitutions may be made once the game has started.

Rules:

1. A flag will indicate the center of the rope.

2. Limit lines will be marked on the ground approximately 10 feet towards each team.

3. The rope must be held with the hands: participants may NOT tie it around any body parts.

4. NO knots are permitted on the rope.

5. The flag on the middle of the rope will be centered by the judge.

6. Teams may begin when the judge gives the command to "go".

Scoring:

- The first team to pull the center flag over the ground mark nearest them, as determined by the judge(s), will be declared the winner
- If a team drops the rope, the other team will win by default.



The top five teams of the bracket will be awarded points.

2" by 4" Jenga Rules

Participation: Each school may enter one team in the competition. A team must consist of at least two members, one male and one female participant.

Rules:

1. Each team must switch turns accordingly while not disrupting the rhythm.
2. Same idea of puzzle board Jenga, but now with 2 by 4's in a bigger form. Play until one team makes the stack fall over, ending the game.
3. Correctly stack the 2 by 4's once the game is over for the next groups to play.

Scoring:

- The first team to knock over the Jenga stack loses announcing the other team as the winner.



DANIEL W. MEAD PAPER

Competition Date: Friday, April 21st, 2017

Competition Location: Chico State Campus

Summary:

The National Competition was established and endowed in 1939 by Daniel W. Mead, Hon.M.ASCE, a Society Past-President. The contest provides an opportunity for alert young civil engineers to further their professional development and gain national attention.

Resources:

The National Student Daniel W. Mead Competition Rules have been published at the website located below: <http://www.asce.org/mead-student/>

The same topic and rules will be applied to the paper at the Mid Pacific Conference as seen on the above website and in the topic and rules sections below.

Please be advised, the submittal to the Mid Pacific Mead Paper Competition should not be confused with the National Daniel W. Mead nomination. Although the two competitions have the same topic, and rules they are two individual competitions with two different submittals.

At the Mid Pacific Conference, a Mead Paper Presentation will also be judged in this competition.

Contact:

Any questions regarding the Mid Pacific Mead Paper Competition may be sent to:

Carole Wigno

midpac2017meadpaper@gmail.com



Topic:

"Is it ethical for university engineering faculty to teach technical subject matter to engineering students without obtaining professional licensure?"

Mead Paper Rules

1. Papers for the Regional Competition shall:
 - a. be limited to one paper from each Student Organization
 - b. not exceed 2,000 words in length
 - c. be written by only one person
 - d. Not have previously been published in other than school or Society publications.
2. Reference citations of the papers should conform to official ASCE Journal Submission Guidelines, which can be found on the ASCE Publications Website: <http://ascelibrary.org/page/authors>
3. A complete bibliography should also be included, if appropriate (Bibliography will not count towards total word count.)
4. Authors must be undergraduate students and both ASCE Student Organization members and ASCE national student members in good standing at the time of submission to be considered.

Mead Presentation Rules

1. Each entrant must formally present his or her paper at the Mid Pacific Conference. Presentations must be 5 minutes in duration (+/- 5 seconds without penalty.) Please see the scoring rubric for further scoring details.
2. Presentations must be accompanied by visual aids.
 - a. The host chapter will provide a projector and screen.
 - b. Any additional equipment shall be furnished by the presenter.



- c. The specifications of the convention room and type of useable input for the projector will be provided in Mailer II.
3. The host school will not provide a timer for the presenter's use. The presenter may have someone in the room help keep track of the time, but they shall not be a distraction for the judges.
4. At the end of each presentation, the judges will have up to (5) minutes to ask questions.

Submittal

The Mid Pacific Mead Paper submittal deadline will be March 18th, 2017.

A completed paper submission will consist of a single PDF file containing

1. A cover letter with the title of the paper, the author's name, the name of the school the author is competing for, a mailing address, and an e-mail address.
2. The paper being submitted.

The name of the file shall follow this format:

Mid-Pac Mead Paper – Author's last name – Name of University.pdf

Submissions should be sent to midpac2017meadpaper@gmail.com and must be received on or before March 18th.

Please be advised, the submittal to the Mid Pacific Mead Paper Competition should not be confused with the National Daniel W. Mead nomination. Although the two competitions have the same topic and rules, they are two individual competitions with two different submittals.

Scoring and Awards

1. The paper and presentation carry equal weight of 50 points each, for a maximum overall score of 100 points from each of the three judges. Please see the Mead Paper Competition scoring rubric for further scoring details.
2. The overall scores will be the average of all three judges and ranked accordingly.



3. Awards will be as follows: 1st place - \$100, 2nd place - \$75, and 3rd place - \$50.

Paper Scoring Criteria	Score
1. Adherence to topic	/10
2. Presence of original ideas and research involved	/10
3. Command of subject matter	/10
4. Spelling and grammar / length (2,000 word maximum)	/5
5. Overall clarity, organization, quality of paper and references	/15
Presentation Sub--Total	/50

Presentation Scoring Criteria	Score
1. Degree to which presentation addressed and supported key concepts of written paper and theme of contest	/10
2. Ability to communicate key concepts from written paper and to convince audience of their importance. Ability to address and answer questions effectively	/25
3. Personal bearing (i.e. appearance, poise, eye contact)	/5
4. Delivery style (i.e. reading, memorized, conversational) / pronunciation and proper use of technical language and grammar / enthusiasm and voice projection	/5
5. Time (5 minutes +/- 5 seconds) (Beyond 5--second allowance: 0.05-point penalty per second difference from required 5 minutes, i.e. 5:20 or 4:40 = 1 point penalty)	/5
Presentation Sub--Total	/50
Errors in logic or facts (up to 10 points penalty)	/-10
Overall Score	/100



GEO-WALL COMPETITION

Competition Date: Thursday, April 20th, 2017

Saturday, April 22nd, 2017

Competition Location: TBA

Summary:

The GeoWall competition is to design and build a model mechanically stabilized earth (MSE) retaining wall using paper reinforcement taped to a poster board wall facing. Students are to design a MSE wall using the least amount of reinforcement needed to support the retained soil and design loads, and effectively communicate their analysis and design processes.

Contact:

For any questions or concerns email Dayana De La Rosa and Diana Cendejas at:

midpacgeowall2017@gmail.com

Design Report Submission:

The complete Design Report must be submitted in PDF format via email to MidPac GeoWall Coordinator, midpacgeowall2017@gmail.com, by 6:00 pm PST on the Saturday one week prior to the MidPac competition. Subject line must include "GeoWall 2017 Report Submittal." The sender will receive confirmation of receipt by e-mail. Any changes or corrections made to the design report after this time will incur a penalty (see Section 13).

Design Poster Submission:

The complete Design Poster must be submitted in PDF format via email to MidPac GeoWall Coordinator, midpacgeowall2017@gmail.com, by 5:00 pm PST on the Saturday one week prior to the MidPac competition. Subject line must include "GeoWall 2017 Poster Submittal." The sender will receive confirmation of receipt by e-mail. Any changes or corrections made to the design report after this time will incur a penalty (see Section 13).

Important Dates

<i>Design Poster due</i>	April 15, 2016
<i>Design Paper due</i>	April 15, 2016

Rules:

1. **Objective** – The objective of the GeoWall competition is to design and build a model wrapped faced mechanically stabilized earth (MSE) retaining wall using Kraft paper reinforcement. The competition objectives are for students to:

- Design a MSE wall using the least amount of facing and reinforcement material needed to support the retained soil and design loads
- Effectively communicate their analysis and design processes
- Enjoy a friendly but spirited competition among schools

2. **Background** – MSE walls have root to prehistoric builders who used sticks and branches to reinforce soil structures. The modern use of reinforced soils dates to the 1960s and French architect Henri Vidal's development of the Reinforced Earth® system. In the US, the first MSE wall was built on California SR-39 near Los Angeles in 1971. A more recent development in MSE walls is the wrapped face wall as shown in Figure 1. This year's competition will model this development of MSE walls by requiring teams to wrapped face retaining wall.



Figure 1: Typical wrapped face MSE walls

3. **Eligibility** -- Only one team per school will be allowed to compete. Each team shall designate a Team Captain who shall be the point of contact for the team. For the construction phases (Section 11 a-b), the competition team consists of a maximum of four students that includes not more than one graduate student. At each phase, a school may use the same students, or may use a different set of students. Although different members can be used for each phase, not more than two graduate students can be part of the overall team. The loading stage (Section 11 c), shall be performed by the Team Captain and not more than one additional student. The team Captain shall remove the wall facing. All team members must be enrolled students at the date of the Mid-Pac competition and be members of ASCE.

4. **Design Report Submittal** – The report must include:



- a) Cover page with name of institution; names and status (graduate, undergraduate) of each team member; identification of team captain with email address; and name, title, and email address of faculty advisor.
- b) Material properties used in design including methods (lab tests, correlations, assumptions) used to obtain the properties.
- c) Description of the engineering design and construction procedures including assumptions and equations used.
- d) A complete description of the geometry and placement of all reinforcing elements. Estimated mass of the facing and reinforcing paper in grams and total length of Kraft paper required to construct MSE wall.
- e) A safety appendix which outlines the potentially hazardous tasks reasonably expected during the competition and how the team will mitigate these hazards.

Formatting requirements:

- a) Length shall be a maximum of three (3) pages long (not including references, cover page, or safety appendix).
- b) One inch margins, single spaced, and 12 point Times New Roman font.
- c) All pages after the cover page shall contain a header identifying the team and a footer with the page number.
- d) Entire design report must be submitted in a single pdf format file with a filename of <School Abbreviation>2017GeoWall.pdf.

Design reports will be judged by a panel of practicing engineers and professors. Judging will consider reasonableness of design equations, material properties, factors of safety, and assumptions. "Trial and error" designs will be heavily penalized. The judging rubric is presented in Appendix C.

The complete Design Report must be submitted in PDF format via email to MidPac GeoWall Coordinator, midpacgeowall2017@gmail.com, by 6:00 pm PST on the Saturday one week prior to the MidPac competition. Subject line must include "GeoWall 2017 Report Submittal." The sender will receive confirmation of receipt by e-mail. Any changes or corrections made to the design report after this time will incur a penalty (see Section 13).

5. Design Poster- Each team is to present their analysis and design on a design poster. The 24-inch x 36-inch (maximum size) poster shall be displayed in a designated area throughout the GeoWall competition. The design poster must include:



- a) The school name and logo are to be readily visible on the poster. The school name shall have at least 1-inch tall letters. Cover page with name of institution;
- b) The names and status of each team member, their next degree objective, identification of team captain, and name/title of the advisor of the GeoWall team.
- c) Material properties used in design including methods used to obtain the properties.
- d) Description of the engineering design and construction procedures including assumptions and equations used.
- e) A complete description of the geometry and placement of all reinforcing elements. Estimated mass of the reinforcing paper in grams.
- f) Acknowledgments to team sponsors and advisors both named in (b).
- g) References (books or papers referred to in the design or analysis).

Design posters will be judged by a panel that will include practicing engineers and may include professors. Posters will be briefly described by the team captain and up to one other team member. Judges will follow up with questions and consider quality, reasonableness, and completeness of the design, material properties and assumptions. "Trial and error" designs will be heavily penalized. The judging rubric for the design poster is presented in Appendix D.

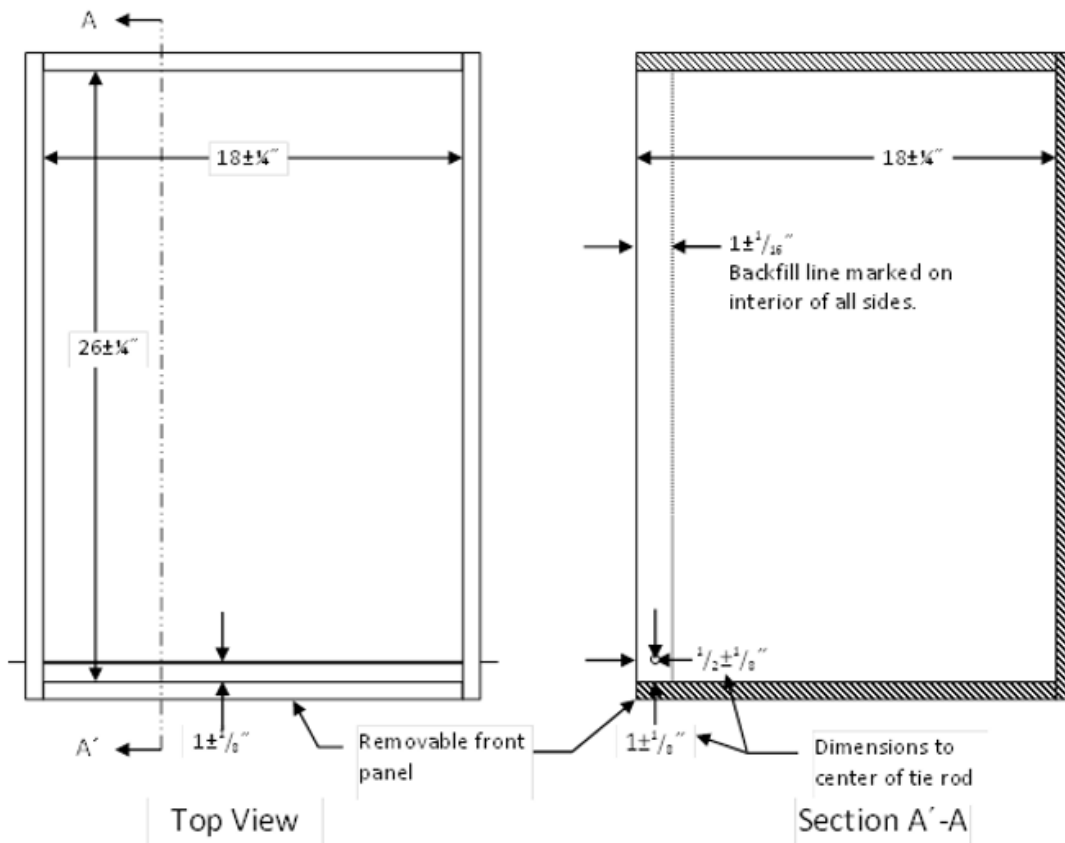
The complete Design Poster must be submitted in PDF format via email to MidPac GeoWall Coordinator, midpacgeowall2017@gmail.com, by 5:00 pm PST on the Saturday one week prior to the MidPac competition. Subject line must include "GeoWall 2017 Poster Submittal." The sender will receive confirmation of receipt by e-mail. Any changes or corrections made to the design poster after this time will incur a penalty (see Section 13).

6. Comparison to National Competition Rules – The design report, sandbox, wall materials, construction process and execution sections of the regional rules are intended to be almost identical to the National Competition Rules. The poster requirements and scoring rubrics are different.

7. Sandbox – The MSE wall will be constructed within an apparatus hereafter referred to as a sandbox. Each team shall bring their own sandbox to the competition. Painting and addition of school or sponsor logos and other decorations to the exterior of the sandbox is highly encouraged. The sandbox shall be made up of a bottom and four vertical sides with no top. The front panel will be removable as shown in Figure 2. The removable box panel will be in place during wall construction and removed after construction to expose the MSE wall. The sandbox will meet the following requirements:

- a) Have exterior walls and base constructed of any grade of plywood not to exceed 3/4-inch (19 mm) thick.
- b) Have planar inside surfaces with the natural plywood finish.
- c) Have a removable front as shown in Figure 2. Panels must be flush with the base of the box and held in place with threaded inserts, screws, hinges or other easily removable fasteners.

- d) Have a full-sized base such that it extends no more than 3/4 inch (19 mm) beyond the base of the wall once the front panel has been removed.
- e) Include a steel tie rod designed to keep the two fixed sides of the box parallel after removal of the facing panel.
- f) Any templates used must be removed after wall construction and before testing.
- g) All dimensions of the sandbox shall be as shown in Figure 2.



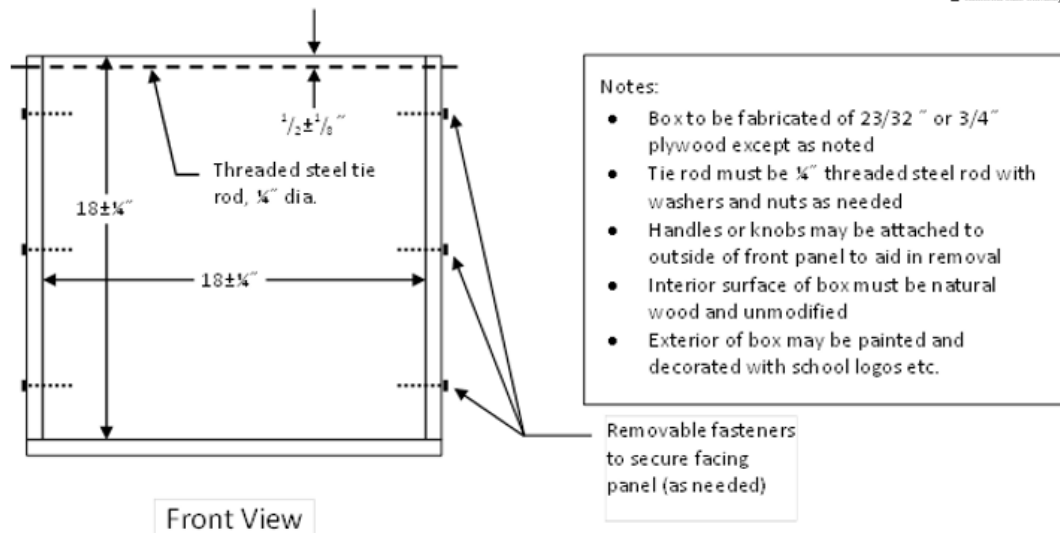


Figure 2: Sandbox dimensions (not to scale)

For convenience, sandboxes may be designed so they can be transported as flat pieces and reassembled at the competition site.

Sandboxes will be checked for compliance at the pre-competition captains' meeting. Teams will have until 9:45 am local time the day of the competition to correct any compliance issues. Any team with a box out of compliance at the start of competition will be penalized.

8. Backfill Material- The backfill material will be sand provided by competition organizers on site. The sand will be a clean, dry, rounded to subrounded sand with grain size as specified in Table 1 and Figure 3. The backfill material must be used as-is: no water, additives, or chemical stabilizers may be placed in the backfill material.

Competition organizers will make reasonable efforts to ensure the competition backfill materials meet the specifications in Table 1 and Figure 3. Teams will be allowed to examine a sample of the competition backfill at the captains' meeting. No backfill samples may be removed from the meeting room. Teams may modify their wall design at this time if they desire. See paragraph 11 below.

Table 1: Representative anticipated grain-size distribution for GeoChallenge competition sand.

Typical Distribution		Lower Bound		Upper Bound	
Size (mm)	% Passing	Size (mm)	% Passing	Size (mm)	% Passing
2.00	100.0	1.30	100.0	2.50	100.0
1.70	96.8	1.20	96.9	2.30	96.9
1.18	41.8	1.15	93.7	2.10	93.7
1.00	15.8	0.80	38.7	1.60	38.7
0.85	3.3	0.60	12.7	1.30	12.7
		0.50	2.0	1.10	2.0

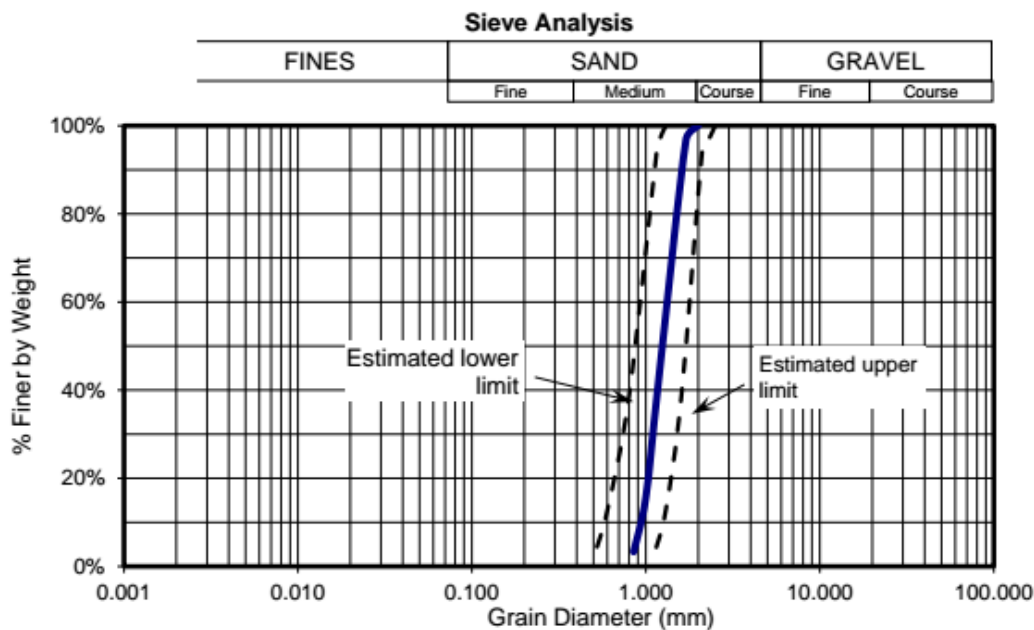


Figure 3: Estimated grain size distribution of backfill sand

9. **Wall Materials** – Materials will be provided by competition organizers on site. See Appendix B for detailed specifications. Facing and reinforcement will be prepared from 60 lb. Kraft paper. Quantity of Kraft paper will be measured by mass to the nearest 0.01g. There are no restrictions on the shape or geometry of reinforcing elements, except that all reinforcement must be cut from Kraft paper. The teams must specify in their report the length of the 24" wide Kraft paper required for their design during the competition.



Competition organizers will make reasonable efforts to ensure the wall materials meet the specifications in Appendix B. Teams will be provided small samples of the reinforcing material at the captains' meeting. No reinforcing material samples may be removed from the meeting room. Teams may modify their wall design at this time if they desire. See paragraph 11 below.

10. Construction Tools - The following construction tools may be used and must be provided by the competing team (quantities of these items shall not be restricted):

- a) Pencils, pens, and markers
- b) Rulers and straight edges
- c) Levels
- d) Manually operated cutting instruments (e.g., scissors, utility knives, razor blades, hole punch)
- e) Cutting boards or mats
- f) Design notes, calculations and drawings
- g) Material handling and compaction tools consisting of any hand operated devices.
- h) Screwdrivers (battery operated drills or screwdrivers may be used, but only to remove fasteners when removing the facing panels)
- i) Temporary templates for use in any stage of competition. May be made of any material, must not have any moving parts, must be removed at the end of any stage in which they are used.

Buckets and shovels will be provided by the competition organizers. It may be necessary for teams to haul backfill a distance up to 20 feet.

11. Execution – Construction and testing of the wall will be done in the following stages:

a) **Reinforcement Fabrication Stage** – Each team will be provided with 60 lb. Kraft paper (as mentioned in the design report). The team must fabricate all their reinforcing elements from those sheets using authorized construction tools. Twenty (20) minutes will be allotted for this stage. Teams will be penalized for time exceeding the time limit. After all reinforcing elements are fabricated, excess material will be disposed of and the judges will weigh the reinforcing elements to the nearest 0.01 grams.

b) **Construction Stage** – After each team's reinforcing elements have been fabricated and weighed, the judges will instruct the team to start construction. During this stage the team constructs the wrapped MSE wall filling the box with sand so that the backfill line (see Figure 2) is covered and the backfill is level, and places the empty 5 gallon vertical surcharge bucket on top of the sand. The facing material must be in direct contact with the inside of the sandbox at all times during this stage. The tie rod may be removed from the box at the start of this stage, but it must be in place before any sand is placed in the box. Temporary templates or guides may be used during this stage so long as they are removed before the end of the stage.



The construction stage is complete when the wall is in place, the sand backfill covers the sand fill line and is level, any temporary templates or guides have been removed, and the empty vertical surcharge loading bucket is in place. Twenty-five (25) minutes will be allotted for this stage. At the end of the phase, judges will check fill placement to ensure it meets requirements.

c) **Loading Stage** – This stage occurs in two steps: 1) removal of front panel and 2) placement of vertical surcharge. During each step, the wall will be checked for the following three criteria: 1) excessive deformation (any portion of the wall extending outside imaginary planes extending vertically from base of sandbox), 2) excessive soil leakage (more than 30 cm³ of sand passing out of the sandbox), and 3) catastrophic failure. The team will be penalized for excessive soil loss and excessive deformation. The team will be disqualified for a catastrophic failure.

- i. When directed by judge, the team shall remove the front panel of the sandbox. After the panels are removed, the judge will wait one (1) minute and then check the three criteria.
- ii. If the wall does not fail catastrophically, the team will then place 60 lbs. of sand in the vertical surcharge bucket centered 5 inches from the back face of the removable front panel. The team will have one (1) minute to place the load. After the load is placed, the judge will wait one (1) minute and then check the three criteria.

12. **Design Changes** – Teams may change their design between the time the design report is submitted and the wall is tested. The adjusted mass of the reinforcing material used for scoring, M , will be computed as

$$\begin{aligned}
 & \text{if } |m_D - m_A| \leq 0.25 & M &= m_A \\
 & \text{if } |m_D - m_A| > 0.25 & M &= \max \left[\begin{array}{l} (m_D - 0.25) - \frac{(m_D - m_A - 0.25)}{2} \\ m_A + \frac{(m_A - m_D - 0.25)}{2} \end{array} \right]
 \end{aligned} \tag{1}$$

Where,
 m_D = reinforcing mass (g) reported in design report;
 m_A = reinforcing mass (g) used during competition;
 M = adjusted mass (g) rounded to two decimal places

13. **Scoring** – After completion of the loading stage, the score for each team will be computed using the following formula:

$$\text{Score} = R + 15(100 - M) - 10N_{\min} - 40N_{\max} - 2T - 20D \tag{2}$$

Where,

- R = report score out of 50 points
- M = adjusted mass of the reinforcement material in grams from Equation 1
- N_{\min} = number of minor rules violations
- N_{\max} = number of major rules violations



T = total number of minutes over time limit for all phases each rounded up to nearest minute

D = deflection rating

8 if wall fails deflection criterion during initial loading without surcharge

4 if wall fails deflection criterion during vertical surcharge loading

0 if wall passes deflection criterion for all loading phases

If the wall fails catastrophically during any loading step, the team will be disqualified.

a) Minor Penalties

i) Box dimension out of spec

ii) Any addendum to the design report required by judges which simply clarifies content but does not change the design

iii) Any other rule violation that in the opinion of the judges that has the potential to provide the team with a measurable but minor advantage

b) Major Penalties

i) Soil leakage greater than 30 cm³ (volume of standard 1 oz. plastic medicine cup)

ii) Any addendum to the design report required by judges which results in a significant change to the design

iii) Any other rule violation that in the opinion of the judges has the potential to provide the team with a significant advantage, but does not warrant disqualification

c) Disqualification – Teams may be disqualified for the following:

i) Failure to send a representative to the pre-competition captains' meeting

ii) Unsafe practices

iii) Design or construction techniques which violate the spirit of the competition and provide a large and unfair advantage

iv) Catastrophic wall failure at any point during the loading

Scores will be recorded to the nearest tenth of a point. In the event of a tie the following criteria will be used, in order, to break the tie: 1) lowest actual reinforcement mass, 2) higher report score, 3) lowest deflection rating, and 4) judges' consensus of best decorated box.

The judges will follow the rules as published using reasonable judgment and interpretation. The head judge will be the arbiter of any disputes, which are to be brought forth solely by the Team Captain. Decisions of the head judge are final. Results posted at the competition are not subject to review after the competition.



Scoring Example: Assume a team constructs a wall with following characteristics

- Report Score: 48/50, $R = 48$
- Design report specifies 86.23 g. Reinforcement used is 87.01 g.

$$M = 87.01 + \frac{87.01 - 86.23 - 0.25}{2}$$

$$M = 87.28g$$

- Minor deduction for two box dimensions out of spec, $N_{min} = 2$
- Execution times were
 - Reinforcement fabrication: 20:18 (18 sec over allotted time, round up to 1 min)
 - Construction: 26:05 (1:05 over allotted time, round up to 2 min)
 - Total time over: 3 min, $T = 3$
Note: Only times over limit during each stage are counted. Teams get no benefit for times under the limit of any individual stage.
- Wall passed deflection test in initial loading without surcharge but failed deflection test during vertical surcharge loading phase, $D = 4$

Using equation 2, the final score would be

$$\begin{aligned} \text{Score} &= 48 + 15(60 - 47.28) - 10(1) - 40(0) - 2(3) - 20(4) \\ &= 142.8 \end{aligned}$$

See Appendix D for scoring checklists.

See Appendix E for scoring checklists.

14. Pre-Competition Team Captains' Meeting – A team captain's' meeting will be held prior to the competition for the purposes of: checking sandboxes for compliance, establishing competition order, gathering team biographical information, and disseminating any logistical or administrative information. This is a MANDATORY meeting. Each team must have the team captain (or designee) present. Specific meeting time and location will be announced (APP OR FOLDER). Teams without a representative at the captains' meeting will be disqualified.

Teams should bring their sandboxes and any hardware or tools needed for assembly. Sandboxes will be assembled and checked for compliance at the meeting. Teams will have until 9:45 am local time of the day of the competition to correct any compliance issues identified during the captains' meeting. Any sandboxes found out of compliance at the captains' meeting will be rechecked at this time.

Teams shall complete Appendices G and H and bring copies to the captains' meeting. The information on these forms will be used by the emcee during the competition.



Appendices



Appendix A: Reimbursements

This form is to be submitted with your design report.

This year, any monies due to competitors will be paid to a representative of your university. Examples of valid representatives are your faculty advisor or your departmental accounting administrative assistant.

Unacceptable representatives include students, parents, friends, etc.

Please provide complete contact information for this representative.

School	
Name of Representative	
Position at Institution	
Complete Mailing Address	
Phone	
Email Address	



Appendix B: Material Specifications

- Sand:
 - Clean sand with grain size distribution as specified in Table 1 and Figure 3
 - Grain shape will be rounded to sub-rounded
- Sandbox Material:
 - Walls and Base: 23/32 or 3/4" plywood, any grade
 - Tie Rod: 1/4" threaded steel rod with washers as nuts as needed
 - Fasteners: any suitable wood fasteners
- Facing and Reinforcing Material:
 - 60 lb. Kraft Paper
 - Grammage: 97.7 g/m², 0.063 g/in²
 - Office Depot® Postal Wrap Item #444835 (2' x 50' roll)



Appendix C: Design Paper Judging Rubric

Mid-Pacific GeoWall Design Paper – Scoring Form			
Reviewer Guidelines: 1) Place weight on the team ability for engineering reasoning not technical knowledge; 2) Place weight on team communication skills on procedures, findings and observations; 3) Score in 0.5-point increments; 4) Team to be awarded higher score if verifying design parameters beyond assumptions and references			
Criterion	Max	Actual	Notes
1) Formatting, Mechanics, Grammar & Safety			
a. Paper length, margins & font are acceptable	1		Paper complies with specifications
b. Layout, or structure, of paper is logical	1		Paper organization is clear and supports the message.
c. Grammar and punctuation are correct	1		Error free paper with writing that clearly presents design.
d. Figures & tables are clear, properly numbered, captioned and referenced in the text	1		Good choice of tables vs. figures, clear presentation of data.
e. References are reasonably formatted and complete	1		Quantity appropriate with correct citations and references
f. Appendix A and safety appendix complete with reasonable controls	1		Clearly identifies key safety concerns and provides viable plans to keep team safe during competition.
2) Experimental Methods, Analyses and Design:			
a. Methods to obtain soil properties	2		Experimental methods are reasonable and clearly described
b. Methods to determine reinforcement properties	2		Experimental methods are reasonable and clearly described
c. Methods to determine backfill-reinforcement interaction	2		Experimental methods are reasonable and clearly described
d. Engineering properties are reasonable	2		Backfill unit weight, friction angle, interface friction angle, reinforcement strength are compared to typical values
e. Earth-pressure calculations (backfill only)	2		Calculations are correct and presented in a logical, readily followed format
f. Vertical surcharge load included in the design	2		Considers both lateral loads on wall and effect on reinforcement pullout
g. Method used to account for segmental front face	2		Method and assumptions are reasonable
h. Determination of reinforcement length	2		Method and assumptions are reasonable

i. Determination of reinforcement spacing	2		Method and assumptions are reasonable
3) Engineering Reasoning and Communication			
The report is, on the whole, clear, precise, and well-reasoned. Engineering terms and distinctions are used effectively and in keeping with established professional usage. The report demonstrates a clear and precise analysis of the MSE wall design problem, very little or no irrelevant information is presented, key assumptions are identified, and key concepts are clarified. The authors have shown, through their report, excellent engineering reasoning and problem-solving skills.	10		Scores may range from 0 to 10. It is the opinion of the reviewer as to how the overall report measures up to the criteria listed under item 3 "engineering reasoning and communication".
Total	40		



Appendix D: Design Poster Judging Rubric

Mid-Pacific GeoWall Design Poster– Scoring Form			
Reviewer Guidelines: Reviewer Guidelines: 1) Place weight on the team ability for engineering reasoning not technical knowledge 2) Place weight on team communication skills on procedures, findings and observations 3) Score in 0.5-point increments 4) Team to be awarded a higher score if verifying design parameters beyond assumptions and references			
Criterion	Max	Actual	Notes
1) Formatting, Mechanics, Grammar & Safety			
a. Poster size (24x36" max), headings, fonts, margins and layout	1		Poster complies with specifications
b. Grammar and punctuation are correct	1		Error free poster with writing that clearly presents design.
c. Figures & tables are clear, properly numbered, captioned and referenced in the text	1		Good choice of tables vs. figures, clear presentation of data.
d. References are reasonably formatted and complete	1		Quantity appropriate with correct citations and references
2) Experimental Methods, Analyses and Design:			
a. Conveys the Experimental Methods, Analyses and Design steps used to plan the GeoWall construction	3		Experimental methods, analyses, and design of the project are displayed. This is not as in-depth as the report, but technical enough for another engineer to grasp the concepts and gain an understanding of the GeoWall Competition.
3) Engineering Reasoning and Communication			
The poster is, on the whole, clear, precise, and well-reasoned. Engineering terms and distinctions are used effectively and in keeping with established professional usage. The report demonstrates a clear and precise analysis of the MSE wall design problem, very little or no irrelevant information is presented, key assumptions are identified, and key concepts are clarified. The authors have shown, through their report, excellent engineering reasoning and problem-solving skills.	3		Scores may range from 0 to 3. It is the opinion of the reviewer as to how the overall report measures up to the criteria listed under item 3 "engineering reasoning and communication".
b. Answering judges questions	10		This score reflects the team's ability to professionally answer the judge's questions and clearly explain the material.
Total	20		



Appendix E: Judges' Scoring Checklist for GeoWall Competition
E1: Captains' Meeting—Box check

Team School:		Deductions	
Item	Instruction	Minor	Major
Plywood	23/32 or 3/4" thickness		
	Inside surfaces planar and natural		
Box dimensions	Within tolerance		
	Sand fill height marked		
Facing panels	Flush to box base		
	Removable fasteners		
	Base extends to outside of vertical facing panels		
Tie rod	1/4" dia		
	Located within tolerances		
Tools	Only authorized tools used		
Other minor, explain:			
Other major, explain:			
Disqualification, explain:			
	Total deductions		

Notes:

E2: Reinforcement fabrication

Item	Instruction	Time	
		Total	> 20:00 (Min:sec)
Time	Give start command. Time ends when all elements cut to size and shape		
		Mass (g)	
		Design	Actual
Mass	Weigh reinforcement to nearest 0.01 g		
	Compute official adjusted Mass, M , using Equation 2	$M =$	
		Deductions	
		Minor	Major
Deductions			
Tools	Only authorized tools used		
Safety	No mishaps		
Other, explain			
	Total deductions		

Notes:

E3: Construction

Item	Instruction	Time	
		Total	> 25:00 (Min:sec)
	Time Give start command. Time ends when soil filled to line and empty bucket is in place		
		Deductions	
		Minor	Major
Backfill	Level Filled to fill line		
Tools	Only authorized tools used		
Safety	No mishaps		
Total deductions			

Notes:

E4: Loading

Team School:			
Item	Instruction		
Stage 1: Backfill only	<ul style="list-style-type: none"> Place clean posterboard on floor in front and sides of box At judge's direction students remove panels from box. Electric drills/screwdriver may be used to remove fasteners. Once panels are completely removed start 1 min wait period At end of 1 min make following checks 		
	<input type="checkbox"/> Swipe front wall front and sides with straight edge to check wall deflection	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail $D = 8$
	<input type="checkbox"/> Less than 30 cm ³ sand leaked from box onto floor	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail Major Ded
	<input type="checkbox"/> Catastrophic failure	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail Disqualified
Stage 2: Vertical Surcharge	<ul style="list-style-type: none"> Bucket preweighed with 60 lbs of sand should be ready. At judge's direction students add 60 lbs of sand to surcharge bucket. Students have one minute to complete loading. Once load is placed start 1 min wait period At end of 1 min make following checks 		
	<input type="checkbox"/> Loading complete within 1 minute	<input type="checkbox"/> Yes	<input type="checkbox"/> No Minor Ded
	<input type="checkbox"/> Swipe wall front and sides with straight edge to check wall deflection	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail $D = 4$
	<input type="checkbox"/> Less than 30 cm ³ sand leaked from box onto floor	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail Major Ded
	<input type="checkbox"/> Catastrophic failure	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail Disqualified

E5: Scoring

Adjusted mass, M , computed by

$$\begin{aligned}
 &\text{if } |m_D - m_A| \leq 0.25 && M = m_A \\
 &\text{if } |m_D - m_A| > 0.25 && M = \max \left[\begin{array}{l} (m_D - 0.25) - \frac{(m_D - m_A - 0.25)}{2} \\ m_A + \frac{(m_A - m_D - 0.25)}{2} \end{array} \right]
 \end{aligned}$$

$$\text{Score} = R + 15(100 - M) - 10N_{\min} - 40N_{\text{maj}} - 2T - 20D$$

Team School:			
Item	Score	Weight	Extended
Report score out of 50, R		1	
Reinforcement mass score, enter as $(60 - M)$		15	
Total # of minor deductions, N_{\min}		-10	
Total # of major deductions, N_{maj}		-40	
Total time over limit rounded up to nearest whole minute, T		-2	
Deflection rating, D 8 = Deflection exceeded at Stage 1 4 = Deflection exceeded at Stage 2 0 = Deflection never exceeded		-20	
Catastrophic failure any Stage disqualifies the team	DQ	Stage #	
		Final Score	

Notes:



Appendix F: Safety Appendix

This section is intended for each team to consider the competition steps and manage safety risk. Use rows as necessary.

Title	Work Task	Hazards	Controls

Notes:

1) Safety mishaps that result in bleeding will be classified as "major."



Appendix G: Bio-form to be completed by each team captain and submitted to the head judge at the pre-competition meeting

<p>Mid-Pacific Conference 2017</p> <p>GeoWall Competition Bios</p>
Team School:
Team Mascot:
No. of Years Competing at Nationals:
Team Advisor:
Team Captain:
Current Year in School (junior, senior, MS, or PhD):
Hometown (City and State or Country)
Other School Activities:
Interests/Hobbies:
Future Plans, e.g., graduate school, consulting, government, other?

Geographical preferences?



Appendix H: Bio-form to be completed by each team member and submitted to the head judge at the pre-competition meeting

<p style="text-align: center;">Mid-Pacific Conference 2017</p> <p style="text-align: center;">GeoWall Competition Bios</p>
Team School:
Team Mascot:
No. of Years Competing at Nationals:
Team Advisor:
Team Member:
Current Year in School (junior, senior, MS, or PhD):
Hometown (City and State or Country)
Other School Activities:
Interests/Hobbies:
Future Plans, e.g., graduate school, consulting, government, other?



Geographical preferences?



WATER RESEARCH

Competition Date: Friday, April 21st, 2017

Competition Location: Chico State Campus

Summary:

The Mid-Pac Student Water Research Competition is an initiative to promote the education of undergraduate/graduate students in various water and wastewater related topics. Winners of the competition receive a cash prize.

Submission Deadline:

Please submit your paper (in PDF format) by March 18th, 2017 and oral presentation PowerPoint (or equivalent) by April 15th, 2017 to

midpac2017waterresearch@gmail.com.

Contact:

For questions regarding the water research competition contact:

Carole Wigno

midpac2017waterresearch@gmail.com



Rules:

Topic

This year's topics should focus on research relating to the sustainable use of groundwater.

Examples include:

- Research findings, including literature reviews, field studies, or mathematical modeling studies on overuse of groundwater and its associated effects, such as, but not limited to, inelastic land subsidence, degradation of water quality (e.g., seawater intrusion), significant lowering of groundwater levels and storage, and streamflow depletion.
- Papers describing policies for sustainably managing groundwater supplies in areas where there are competing uses for groundwater.
- Papers or research describing the role of groundwater during drought, vulnerability of groundwater to climate change, and determination of the safe or sustainable yield of groundwater systems.
- Papers or design reports describing strategies for sustainably managing surface water groundwater systems, such as managed aquifer recharge, changes in agricultural practices, conjunctive use, land fallowing, and water transfers.

Paper

The paper must include/will be:

- ❖ Limited to 10 total typed pages of less than 5,000 words
 - An appendix, if included, will not count against either the final page or word count; however, the appendix should be clearly marked as such in the report in order to ensure this.
 - A references section would also be excluded from the final page and word count.
- ❖ Use an 11-point font and line spacing set to 1.5.
- ❖ A descriptive title.
- ❖ Author's full name, department and university address, and email.
- ❖ An abstract of 350 words or less.

The paper should generally include the following, although not all may be applicable to a given topic:

- ❖ An introduction, which should include citations of published related work to assess previous research and identify the gaps in knowledge, as well as a statement of the objectives of the work.
- ❖ Sections on methodology, results, discussion and conclusions, and an appendix. (Again, appendices will not count against page or word count.)



- ❖ An acknowledgment section following the conclusions, which may include any credits for funding or for assistance in the study. Faculty advisors cannot be listed as coauthors; however, they may act in an advisory capacity, and should be listed in an acknowledgment.
- ❖ A list of references, alphabetized by the last name of the first author cited. Students are encouraged to use Water Environment Research reference formatting guidelines, which can be found at the following website: <http://www.wef.org/Publications/page.aspx?id=2834> (Again, a references section will not count against the final page or word count.)

Oral Presentation

- ❖ Each paper must be formally presented at the conference.
- ❖ Presentations must be no longer than 5 minutes in duration (± 10 seconds without penalty).
 - Presentations that go beyond the 10 second allowance will receive a 0.05 point penalty per second difference from the buffer, i.e. a final time of 5:30 or 4:30 would each receive a 1 point deduction for being 20 seconds outside of the buffer.
- ❖ A 5-minute question and answer period will immediately follow the presentation.
- ❖ Presentations should be accompanied by a visual aid of some kind (e.g. PowerPoint).

Competition Scoring

Scoring will be out of 100 points total with a maximum of 75 points for the paper and a maximum of 25 points for the oral presentation. This breaks down as follows:

Paper Scoring Criteria	Score	Presentation Scoring Criteria	Score
1. Originality	/20	1. Addressing the paper's main points	/10
2. Technical content	/20	2. Convincing support	/5
3. Clarity, professional quality, and references	/15	3. Delivery	/5
4. Relevancy to topic	/5	4. Question and Answer	/5
5. Abstract	/10	Deduction for time (5 min \pm 10 sec) *	
6. Spelling and grammar	/5		
Paper Sub-Total	/75	Presentation Sub-Total	/25
Overall Score		/100	



*beyond 10 second allowance: 0.05 point penalty per second difference from the buffer, i.e. 5:30 or 4:30 = 1 point deduction)

The overall scores will be tallied and the papers ranked accordingly. Top placing papers will be awarded cash prizes

1st place: \$100

2nd place: \$75

3rd place: \$50

Authorship and Submission Requirements

Authorship

The paper and presentation are to be done individually. Only one contestant from each participating school may enter the competition and write the paper. Faculty advisors should be listed in an acknowledgement section. Entrants must be a current undergraduate/graduate student to be eligible for this competition. Faculty advisors cannot be listed as coauthors.

Submission Requirements

To be eligible for the Mid-Pac 2017 Student Research Competition, the paper shall be sent electronically (PDF format) to midpac2017waterresearch@gmail.com by March 18th, 2017.



WATER TREATMENT COMPETITION

Competition Date: Thursday, April 20th, 2017

Friday, April 21st, 2017

Competition Location: Chico State Campus

Summary:

Water is one of the most precious commodities on earth, which is why protecting its quality as well as coming up with innovative ways to treat it is so important. The ASCE Mid-Pac Student Water Treatment Competition includes the research, design, presentation, and hands-on construction of a treatment filter made of supplies found in a hardware store. The filter is loaded with a standardized simulated wastewater to test and rank the participants, who are from ASCE student chapters across California, China, and Canada.

The competition allows civil and environmental engineering students to apply principles of wastewater treatment design in a collaborative and empirical manner under a real-world situation. It provides students an opportunity to increase leadership and project management skills and to increase awareness of technologies and opportunities in the water/wastewater fields by way of engaging with other students, faculty, and industry professionals on a practical design project. The Water Treatment Competition occurs at the Mid-Pacific Conference, which will be hosted at the California State University, Chico this school year from April 20 – 22, 2017.

Contact:

Water Treatment Competition Coordinator

Whitney Brown

Send submissions and questions via email to: watertreatmentmidpac2017@gmail.com.



Important Deadlines:

- Registration – December 4, 2016 via “School Registration” form provided in Mailer I
- Questions and materials requests – Emailed by Sunday, December 18, 2016
- Design report – Submitted electronically (in PDF format) by midnight Saturday, March 18, 2017
- Presentation – Submitted electronically by midnight April 15, 2017

*Failure to comply with the deadlines listed above will result in your team’s immediate disqualification in the competition.

Rules:

Scenario

Mt. Lassen erupted sending gases and volcanic ash out for miles, a few were able to escape the destruction but some were not so lucky. The neighborhood is destroyed with no power or running water and any fresh water supply is severely contaminated. A disaster relief center opened up to supply you with some food, bottled water and medical supplies, but with no viable water source nearby the resources will be depleted in no time. With no knowledge of being relocated to a more sustainable area, it could be months living this way.

Not being able to sit around doing nothing you decide to check out some water sources in the area and find an irrigation canal down the street. Unfortunately, the water is worse than usual because it has become stagnant from all the ash and debris after the eruption. All the fish and amphibious life forms have suffocated from the pollution but it is the only nearby water source that is easily accessible for continuous use. Fortunately, you know a thing or two about water resources engineering and decide to assemble a few of the town’s people to scavenge for supplies to design a reusable and efficient water treatment filtration system to supply people in the area with fresh water for drinking and bathing. So let’s get to work!



Inlet Water Constituents

Two (2) 5-gallon buckets total will be prepared for each team. All constituents will be added and stirred 24 hours prior and then stirred again 5 minutes before filter loading phase.

Per 5-gallon bucket:

- 4.5 Gallons of Water
- Miracle Grow Potting Soil
- Frontier Charcoal Briquettes
- Iodized Salt
- Vegetable Oil
- Food Dye
- Distilled Vinegar

Water Quality Testing

Immediately after filter construction and loading, the final treated water will be tested using university laboratory equipment. Results will be provided before the team's oral presentation. The following six (6) water quality parameters of your final treated product will be graded based on the scoring methods described below. The water quality section is worth 30 total points.

pH Value:

Target: Range is between 6.5 and 7

Grading: Between 6.5 and 7 will result in 5 Points

$6 \leq \text{pH} < 6.5$ or $7 < \text{pH} \leq 7.5$ will result in 4 points



$5.5 \leq \text{pH} < 6$ or $7.5 < \text{pH} \leq 8$ will result in 3 points

$5 \leq \text{pH} < 5.5$ or $8 < \text{pH} \leq 8.5$ will result in 2 points

$4.5 \leq \text{pH} < 5$ or $8.5 < \text{pH} \leq 9$ will result in 1 point

All other pH ranges will result in 0 points

Turbidity

Target: Minimal NTU

Grading: (Your rank / best team's rank) * 5 points

Electric Conductivity

Target: Minimal $\mu\text{S}/\text{cm}$

Grading: (Your rank / best team's rank) * 5 points

Volume

Target: 9 gallons

Grading: (Your effluent volume (gal) / 9 gallons) * 5 points

Note: There is a maximum of 5 points allotted for volume. It is conceivable, however unlikely, that a team could have a volume greater than 9-gallons; in that case, they would still only receive 5 points.

Total Free/Available Chlorine

Target: 4 ppm

Grading: (Your rank / best team's rank) * 5 points

Dissolved Oxygen

Target: 100% DO



Grading:

100% DO will result in 5 points

$90\% \leq DO < 100\%$ or $100\% < DO \leq 110\%$ will result in 4 points

$80\% \leq DO < 90\%$ or $110\% < DO \leq 120\%$ will result in 3 points

$70\% \leq DO < 80\%$ or $120\% < DO \leq 130\%$ will result in 2 points

$60\% \leq DO < 70\%$ or $130\% < DO \leq 140\%$ will result in 1 point

All other DO values outside of these ranges will result in 0 points.

DESIGN REPORT

Each team is required to submit a design report detailing the overall project and must include a description of the design process, treatment principles utilized, environmental impacts, a cost analysis, and tables of material and operational costs. The design report is worth 25 total points. Please submit an electronic version of your report (in PDF format) via email to watertreatmentmidpac2017@gmail.com by no later than midnight on March 18, 2017 (11:59 PM). A hard copy submission is not required.

Formatting

One (1) point will be deducted from the team's report score for each violation:

- **Report Cover Page:** Must contain school name, team name, and competition name: "2017 ASCE Mid-Pacific Student Water Treatment Competition."
- **Table of Contents:** Limited to a total of one (1) page.
- **Body of Work:**
 - o Must be a minimum of 1000 words
 - o May not exceed eight (8) pages
 - o Use 12-point font, single spaced, and 1-inch margins on all sides



- o Apart from headings, Times New Roman or Arial font must be used, and the text shall have normal width character spacing
 - o Headings may be of any font, size or color
 - o Body pages shall be numbered, beginning with '1'
 - o Captions used for any photographs, tables, line drawings, graphs or other figures shall have normal width character spacing and be no less than 10-point font.
- **Appendices:** Pages shall be numbered in such a way that the appendix and page number are clearly listed (i.e. A1, A2, B1, B2, etc.). There is no limit to appendix length, but it must only contain relevant materials.
 - **Paper:** The Body of Work shall be presented on 8 ½" x 11" with portrait-orientated pages. Appendices shall also be presented on 8 ½" x 11"; however, they may include landscape oriented pages.
 - **Miscellaneous:**
 - o Photographs, tables, line drawings, graphs, headers, and footers shall be permitted and shall be counted as part of the page limits defined above.
 - o A list of references or works cited should be included (if necessary), and will not count towards the report page limit.

Body of Work Content

The design report must include the following content. The point distribution for grading of each section is denoted in parenthesis.

- **Filter Discussion (15):** The body of the design report shall contain an overview of the filter and how it works. The filter design will be judged based on the approach each team used to solve the problem as well as the industry treatment principles implemented in the design process. This section must include clear descriptions of test results, engineering design processes, and the filters success in achieving the water quality requirements. Any advisors on the project shall be recognized.
- **Materials and Cost Analysis (3):** The design report must include a material list with brief explanation and justification of each material selected. See Appendix A for list of



permitted materials. The design report must include a cost analysis, which must include both a material cost estimate and an operational cost estimate. The total cost will be taken as a sum of the material and labor costs. Teams will be ranked by lowest cost estimate.

- **Sustainability (3):** The design report must include an explanation of the sustainability aspects of your filter. This section may include the environmental impacts of materials used to design your filter and decisions made regarding choices to minimize cost or reduce environmental impact.
- **Professional Quality (4):** Professional quality of the design report will be based on organization, appearance, and use of language.

Plagiarism of any kind will not be tolerated. Teams caught plagiarizing any portion of their design report will be disqualified.

CONSTRUCTION AND LOADING

Teams will construct their filter design as shown on their technical report. This phase will include construction, filter loading, and transportation of effluent to the testing lab. This section is worth 20 total points, and will be judged based on orderliness of construction site, construction time, cost of treatment system, and overall teamwork – See scoring and deduction methods described below as well as the breakdown of competition scoring on page 12 for the point distribution.

Site Constraints

The teams will each be given a 10' x 10' area to construct their filters defined by lines on the floor. The site limits will be measured from the inside of the boundary marker. Neither operators nor materials may exceed the boundaries of the area. All sites will be located on level concrete or another hard surface. Teams will be scored on their utilization of the space, the orderliness of the site during construction, and the operators' safety and overall teamwork.



Time Constraints

Teams will be timed on the construction of their filters. Each team will be limited to a total of thirty (30) minutes in which to construct the treatment systems. The treatment phase will follow and includes ten (10) minutes for teams to load their systems and a twenty (20) minute treatment period. The collection basin must be removed from the treatment system immediately following the treatment phase.

Construction Details

Teams will construct their systems in a 10' x 10' space. Site limits will be based on the inside of the placed markers, using a marking tape.

- Teams will place all their unassembled raw materials and tools in the competition area. Prior to beginning the construction phase, judges will compare the provided materials list in the team's technical report to the materials present at the competition.
- Teams shall not pre-mark, pre-assemble, pre-cut or tamper with materials prior to beginning of the construction, although decoration is encouraged. In order to mark any materials, teams must provide their own markers, tape measure, measuring cups, and scales, on an as-needed basis. Teams should list marking materials neither in the materials list or discuss them in the cost analysis.
- All construction materials should be sorted to match the quantity lengths provided in the Competition Rules. For example, lumber should be 4 linear feet prior to bringing the material to the competition regardless of the initial length of purchase.
- All prewashed materials must be dry and should be placed in their original packaging, with the exception of loose sand, GAC, pebbles, and lava rocks which can be placed in clear containers based on the predetermined quantity sizes in Appendix A. A burlap sack may be used instead of a clear container, but should be opened for judges to inspect. Packaging shall not be added to the materials list or the cost analysis portion of the design report. All materials not being prewashed should be in their sealed state, as if purchased from the store. For example, if hydrogen peroxide is purchased, the hydrogen peroxide bottle should be sealed in the manner bought from the store.
- Powered saws or power blades are not permitted.
- Battery-powered tools are permitted, with the exception being the items listed in the above detail. Corded power tools of any kind are not permitted.



- Teams must provide their own tools based on the approved list given in the Competition Rules, Appendix B.
- Teams may use up to 4 operators to construct the team's system. Construction time will start once the chief operator says "ready" and the judge will start the clock. Construction time will end once the chief operator says "stop" and the judge will stop the clock.
- Once the chief operator says "stop" teams may not re-enter the construction region, until the filter loading phase.
- Teams will be given a maximum of 30 minutes for the construction of the system.
- Treatment systems must include a collection basin capable of holding 9 gallons of water.

Treatment Phase

At a designated start time, the 10-minute loading period will begin, in which only 2 operators from each team may add any treatment chemicals to their effluent. A stirring stick will be provided. Operators must be outside of their construction site before the end of the 10-minute loading period. Teams will then have 20 minutes for the treatment system to work. The collection basin must be removed from the treatment system immediately following the 30-minute treatment phase.

Scoring and Deductions:

The Construction category is worth 20 points out of the 100 total points in the competition. Construction points will be based on the construction time remaining (13 points), the cost of the treatment system (5 points), the orderliness of their site during construction (1 point), and the operators' overall teamwork (1 point). The orderliness of their site during the construction phase, and the operators' overall teamwork will be determined based on the judge's discretion.

Points for construction time will be awarded based on the following equation:

$(\text{Your rank} / \text{best team's rank}) * 13 \text{ points}$

Deductions affect the overall "Construction" subcategory score.



- Any violation of construction limits will result in a 1-point deduction (i.e. each time an operator or a construction material goes outside the 10' X 10' boundary during the construction phase, 1-point will be deducted).
- Any pre-marked, pre-assembled, pre-cut or tampered materials will result in a 1-point deduction.
- 1-point deduction for any time an operator begins constructing prior to the judge starting the stopwatch.
- Any materials not present in the team's materials list but located in the team's design report will result in a 1-point deduction.
- Any tools used that are not present in Competition Rules, Appendix B, will result in a 2-point deduction per tool.
- Usage of powered saws or powered blades will result in a 5-point deduction.
- Teams using more than 4 operators will be asked to dismiss the extra operators; ignorance of this request will result in the team's disqualification.
- A point will be deducted from the team's construction score for every time a worker or material touches or enters into the site boundary during the treatment phase.

Note: It is not possible to lose more than 15 points. Clear violation of ethical practices, based on judge's discretion, will result in disqualification of the team.

Cost of Treatment System

The cost of the treatment system is worth 5 points. The lowest cost treatment system will receive the most points. This includes the cost of construction (i.e. operator costs).

Points will be awarded based on the following equation:

$(\text{Your rank} / \text{best team's rank}) * 5 \text{ points}$



Safety

Safety is a vital part of this competition. Operators must wear hard hats, safety gloves, safety glasses, closed-toed shoes, and long pants at all times during the construction and treatment phases. If at any point the judge deems safety is being violated by a team, the team's construction will come to a halt and the judge will advise the team on best safety practices, while the stopwatch continues running. Any person handling chemical must be wearing a long-sleeved shirt or other article of clothing to cover arms.

POSTER PRESENTATION

Each team must display a poster board of dimensions no larger than 36" x 24" next to their work site. The posters will be judged by the parameters listed below. The point distribution for each is denoted in parenthesis. The poster section is worth a total of five (5) points. Themes are encouraged.

- **Technical Content (2):** The poster must contain, at a minimum, the purpose of the competition, an overview of the filter design, the material list, and the filter cost.
- **Presentation/Q&A (2):** Immediately after the filter construction phase, at least one member of the team must be present to answer any questions about the poster and/or construction to a judge.
- **Professional Quality (1):** Professional quality of the poster will be scored based on organization, appearance, and use of language.

Stands will not count toward the space limitation of the board. Additionally, teams will provide their own poster stands and/or any other equipment required to display the poster.

ORAL PRESENTATION

The final component of the competition is an oral presentation. Judges will award points based on the team's professionalism and clarity in presenting the design process and analysis of their filter design performance. Oral presentations shall be presented in English. Presentation order shall be randomly



selected before the competition begins and shall be provided at the time of on-site registration. The oral presentations shall be open to the public for viewing; however, once a presentation begins, the doors will be closed until it ends. People will not be allowed to enter the room once a presentation begins.

Teams are required to use PowerPoint to present their projects. Please submit your team's PowerPoint presentation via email to watertreatmentmidpac2017@gmail.com by midnight on April 15, 2017 (11:59 PM). If you need to request changes made to your slide show after the submission date, you may be allowed to do so, but 4 points will be deducted from your overall Oral Presentation score.

Please note that each team will be presented with their water quality results at least ten (10) minutes before the start time of their presentation. Teams may choose to incorporate these results from the water quality phase into their presentation.

Scoring

The presentations will be scored by the parameters listed below. Point distribution is denoted in parenthesis. The presentation section is worth a total of 20 points.

- **Technical Content (8):** Presentations must include, at least, the filter design and treatment process used, materials used, a cost analysis, and sustainability aspects. The content may be presented in any order and is not limited to these components.
- **Oral Presentation (4):** The duration of the oral presentation is limited to ten (10) minutes. Within this time, six (6) minutes will be allotted to the presentation, and four (4) minutes will be allotted to the question-and-answer session. There will be a 5-second grace period to account for timer (stopwatch) reaction. The presentation shall discuss the design reasoning and give an analysis of the filter performance in a clear and concise manner. No more than two team members may present the PowerPoint and answer questions.
- **Visuals (3):** Teams may only use PowerPoint for their presentations. The maximum length is 20 slides. Teams shall use visual aid including graphs or photographs that enhance the product of the presentation.



- **Question & Answer (5):** There will be question-and-answer session immediately following the presentation. Only the panel judges will be permitted to ask questions. The number of questions asked is limited to the 3-minute time frame.

Deductions

After a 1-point deduction for exceeding the allotted presentation time, for every 10 seconds following the maximum 6 minutes and 5 seconds, teams will be deducted 1 point. See below:

6:06 – 6:15 1-point deduction

6:16 – 6:25 2-point deduction

6:26 – 6:35 3-point deduction and so on...

COMPETITION SCORING

A breakdown of points per section of the competition is detailed below. Please refer all water treatment competition related questions to watertreatmentmidpac2017@gmail.com.

Table 1: Competition Scoring by Points Summary

Category	Sub-Category	Points
Water Quality	pH	5
	Turbidity	5
	Total Free/Available Chlorine	5
	Electrical Conductivity	5
	Dissolved Oxygen	5
	Volume	5

	Subtotal	/30
Design Report	Filter Design & Analysis	15
	Materials List/Cost Analysis	3
	Sustainability	4
	Professional Quality	3
	Subtotal	/25
Poster Presentation	Technical Content	2
	Professional Quality	1
	Presentation and Q&A	2
	Subtotal	/5
Oral Presentation	Technical Content	8
	Visuals	3
	Oral Presentation	4
	Q&A Session	5
	Subtotal	/20
Construction	Construction Time	13
	Utilization of Space	5
	Orderliness of Construction Site	1
	Overall Teamwork	1
	Subtotal	/20
Total		/100



Appendices



Appendix A: Materials List

Each team is permitted to submit a request to add two (2) materials or tools to this list. Please submit for approval to watertreatmentmidpac2017@gmail.com by December 18, 2016. If your suggestions are accepted, these materials will become accessible to all teams.

Note: All items must be in its original packaging (see exceptions in construction details). For example, if a store sells hardware cloth in 10 square feet sizes, bring the unopened packaging to the competition. The hardware cloth will therefore be charged as \$6.70 in the cost analysis section of the design report, regardless of how much is used during the construction phase.

Table 2: List of Available Materials for Filter Design

Number	Item	Unit	Cost (\$/unit)
1	1/2" Hardware Cloth	/sq. ft.	0.67
2	1/2" I.D. Soaker Hose	/lin. ft.	0.36
3	1/4" Hardware Cloth	/sq. ft.	0.53
4	1" High Pressure Washer Hose	/lin. ft.	2.50
5	13 Gallon Trash Can	/unit	5.00
6	16 Qt. Igloo Can Cooler	/unit	23.00
7	2' Ladder	/unit	30.00
8	2" Adjustable Spring Clamp	/unit	6.00
9	2" PVC Pipe Elbow	/unit	3.00
10	2"x4" 3M Steel Wool	/unit	0.83
11	20 Gallon Trash Can	/unit	8.00
12	2"x4" Dimensional Lumber	/4 lin. ft.	1.70
13	2"x6" Dimensional Lumber	/4 lin. ft.	2.44

14	3/4" Black Electrical Tape	/lin. ft.	0.06
15	3/4" Thick Plywood	/4 sq. ft.	1.06
16	3/8" Nylon Rope	/lin. ft.	0.20
17	3/8" Thick Plywood	/4 sq. ft.	2.00
18	30 Gallon Tote	/unit	12.00
19	32 Gallon Trash Can	/unit	13.00
20	36 Gallon Garbage Bag	/unit	0.63
21	3M Compressed Air Dust Remover	/unit	4.67
22	4' Ladder	/unit	40.00
23	409 Original Cleaner	/fl. oz.	0.16
24	4"x4" Dimensional Lumber	/4 lin. ft.	3.00
25	5 Gallon Bucket	/unit	2.50
26	5 Gallon Bucket Lid	/unit	2.50
27	5/8" Carpet Pad	/sq. ft.	0.44
28	5/8" I.D. Garden Hose	/lin. ft.	0.66
29	6' Ladder	/unit	60.00
30	8"x6"x2" Grout Sponge	/unit	2.00
31	Alum	/oz.	1.60
32	All-Purpose Gravel (Quikrete)	/50 lb.	8.00
33	Apple Cider Vinegar	/2 cups	1.99
34	Astroturf	/sq. ft.	4.00
35	Bolts	/unit	0.05
36	Bounce Dryer Sheets	/20 units	5.00
37	Brawny Paper Towels	/roll	3.00
38	Burlap	/sq. ft.	0.14

39	Canvas Drop Cloth	/sq. ft.	0.25
40	Charcoal	/lb.	0.50
41	Clorox Bleach, concentrated	/5 cups	1.17
42	Clorox Disinfecting Wipes	/15 units	1.50
43	Coarse Compost	/gallon	3.00
44	Coco Liner, 18"	/unit	8.00
45	Coffee Filter	/unit	0.03
46	Commercial Grade Fine Sand	/lb.	0.16
47	Commercial Grade Sand	/lb.	0.12
48	Cotton Ball	/20 units	0.40
49	Dawn Dishwashing Liquid	/oz.	0.20
50	Diatomaceous Earth	/2 lb. bag	10.00
51	Duct Tape 20 yd. Roll	/unit	10.00
52	Fiber Twine	/ft.	0.01
53	Gelatin (Knox Unflavored)	/4 oz.	2.00
54	Granular Activated Carbon	/oz.	0.40
55	Gutter Insert Foam, 3'	/unit	8.00
56	Gypsum	/lb.	0.23
57	Hydrogen Peroxide	/3 cups	1.49
58	50 Qt. Igloo Cooler	/unit	70.00
59	94 Qt. Igloo Cooler	/unit	90.00
60	Lava Rock	/cu. ft.	6.00
61	Lemon Juice	5 fl. oz.	1.00
62	Mylar Emergency Sleeping Blanket	/unit	3.00
63	Nail	/unit	0.05

64	Nut	/unit	0.05
65	OxiClean Stain Remover	/lb.	1.20
66	Paint Tray	/tray	2.00
67	Peat Moss	/cu. ft.	6.50
68	Pebbles, Large	/5 lb.	2.50
69	Pebbles, Pond/Landscape	/.5 cu. Ft.	4.99
70	Pickling Lime	/oz.	0.20
71	Pine-Sol All-Purpose Cleaner	/fl. oz.	0.07
72	(Use no other Pine-Sol Products)	--	--
73	Plant Protector Bags	/bag	5.00
74	Plaster of Paris	/lb.	0.70
75	Plastic Tarp	/sq. ft.	0.20
76	Play Sand	/lb.	0.10
77	Plumbing Epoxy Putty	/package	3.49
78	ABS Pipe, 1-1/2" Diameter	/5 lin. ft.	1.50
79	ABS Pipe, 2" Diameter	/5 lin. ft.	20.00
80	Copper Pipe, 1/2" Diameter	/5 lin. ft.	6.00
81	Copper Pipe, 1" Diameter	/5 lin. ft.	16.00
82	Corrugated Pipe, 3" Diameter	/5 lin. ft.	2.50
83	Corrugated Pipe, 4" Diameter	/5 lin. ft.	3.00
84	PVC Pipe, 1" Diameter	/5 lin. ft.	1.00
85	PVC Pipe, 1-1/2" Diameter	/5 lin. ft.	1.50
86	PVC Pipe, 2" Diameter	/5 lin. ft.	2.00
87	Pool Filter Sand	/lb.	0.30
88	Pumice Stone (1 CF)	/cu. ft.	11.99

89	Rubbing Alcohol	/3 cups	1.49
90	Salt (Morton Iodized Table Salt)	/26 oz.	1.00
91	Screw	/unit	0.05
92	Sham-Wow	/sq. ft.	5.00
93	Stainless Steel Safety Wire	/lin. ft.	0.25
94	Standard Air Conditioner Filter	Unit	2.67
95	Terrycloth Rags	lb.	5.00
96	Tide Concentrated Liquid Detergent	fl. Oz.	0.25
97	Tote, 5 Gallon	/unit	4.00
98	Tote Lid, 5 Gallon	/unit	1.00
99	Tote, 10 Gallon	/unit	5.00
100	Tote Lid, 10 Gallon	/unit	1.00
101	Tote, 13 Gallon	/unit	7.00
102	Tote Lid, 13 Gallon	/unit	1.00
103	Tote, 18.5 Gallon	/unit	8.00
104	Tote Lid, 18.5 Gallon	/unit	1.00
105	TSP/90	/lb.	3.00
106	Turtle Wax Hard Shell Paste Wax	/fl. oz.	0.55
107	Weed Control Fabric	/sq. ft.	0.11
108	Window Screen Mesh	/3 sq. ft.	1.00
109	Window Squeegee	/unit	6.00
110	Wood Mulch	/cu. ft.	6.00

Appendix B: Operational Costs

Table 3: Breakdown of Additional Operator Costs

Number	Item	Cost (\$/unit)
1	Adjustable Wrench	3.00
2	Basic Socket Set	5.00
3	Caulking Gun	2.00
4	Channel Locks	1.50
5	Cordless Drill	10.00
6	Drill Bits (Each)	1.50
7	Hand Saw	10.00
8	Pliers	1.50
9	Scissors	2.00
10	Screwdrivers (Each)	1.00
11	Standard Builder's Hammer	5.00
12	Utility Knife	2.00
13	Wire Cutters	2.00
14	Pipe Cutters	10.00
15	Pipe Wrench	5.00

Operator Costs: \$40/operator/hour



TRANSPORTATION COMPETITION

Competition Date: Friday, April 21st, 2017

Competition Location: Chico State Campus

Summary:

The purpose of the Transportation Competition is to provide students with a practical transportation engineering problem. This challenge requires students to apply methods of intersection design, geometric design, pavement design, and traffic engineering along with the application of surveying and drafting techniques.

Contact:

Carole Wigno

midpac2017transpo@gmail.com



Rules:

Problem Statement

Property owners along Business Lane, a privately owned street in Chico, CA, have approached the city about improving access and circulation to the intersection of E 20th St/ Business Lane with the ultimate goal of converting Business Lane to a public street.

Business Lane runs between E 20th St and Barney Lane. It provides primary access to several restaurants, a hotel, and a gas station, as well as secondary access to a Walmart. Due to its proximity to an existing signalized intersection, which provides primary access to the Chico Mall and the Toys-R-Us/Target shopping center, approximately 150 feet to the east, the intersection of E 20th St/ Business Lane is currently restricted to right-turn-in/right-turn-out movements only. This configuration means that drivers on Business Lane wishing to access westbound E 20th St, as well as drivers on westbound E 20th St wishing to access Business Lane, must travel through the Toys-R-Us private parking lot. This route is confusing to drivers not familiar with the area, and results in long delays during peak hours, especially during the December shopping season.

The city has contacted several consulting firms requesting conceptual designs and plans to provide a comprehensive solution to the existing problem of access to and from Business Lane and E 20th St. The design must include pedestrian and bicycle facilities, striping, signage, pavement cross sections, standard details, and signal timing for signalized intersections.

The city will allow changes to the right-of-way to accommodate design improvements. This may include widening, reconfiguration of the adjacent parking lots, and removal of up to one building. These changes should be reflected in the cost analysis.

Requirements

All participants must follow the guidelines and requirements of this project in order to be considered for the contract.

Specifications

The City of Chico has provided the existing topography and right-of-way limits, as well as the most recent traffic counts. Please email midpac2017transpo@gmail.com to request these documents.

These documents should be referenced in your plans as the existing surface and existing right-of-way limits. Any design changes to the surface or right of way should be clearly noted.



Posted Speed Limit:	35 mph
Expected Design Level-of-Service*:	E 20th St/ Business Lane – E
	E 20th St/ Mall Entrance/ Toys-R-Us Shopping Center -- C
Traffic Growth:	2%
Annual Design Life:	20 years

*Any combined intersections must adhere to the higher LOS

Submittals

The 100% plan documents, written summary, calculations, and opinion of probable cost should be combined into one .pdf and submitted by March 18, 2016 at 5:00 pm PST to midpac2017transpo@gmail.com and include the following:

- ❖ Site Plan of the proposed area
- ❖ Roadway profiles
- ❖ Cut and Fill / Grading plan
- ❖ Signal timing and phasing figure or justification for an unsignalized intersection
- ❖ Detail sheet(s) including cross sectional details and standard construction details
- ❖ Opinion of Probable Cost
- ❖ Calculations
- ❖ Written summary

All figures and plans must be computer drafted in the format of ANSI B (11"x17").

All Request for Information (RFI) should be sent to midpac2017transpo@gmail.com prior to December 9, 2016.

Site Plan

The site plan should show the designed intersection with roadways extending at least 100' from the stop bar or yield line in each direction (North, South, East, and West). Two centerlines (North-South direction and East-West direction) should be derived. All medians, turn pockets, sign locations, striping, bus stops, and bike and pedestrian facilities should be clearly displayed, as well as any changes to the surface or right-of-way. Additionally, any necessary detail callouts and dimensions should be shown on the plan(s). The Site Plan may be split up into multiple sheets with appropriate match line callouts. Displaying landscaping features are optional.



Roadway Profiles

The profile plan should show at least two profiles, one for the north-south roadway alignment and one for the east-west roadway alignment of the designed intersection(s). The profile views should clearly display the existing ground and the designed finished grade profile. Grades, grade breaks, points of vertical intersection, and vertical curve dimensions should be clearly labeled on the finished grade profile lines.

Grading Plan

The grading plan should clearly display existing and finished grade contours. The design should aim for a near balance of cut and fill and the locations of each should be clearly defined. Also, be sure to provide sufficient elevation points at areas that are not covered by a specific detail.

Signal Timing and Phasing or Justification for Unsignalized Intersection

The signal timing and phasing figure should clearly display the appropriate movements for each phase, the time for each phase, and total cycle length. Any formulas and assumptions should be clearly shown.

For an unsignalized intersection, justification must be provided for why an unsignalized intersection is preferable to a signalized intersection.

Detail Sheet(s)

Standard detail drawings should be combined onto the appropriate number of sheets. The details should be thorough enough to ensure that the contractor can correctly construct the designed intersection and roadways. A list of standard City of Chico details can be found at: http://www.chico.ca.us/capital_project_services/CityStandardPlansandSpecificationDetails.asp. Any other details must be designed by the consulting firm and comply with any ADA standards as necessary. Additionally, roadway cross sections should be designed and displayed in this area. Be sure to make the appropriate call outs on the site plan that refers to the details using an organized detail numbering system (Example: See detail 3 on sheet DT-01)



Opinion of Probable Cost

A construction cost estimate for the project should be established via an excel spreadsheet. All variables associated with the construction of the new intersection should be considered with an assumed cost (in USD). This includes any costs associated with expanding the right-of-way.

Calculations

The calculations sheet should be organized and clearly labeled with a title and numbered steps for each formula. All appropriate calculations should be conducted for the intersection to ensure a sufficiently designed intersection. The level of service calculation should be clearly displayed and should be appropriately backed up by a transportation engineering computer software calculation. Any assumptions should be clearly noted.

Written Summary

The written summary should be no greater than 10 pages, double spaced, using 12 point Times New Roman font. The citations, cover page, table of contents, and appendices are NOT INCLUDED in the 10-page length.

The summary should review the entire project and also explain the following:

- ❖ Functionality of the intersection
- ❖ Efficiencies and benefits to the overall design
- ❖ Explanation of the chosen signal timing and phasing sequence
- ❖ Explain any innovative features of the intersection
- ❖ Discuss the traffic and pedestrian safety aspects of the design
- ❖ Discuss the impacts this design may have on traffic along the E 20th St corridor.

Poster Session

All participating schools should prepare a poster that outlines the design around a final conceptual drawing of the intersection. Each poster must display (at the minimum) the school name, each participating member's name, roadway cross section(s), phasing and signal timing diagram, and total cost estimate.

The posters will be displayed on April 21, 2017. Please provide your own poster stand. Additionally, judges may ask questions for clarifications about the design at this time and will count towards the final poster scoring.



Judging

Scoring Criteria	Score
Site Plan	/20
Roadway Profiles	/10
Cut and Fill/ Grading Plan	/5
Figure Displaying Sight Triangles	/5
Figure Displaying Signal Timing and Phases*	/5
Detail Sheet	/10
Opinion of Probable Cost	/10
Level of Service Calculations	/5
Written Summary	/15
Poster Session	/10
Overall Formatting/ Completeness	/5
Total Points	/100

*Or sufficient justification for using an unsignalized intersection.

All calculations and assumptions should be in reference with the most recent MUTCD, AASHTO and HDM.