

GEOWALL

Competition Rules

ASCE Mid-Pacific Student Symposium

April 9—11, 2027

Hosted by CSU Fresno & UC Merced

ASCE FRESNO STATE STUDENT CHAPTER

ASCE STUDENT CHAPTER University of California, Merced

GeoWall Competition Rules

Competition: Sunday, April 11, 2027 (check-in 7:30 – 9:00 AM; competition 9:30 AM – 4:00 PM). All deadlines are 11:59 PM Pacific Time. Questions: ascemidpac2027@gmail.com.

Inspired by the Geo-Institute of the American Society of Civil Engineers (G-I) GeoWall Competition Rules, Revision 02 (September 30, 2026).

Overview

The objective of the GeoWall competition is to design and build a model mechanically stabilized earth (MSE) retaining wall using kraft supplies as reinforcement and a poster board wall facing. The competition objectives are for students to:

- Design an MSE wall using the least amount of reinforcement needed to support the retained soil plus a vertical surcharge load, within the fixed footprint of the sandbox;
- Effectively communicate their analysis and design processes; and
- Enjoy a friendly but spirited competition among schools.

Competition Prompt

As transit infrastructure expands rapidly across the Central Valley for the upcoming High-Speed Rail network, new corridors must navigate narrow rights-of-way through densely developed urban areas. A primary challenge requires constructing a major rail embankment where space is heavily constrained and adjacent structures cannot be disturbed. Your firm must design and construct a mechanically stabilized earth retaining wall to securely support the massive structural loads of the new rail line while strictly minimizing the footprint within the active corridor. Teams will use paper reinforcement to prove their design can retain the backfill and support a vertical surcharge load without failure, using as little reinforcement as possible.

Key Dates (2027)

Item	Date
Team registration (regular, $150 per team)	Tuesday, December 1, 2026
Team registration (late, $180 per team)	Monday, January 18, 2027 (checks must be postmarked by this date)
Attendee registration and team roster due	Monday, February 15
Request for Information (RFI) deadline	Friday, February 19
RFI answers posted	Friday, February 26
Design report due (PDF)	Friday, March 26
Late individual registration deadline	Tuesday, March 30

Item	Date
Poster (PDF) and presentation (.pptx) due	Friday, April 2
Captains' meeting, online (informational only)	Thursday, April 8, 7:00 – 8:00 PM
Captains' meeting, in person (mandatory; captain or designee)	Friday, April 9, 8:30 – 9:15 AM
Presentations	Friday, April 9, 1:00 – 4:00 PM
Check-in and setup (sandbox corrections close at 9:00 AM)	Sunday, April 11, 7:30 – 9:00 AM
GeoWall competition	Sunday, April 11, 9:30 AM – 4:00 PM

Registration, roster, and chapter-standing deadlines follow Mailer 1. All submission deadlines are 11:59 PM Pacific Time. Final times and locations will be confirmed in Mailer 2 and on the symposium website.

Eligibility and Participant Rules

Only one team per school may compete. A team may include any number of students who aid with the design and testing of the team's GeoWall submission, but the competition team (build team) consists of a maximum of four (4) students. Only members of the build team participate in the competition. Each team designates a captain, who must be a member of the build team and is the team's point of contact.

- All build team members must be enrolled students at the date of the competition.
- All build team members must be ASCE student members and registered attendees of the ASCE Mid-Pacific Student Symposium, and the school's chapter must be in good standing (annual report and dues submitted by February 1).
- Students may compete in more than one competition but may captain only one team. Because each competition demands significant time before and during the symposium, students are encouraged to focus on one competition.

Submissions and File Naming

Email all deliverables to the general symposium address below. Use the subject line shown and the exact file names (replace "UniversityName" with your university). The competition chair will email a confirmation when each file is received.

Deliverable	Format	Due Date	Subject Line / File Name
Design Report	PDF	Fri, Mar 26	Subject: UniversityName_GeoWall Report File: UniversityName_Report_GeoWall.pdf
Poster	PDF	Fri, Apr 2	Subject: UniversityName_GeoWall Poster File: UniversityName_Poster_GeoWall.pdf
Presentation	PowerPoint (.pptx)	Fri, Apr 2	Subject: UniversityName_GeoWall Presentation File: UniversityName_Presentation_GeoWall.pptx

Late Policy

A late submission loses 20 points for each of the first three days (up to 72 hours late) and an additional 40 points on the fourth day (72 to 96 hours late), for a maximum loss of 100 points. Submissions more than 96 hours late will not be accepted. The penalty applies separately to each deadline: the design report (March 26) and the poster and presentation (April 2). Submitting the poster and presentation late on the same day counts as one late submission, so the maximum total late penalty is 200 points. This policy replaces all earlier late penalties.

Requests for Information (RFIs)

Send questions and requests for information by **Friday, February 19**. Answers will be posted to all teams on **Friday, February 26**.

Contact

Send all questions about this competition to ascemidpac2027@gmail.com. Replies may take up to 3 business days. Messages sent to any other account will not be addressed.

Background

MSE walls have roots 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. Sometimes the construction of MSE walls must account for underground utilities, tunnels, or other obstructions (Figure 1). Sometimes the construction must account for seismic loads and other unique geometries or soil conditions. This year's competition is a return to a simpler self-weight and vertical surcharge loading condition, but with a novel twist on the reinforcing material.

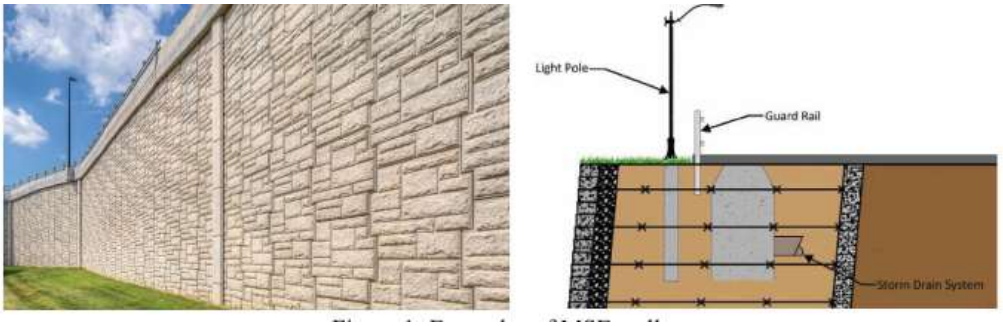


Figure 1: Examples of MSE walls

Design Report: 60 Points

Report Content

Each team submits a Mechanically Stabilized Earth (MSE) Wall Design Report. The report must include:

1. Cover page with name of institution; names of each build team member; identification of the team captain with email address; and name, title, and email address of the faculty advisor.
2. Material properties used in design, including methods used to obtain the properties (for example, lab tests, correlations, and assumptions).
3. Description of the engineering design and construction procedures, including assumptions and equations used.

4. A complete description of the geometry and placement of all reinforcing elements, the estimated mass of the reinforcing paper in grams (not including facing material or tape), and the whole number of pipe cleaners used.
5. A safety appendix (Appendix B) that outlines the potentially hazardous tasks reasonably expected during the competition and how the team will mitigate these hazards.

Formatting

1. Length is a maximum of three (3) pages, not including references, the cover page, or the safety appendix. Over-length reports will not be reviewed and will be disqualified.
2. One-inch margins, single-spaced, 12-point Times New Roman font.
3. All pages after the cover page contain a header identifying the team and a footer with the page number.
4. The entire report is submitted as a single PDF named UniversityName_Report_GeoWall.pdf.

Reports are judged by a panel of practicing engineers and professors. Judging considers the reasonableness of design equations, material properties, factors of safety, and assumptions, as well as satisfaction of the objectives of this competition. Iterative empirical designs supported by fundamental soil mechanics are rewarded. Judges use the GeoWall judging rubric, published separately.

Submit the report as described in Submissions and File Naming. The sender receives a confirmation email within 72 hours. Changes or corrections after the deadline incur a penalty.

Presentation: 20 Points

Each team gives an oral presentation on its design, scored out of 20 points using the GeoWall judging rubric (published separately). Presentations take place on **Friday, April 9, from 1:00 to 4:00 PM**.

- **Length:** 8 minutes, followed by 4 minutes of questions from the judges (12 minutes per team).
- **Presenters:** 2 to 4 build team members. All presenters must be available for questions.
- **Format:** PowerPoint (.pptx), submitted as UniversityName_Presentation_GeoWall.pptx to the symposium email by **Friday, April 2 at 11:59 PM Pacific Time** (subject: “UniversityName_GeoWall Presentation”). No video and no pre-recorded speaking parts. No handouts to judges.
- **Overtime penalty:** organizers will keep time. Presentations between 7:00 and 8:00 are not penalized. Each 30 seconds (or part of 30 seconds) past 8:00 costs 2 points, up to 4 points. The presentation is stopped at 9:00, and any time past 8:00 comes out of the Q&A session.
- **Undertime penalty:** for each 30 seconds (or part of 30 seconds) under 7:00, the deduction increases (1, 2, 3, then 3 points), up to 9 points. Unused time is not added to the Q&A session.

Overtime deductions

Presentation length	Deduction for interval	Total deduction	Q&A time remaining
7:00 – 8:00	0	0	4:00
8:01 – 8:30	2	2	3:30
8:31 – 9:00	2	4 (maximum)	3:00

Undertime deductions

Presentation length	Deduction for interval	Total deduction	Time under 7:00
7:00 – 8:00	0	0	None (no penalty)
6:30 – 6:59	1	1	0:01 – 0:30
6:00 – 6:29	2	3	0:31 – 1:00
5:30 – 5:59	3	6	1:01 – 1:30
Under 5:30	3	9 (maximum)	More than 1:30

Poster: 5 Points

Each team displays a poster no larger than 36" × 24" next to its station during the Sunday competition, so judges and spectators can follow the team's design. The display poster is separate from the poster board used for the wall facing. A PDF of the poster is due April 2 (see Submissions and File Naming).

- **Technical Content (3):** the design approach, the reinforcement layout (lengths, spacing, and connections to the facing), the predicted reinforcement mass, and key assumptions.
- **Professional Quality (2):** organization, appearance, and quality of technical writing.
- Teams must provide their own poster stands and any other display equipment.

Sandbox

The MSE wall is constructed within an apparatus called a sandbox. Each team brings its own sandbox to the competition. Painting and adding school or sponsor logos to the exterior is highly encouraged. The sandbox has a bottom and four vertical sides with no top. The front panel is removable as shown in Figure 2: it is in place during wall construction and removed afterward to expose the wall. The sandbox shall:

1. Have exterior walls and base of any grade of plywood not exceeding ¾ inch (19 mm) thick.
2. Have planar inside surfaces with the natural plywood finish.
3. 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.
4. Have a full-sized base that extends no more than ¾ inch (19 mm) beyond the base of the wall once the front panel is removed.
5. Include a steel tie rod designed to keep the two fixed sides parallel after removal of the facing panel.
6. Be free of templates after wall construction and before testing.
7. Have all dimensions as shown in Figure 2.

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

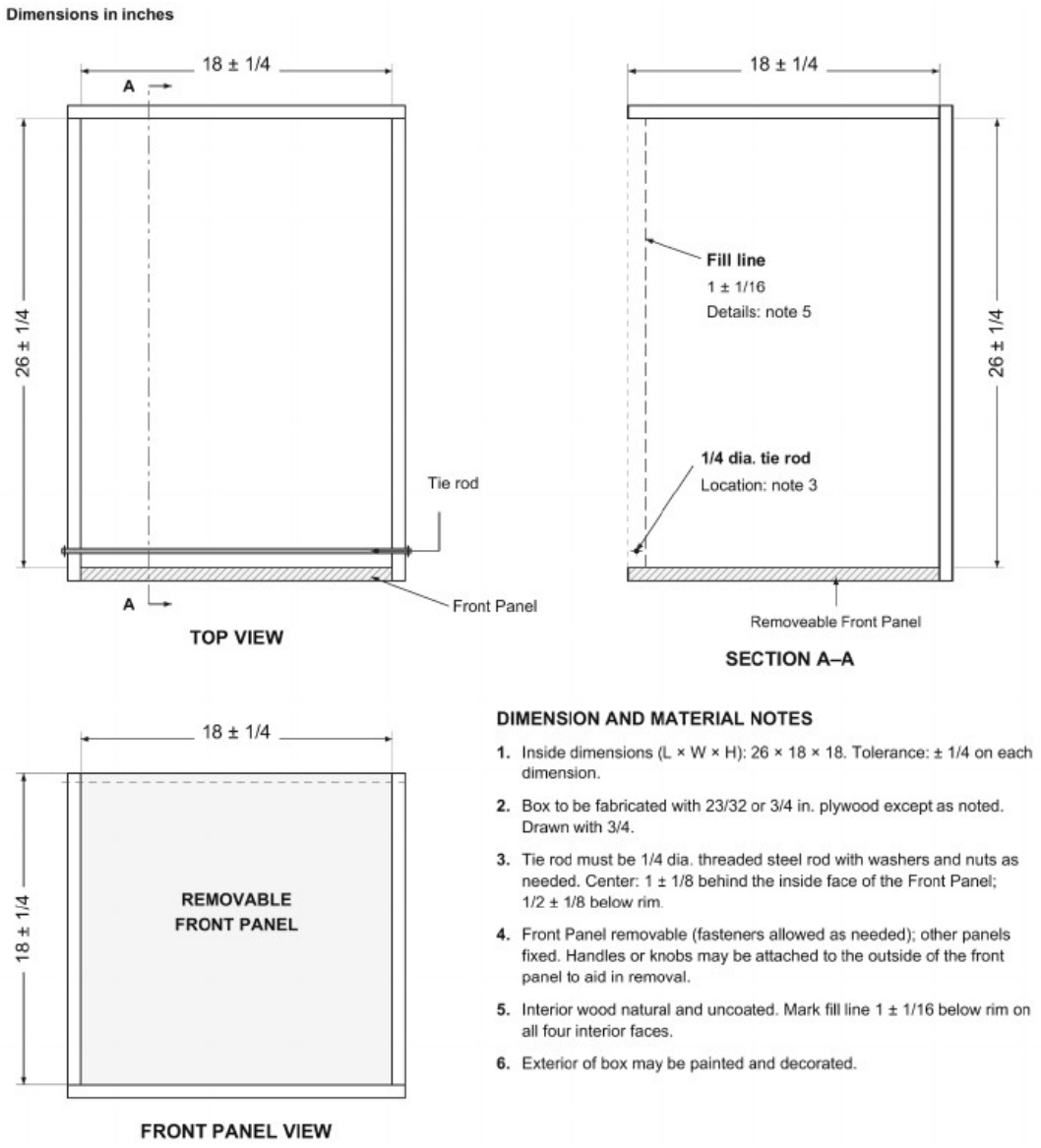


Figure 2: Sandbox Schematic

Sandboxes are checked for compliance at the Friday captains' meeting. Teams may correct any compliance issues until check-in closes at **9:00 AM on Sunday**, and any sandbox found out of compliance is rechecked then. A team with a sandbox out of compliance at the start of the competition is penalized. Sandboxes are stored overnight in a secured room arranged by the organizers.

Backfill Material

The backfill is easily acquired "play sand" from a home improvement store (see Appendix A for examples), provided by the organizers on site. Organizers will make every effort to provide sand as close to the product specified as possible, but cannot guarantee the exact specifications. Students are encouraged to buy this or a similar product for trial runs and to analyze the material. Teams may examine a sample of the competition

backfill at the Friday captains' meeting. No backfill samples may leave the meeting room. Teams may modify their wall design at this time (see Design Changes).

Wall Materials

Materials are provided by the organizers on site. See Appendix A for detailed specifications.

1. **Facing:** one piece of poster board (dimensions in Figure 3).
2. **Reinforcement:**
   a. 60 lb kraft paper. Quantity is measured by mass to the nearest 0.01 g. There are no restrictions on the shape or geometry of reinforcing elements, but all reinforcement must be cut from a single sheet of 24" × 24" kraft paper.
   b. Pipe cleaners (chenille stems; 6 mm diameter, 12 in length). There are no restrictions on shape or geometry, but teams must declare the whole number of pipe cleaners used. An additional 0.5 g is added to the kraft paper reinforcing mass for each pipe cleaner used.
3. **Reinforcement attachment to facing:** heavy-duty polypropylene packing tape, 2" wide. Reinforcement includes both kraft paper and pipe cleaners.

Organizers will make reasonable efforts to ensure the materials meet the specifications in Appendix A. Teams may examine small samples of the reinforcing and facing material at the Friday captains' meeting. No samples may leave the meeting room. Teams may modify their wall design at this time (see Design Changes).

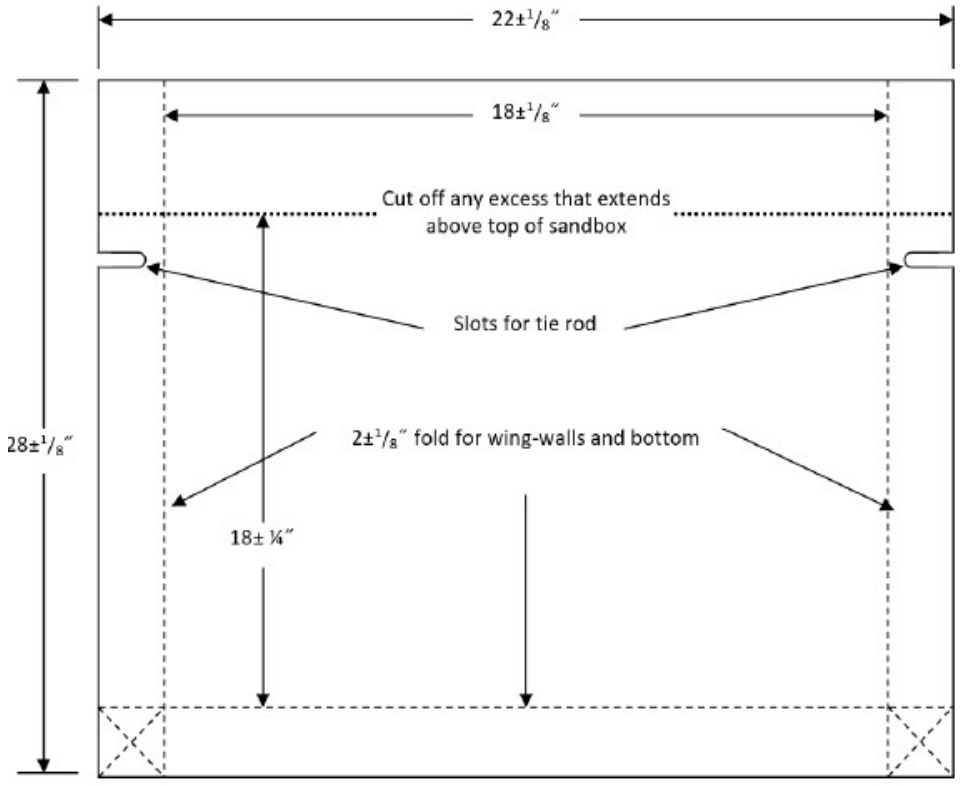


Figure 3: Dimensions of the poster board wall facing (not to scale)

Construction Tools

The following tools may be used and must be provided by the competing team (quantities are not restricted):

1. Pencils, pens, and markers
2. Rulers and straight edges
3. Levels
4. Manually operated cutting instruments (for example, scissors, utility knives, safety razor blades, hole punch)
5. Cutting boards or mats (required if using cutting tools with open blades)
6. Design notes, calculations, and drawings
7. Material handling and compaction tools consisting of any hand-operated devices
8. Screwdrivers (battery-operated drills or screwdrivers may be used only to remove fasteners when removing the facing panel)
9. Temporary templates for use in any stage. Templates may be made of any material, must not have moving parts, and must be removed at the end of any stage in which they are used.

Buckets and shovels are provided by the organizers. Teams may need to haul backfill up to 20 feet.

Execution

Construction and testing of the wall are done in the following stages.

Reinforcement Fabrication Stage

Each team is given a single sheet of 60 lb kraft paper (approximately 24 in × 24 in) and the number of pipe cleaners it declared. The team fabricates all its reinforcing elements from the sheet and pipe cleaners using authorized tools. **Fifteen (15) minutes** are allotted, and teams are penalized for exceeding the time limit. Afterward, excess material is disposed of and judges weigh the kraft paper reinforcing elements to the nearest 0.01 g. An extra 0.5 g is added for each pipe cleaner used.

Wall Assembly Stage

After the reinforcement is fabricated and weighed, the team receives a sheet of poster board (22 in × 28 in) and a roll of packing tape, and assembles the wall using authorized tools (facing dimensions in Figure 3).

1. Tape may only be used to attach reinforcement to the wall facing, in individual pieces no larger than 2 in × 2 in. The adhesive side of each piece must contact both the facing and a reinforcing element. Pieces may not overlap, and all pieces must be on the vertical plane forming the wall facing only.
2. Tape may not be used for any other purpose, including sealing corners of facing material, joining reinforcing elements, or anchoring facing material or reinforcement to the box.
3. This is the only stage in which tape may be used.

The wall is trial-fitted to the sandbox during this stage, and any portion that rises above the top of the sandbox must be trimmed off. The stage is complete when the facing is properly folded and trimmed, all reinforcing elements are attached, the wall is placed in the sandbox, and the tie rod is in place. No sand is added. **Fifteen (15) minutes** are allotted, with a penalty for exceeding the limit. Judges check that the wall is properly assembled.

Construction Stage

After the judges check the assembled wall, they instruct the team to start. The team fills the box with sand until the sand fill line (Figure 2) is covered and the backfill is level, then places an empty 5-gallon vertical surcharge bucket on the sand as shown in Figure 4. The facing must be in direct contact with the inside of the sandbox at all times. The tie rod may be removed at the start of this stage, but must be in place before any sand is added. Temporary templates or guides may be used if removed before the stage ends.

The stage is complete when the wall is in place, the sand covers the fill line and is level, templates are removed, and the empty bucket is in place. **Twenty (20) minutes** are allotted, with a penalty for exceeding the limit. Judges check fill placement and the bucket placement.

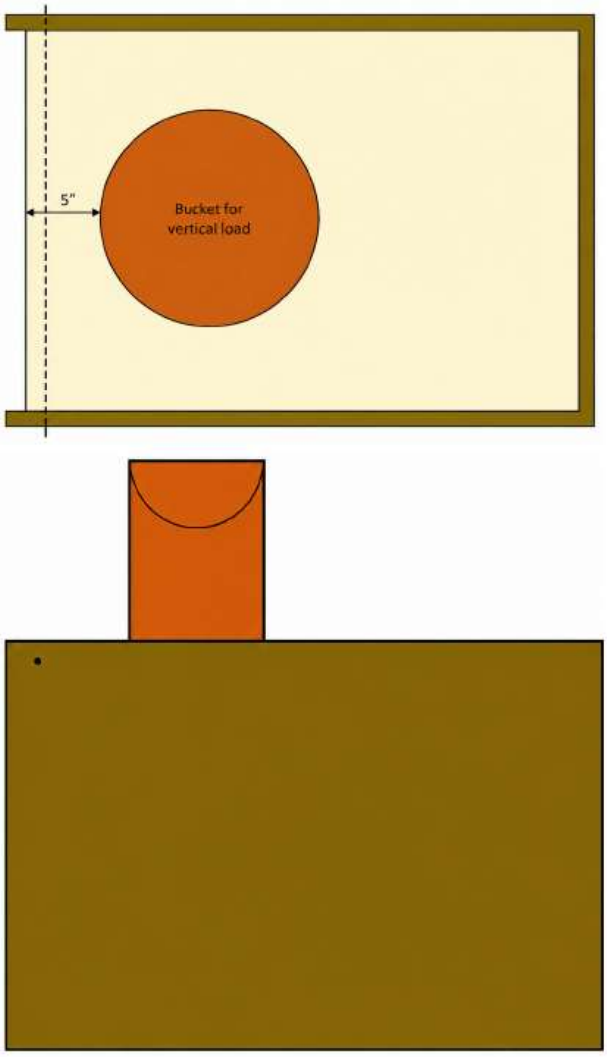


Figure 4: Sandbox Loading (not to scale)

Loading Stage

Load placement is shown in Figure 4. This stage has two steps: (1) removal of the front panel, and (2) placement of a 50 lb vertical surcharge load. After each step, the wall is checked against three criteria: (1) excessive deformation (any portion of the wall extending outside the imaginary vertical plane from the base of the sandbox), (2) excessive soil leakage (more than 30 cm³ of sand passing out of the sandbox), and (3)

catastrophic failure. The team is penalized for excessive soil loss and excessive deformation, and is disqualified for a catastrophic failure.

1. When directed by the judge, the team removes the front panel. After the panel is removed, the judge waits one (1) minute and then checks the three criteria.
2. If the wall does not fail catastrophically, the team places 50 lb of sand in the empty 5-gallon bucket on top of the sand, with one (1) minute to place the load. After the load is placed, the judge waits one (1) minute and then checks the three criteria.

Design Changes

Teams may change their design between the time the design report is submitted and the time the wall is tested. The adjusted mass of the reinforcing material used for scoring, M, is computed as:

$$\text{If } |mD - mA| \le 0.25, \text{ then } M = mA$$

$$\text{If } |mD - mA| > 0.25, \text{ then } M = \max[\,(mD - 0.25) - (mD - mA - 0.25)/2\,,\; mA + (mA - mD - 0.25)/2\,] \quad \text{(Equation 1)}$$

where mD = reinforcing mass (g) reported in the design report; mA = reinforcing mass (g) used during the competition; and M = adjusted mass (g) rounded to two decimal places.

Scoring

After completion of the loading stage, each team's score is computed as:

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

Late penalties (see Late Policy) are subtracted from this score. There is no fixed maximum score. For reference, the Scoring Example in this section totals 447.7 points.

where:

- R = score out of 85 points (design report out of 60, presentation out of 20, poster out of 5)
- M = adjusted mass of the reinforcement material in grams from Equation 1
- Nmin = number of minor rules violations; Nmaj = number of major rules violations
- T = total number of minutes over the time limit for all stages, each rounded up to the nearest minute
- D = deflection rating: 8 if the wall fails the deflection criterion during initial loading without surcharge; 4 if it fails during vertical surcharge loading; 0 if it passes for all loading stages

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

Minor Penalties

- Box dimension out of spec
- Minor safety mishaps
- Missing a required cutting board
- Lack of minimum personal protective equipment (PPE); see Appendix B
- Any addendum to the design report required by judges that simply clarifies content but does not change the design
- Any other rule violation that, in the judges' opinion, could give the team a measurable but minor advantage

Major Penalties

- Soil leakage greater than 30 cm^3 (the volume of a standard 1 oz plastic medicine cup)
- Improper use of adhesive tape
- Major safety mishaps, including any mishap that results in injury
- Any addendum to the design report required by judges that results in a significant change to the design
- Any other rule violation that, in the judges' opinion, could give the team a significant advantage but does not warrant disqualification

Disqualification

Teams may be disqualified for:

- Over-length design reports
- Design reports or presentations not received within 96 hours of the deadline
- Build teams of more than four (4) students
- Failure to send a representative to the Friday captains' meeting
- Unsafe practices, or violations of the professionalism and sanctions policies in Mailer 1
- Design or construction techniques that violate the spirit of the competition and provide a large or unfair advantage
- Catastrophic wall failure at any point during loading
- Plagiarism, or failure to cite generative AI use (see Policies)
- Any other rule violation that, in the judges' opinion, could give a significant advantage and warrants disqualification

Scores are recorded to the nearest tenth of a point. Ties are broken, in order, by: (1) lowest actual reinforcement mass, (2) higher report score, (3) lowest deflection rating, and (4) the judges' consensus of best-decorated sandbox.

The judges follow the rules as published using reasonable judgment and interpretation. The head judge is the arbiter of any dispute, which may be brought only by the team captain. Decisions of the head judge are final, and results posted at the competition are not subject to review afterward.

Scoring Example

Assume a team builds a wall with the following characteristics:

- Report score 48/60, presentation score 16/20, and poster score 4/5, so R = 68.
- The design report specifies 8.57 g of reinforcement (7.57 g of kraft paper plus two pipe cleaners at 0.5 g each). The reinforcement used is 8.25 g. From Equation 1, M = max{ (8.57 − 0.25) − (8.57 − 8.25 − 0.25)/2 = 8.29 g, 8.25 + (8.25 − 8.57 − 0.25)/2 = 7.97 g } = 8.29 g.
- Minor deduction for tape overlapping on the wall, Nmin = 1.
- Stage times: reinforcement fabrication 15:18 (18 seconds over, rounds up to 1 min); wall assembly 16:05 (1:05 over, rounds up to 2 min); construction 18:27 (under the limit). T = 1 + 2 = 3. Only time over the limit in each stage is counted; there is no benefit for finishing early.
- The wall passed the deflection test during initial loading but failed it during vertical surcharge loading, D = 4.

- Score = 68 + 15(40 − 8.29) − 10(1) − 40(0) − 2(3) − 20(4) = 447.7.

Judges score each stage using scoring checklists published separately with the judging rubric.

Competition Schedule and Logistics

The symposium schedule in Mailer 1 is tentative. Final times and rooms will be confirmed in Mailer 2 and on the symposium website.

Date and Time	Event
Thursday, April 8, 7:00 – 8:00 PM	All-competition captains' meeting (online, synchronous). Informational only; attendance is encouraged but not required.
Friday, April 9, 8:30 – 9:15 AM	GeoWall captains' meeting (mandatory; captain or designee). Sandbox compliance check, material samples, design-change window, and station/slot assignments.
Friday, April 9, 1:00 – 4:00 PM	Presentations: 8 minutes plus 4 minutes of questions per team.
Sunday, April 11, 7:30 – 9:00 AM	Check-in and setup, including posters at each team's station. Check-in closes at 9:00 AM, which is also the deadline for sandbox corrections.
Sunday, April 11, 9:30 AM – 4:00 PM	GeoWall competition (two stations, about 65 minutes per run).
Sunday, April 11, 5:00 – 9:00 PM	Awards Ceremony & Banquet (results announced).

Captains' Meetings

Thursday, April 8 (online): informational only. Teams receive logistical updates. Attendance is encouraged but not required.

Friday, April 9, 8:30 – 9:15 AM (in person, mandatory): each team must have its captain (or designee) present, and all team members are encouraged to attend. The meeting is used to check sandboxes for compliance, let teams examine the sand, reinforcement, and facing samples, provide the window for design changes (Design Changes), establish competition order, and share logistical or administrative information. Teams without a representative are disqualified. The meeting location is announced in Mailer 2 and on the symposium website.

Teams bring their sandboxes, any hardware or tools needed for assembly, and all temporary templates that will be used in any stage. Sandboxes should be assembled for the compliance check.

Competition Day

- **Check-in:** Sunday, April 11, 7:30 – 9:00 AM. Check-in closes at 9:00 AM (see Sandbox). The competition runs from 9:30 AM to 4:00 PM. Posters stay on display at each team's station throughout the competition.
- **Stations and order:** each run takes about 65 minutes including weighing, loading, and reset. Teams are assigned to a station and slot at the Friday captains' meeting. The competition is planned for two stations.
- **Sand:** organizers provide about 450 lb of sand per run (about 4.6 ft^3 plus the 50 lb surcharge). Sand is reused between runs where possible and disposed of by the organizers.
- **Overnight storage:** sandboxes are stored in a secured room from Friday through Sunday morning.

Policies

AI Use and Plagiarism

The use of generative artificial intelligence (AI) and natural language processing models (NLP), such as OpenAI's ChatGPT©, is neither encouraged nor discouraged. However, if such models are used, all instances shall be cited as work completed by the respective generative AI/NLP. Failure to cite all instances of generative AI/NLP use will be considered plagiarism.

Plagiarism of any kind will not be tolerated. Teams caught plagiarizing any portion of their submitted work will be disqualified.

Professionalism and Judging

All participants are expected to follow the professionalism and sanctions policies in Mailer 1. The judges follow the rules as published, using reasonable judgment and interpretation. The head judge is the arbiter of any dispute, which may be brought only by the team captain, and decisions of the head judge are final.

Drug and Alcohol-Free Events

The use of drugs and alcohol is prohibited at all ASCE Student Symposium events, including this competition.

Appendix A: Material Specifications

Soil

- All Purpose Play Sand
- Examples: Home Depot Internet SKU #100577543 or #100318476; Lowe's Item #293326

Sandbox Material

- Walls and base: 23/32 inch or ¾ inch plywood, any grade
- Tie rod: ¼ inch threaded steel rod with washers and nuts, as needed
- Fasteners: any suitable wood fasteners

Facing Material

- Poster board, 22 inch × 28 inch, white
- Grammage: 194 g/m², 0.125 g/in²
- Example: Office Depot Item #858277 (pack of 10)

Reinforcing Material

- 60 lb kraft paper; grammage 97.7 g/m², 0.063 g/in²
- Example: Office Depot Postal Wrap Item #444835 (2 ft × 50 ft roll)
- Pipe cleaners: chenille, 6 mm diameter, 12 inch length
- Examples: Michaels Item #10525303; Hobby Lobby SKU #158386

Adhesive Material

- Heavy duty, clear, 2 inch wide polypropylene package tape
- Examples: Scotch 142-B Super Strength Mailing Tape, clear; Office Depot Item #650457, 2 inch × 22.2 yd with dispenser

Vertical Surcharge Bucket

- 5 gallon Home Depot bucket
- Example: Home Depot Internet SKU #100087613

Appendix B: Safety Appendix

Each team considers the competition steps and manages safety risk. Use additional rows as necessary.

1. Proper personal protective equipment (PPE; for example, masks, safety goggles, closed-toed shoes, gloves) should be identified and used during the competition. Failing to use PPE results in major or minor penalties at the judges' discretion.
2. At a minimum, closed-toed shoes, eye protection, and respiratory dust protection are required for all team members. Each missing occurrence of this minimum PPE incurs a minor penalty. After three reminders from the judges, the team incurs a major penalty for each occurrence.
3. Safety mishaps that result in bleeding are classified as "major."

Title	Work Task	Hazards	Controls