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 5
  - Grain shape will be rounded to sub-rounded
- **Sandbox Material**:
  - Walls and Base: 23/32 or ¾ inch plywood, any grade
  - Pile Guide: any wood material ¼ inch thick or less
  - Tie Rod: ¼ inch threaded steel rod with washers and nuts as needed
  - Fasteners: any suitable wood fasteners
- **Pile Material**:
  - 1-½ inch Schedule 40 PVC pipe
- **Horizontal Load Frame Materials**: These are recommended materials. Teams may fabricate their load frames out of any materials so long as they have the correct moment arm as shown in Figures 3 and 4. The load frames provided by organizers for the competition will use the following materials and meet the dimensions shown in Figure 4.
  - 1-¼ inch steel EMT conduit (thin wall electrical conduit)
  - ¾ inch steel L
  - ¼ inch bolts
  - ¼ inch eye hooks
- **Facing Material**:
  - Poster Board, 22 inch x 28 inch, White
  - Grammage: 194 g/m^2, 0.125 g/in^2
  - Office Depot® Item # 858277 (Pack Of 10)
- **Reinforcing Material**:
  - 60 lb Kraft Paper
  - Grammage: 97.7 g/m^2, 0.063 g/in^2
  - Office Depot® Postal Wrap Item # 444835 (2 ft x 50 ft roll)
- **Adhesive Material**:
  - Heavy duty, clear, 2 inch wide, polypropylene package tape
  - Scotch® 142-B Super Strength Mailing Tape, clear
  - Office Depot® Item #650457, 2 inch x 22.2 yd with dispenser
- **Rectangular Vertical Surcharge Bucket**:
  - Sterillite TouchTop Waste Bucket, 7.5 gal
  - Walmart SKU# 073149104380
- **Horizontal Surcharge Bucket**:
  - 5 gallon Home Depot Bucket
  - Home Depot Internet SKU #100087613

Appendix C: Design Report Judging Rubric

Geo-Institute of the ASCE: 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; and 4) Team to be awarded higher score if design parameters were verified beyond assumptions and references. Max = maximum number of points; Act = points awarded.			
Criterion	**Max**	**Act**	**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	2		Paper organization is clear and supports the message.
c. Grammar and punctuation are correct	2		Error free paper with writing that clearly presents design.
d. Figures & tables are clear, properly numbered, captioned and referenced in the text	2		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. Reimbursement appendix (Appendix A) and safety appendix (Appendix E) complete with reasonable controls	2		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	3		Experimental methods are reasonable and clearly described
b. Methods to determine reinforcement properties	3		Experimental methods are reasonable and clearly described
c. Methods to determine backfill-reinforcement interaction	3		Experimental methods are reasonable and clearly described
d. Engineering properties are reasonable	3		Backfill unit weight, friction angle, interface friction angle, reinforcement strength are compared to typical values
e. Earth-pressure calculations (backfill only)	3		Calculations are correct and presented in a logical, readily followed format
f. Vertical surcharge load included in the design	4		Considers lateral loads on wall and effect on reinforcement pullout
g. Method used to account for eccentrically applied loads	4		Model and assumptions are reasonable
h. Method used to compute pressure applied from laterally loaded piles addressed in report	4		Model and assumptions are reasonable
i. Method used to account for 3-D wall geometry	4		Method and assumptions are reasonable
j. Determination of reinforcement length	3		Model accounts for 3-D geometry and is reasonable and appropriate
k. Determination of reinforcement spacing	3		Method and assumptions are reasonable
l. Evaluation of connection strength	3		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	60		

Appendix D: Judges' Scoring Checklist for GeoWall Competition

D1: Captains' meeting—Box check

Team School:		**Deductions**	
Item	**Instruction**	**Minor**	**Major**
Plywood	☐ 23/32 or ¾-inch 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	☐ ¼-inch diameter ☐ Located within tolerances		
Piles	☐ 1-½-inch Sch. 40 PVC ☐ Length in tolerance ☐ Base guides ≤ ¼-inch thick ☐ Locations in tolerance ☐ Upper pile template easily removable		
Tools	☐ Only authorized tools used		
Other minor, explain:			
Other major, explain:			
Disqualification, explain:			
	Total deductions		

Notes:

D2: Reinforcement fabrication

Item	Instruction	Time	
		Total	> 15:00 (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	
Deductions		Minor	Major
Tools	Only authorized tools used		
Safety	No mishaps		
Other, explain			
	Total deductions		

Notes:

D4: Wall Assembly

Item	Instruction	Time	
		Total	> 15:00 (min:sec)
Time	Give start command. Time ends when soil filled to line and empty loading platform is in place		
		Deductions	
		Minor	Major
Backfill	☐ Level ☐ Filled to fill line		
Tools	☐ Only authorized tools used		
Safety	☐ No mishaps		
	Total deductions		

Notes:

D3: 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:

D4: Loading

Team School:			
Item	**Instruction**	**Scoring Guidelines**	
Stage 1: Backfill Only	• Place clean poster board on floor in front of box • At judge's direction, students remove front panel from box. Electric drills/screwdrivers may be used to remove fasteners. • Once panels are completely removed, start 1 min wait period. • At end of 1 min, make following checks:		
	☐ Swipe front wall front and sides with straight edge to check wall deflection	☐ Pass	☐ Fail *D* = 8
	☐ Less than 30 cm^3 sand leaked from box onto floor	☐ Pass	☐ Fail Major Ded.
	☐ Catastrophic failure	☐ Pass	☐ Fail Disqualified
Stage 2: Vertical Surcharge	• Bucket pre-weighed with 50 lbs of sand should be ready. • At judge's direction, students add 50 lbs of sand to surcharge bucket. Students have 1 min to complete loading. • Once load is placed, start 1 min wait period. • At end of 1 min, make following checks:		
	☐ Loading complete within 1 minute	☐ Yes	☐ No Minor Ded.
	☐ Swipe wall front with straight edge to check wall deflection	☐ Pass	☐ Fail *D* = 6
	☐ Less than 30 cm^3 sand leaked from box onto floor	☐ Pass	☐ Fail Major Ded.
	☐ Catastrophic failure	☐ Pass	☐ Fail Disqualified
Stage 3: Horizontal Load	• Bucket pre-weighed with 20 lbs of sand should be ready. • At judge's direction, students add 20 lbs of sand to horizontal loading bucket. Students have 1 min to complete loading. • At end of 1 min, make following checks:		
	☐ Loading complete within 1 minute	☐ Yes	☐ No Minor Ded.
	☐ Swipe wall front with straight edge to check wall deflection	☐ Pass	☐ Fail *D=4*
	☐ Less than 30 cm^3 sand leaked from box onto floor	☐ Pass	☐ Fail Major Ded.
	☐ Catastrophic failure	☐ Pass	☐ Fail ☐ Disqualified

D5: Scoring

Adjusted mass, *M*, computed by

$$if\ |m_D - m_A| \le 0.25 \qquad M = m_A$$

$$if\ |m_D - m_A| > 0.25 \qquad M = \max\begin{bmatrix} (m_D - 0.25) - \dfrac{(m_D - m_A - 0.25)}{2} \\ m_A + \dfrac{(m_A - m_D - 0.25)}{2} \end{bmatrix}$$

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

Team School:			
Item	**Score**	**Weight**	**Extended**
Report score out of 60, *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 6 = Deflection exceeded at Stage 2 4 = Deflection exceeded at Stage 3 0 = Deflection never exceeded		-20	
Catastrophic failure any stage disqualifies the team	**DQ**	**Stage #**	
		Final Score	

Notes:

Appendix E: 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 F: Bio-form to be completed by each <u>team captain</u> and submitted to the head judge at the pre-competition meeting

Geo-Institute of ASCE **Geo-Congress 2022** **GeoWall Competition Bios**
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 F: Bio-form to be completed by each <u>team member</u> and submitted to the head judge at the pre-competition meeting

Geo-Institute of ASCE **Geo-Congress 2022** **GeoWall Competition Bios**
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?