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Continuing Education Course #017  
Mechanically Stabilized Earth Structures

1. In ancient structures built in 2,500 BC, what form of reinforcement was used?
  - a. geogrid
  - b. geotextiles
  - c. reed mats
  - d. bronze
2. When was the first modern use of MSE structures documented?
  - a. 1490's
  - b. 1850's
  - c. 1950's
  - d. 1990's
3. What two methodologies are used to design MSE structures?
  - a. AASHTO & LRFD
  - b. LRFD & British Standard
  - c. AASHTO & Tie Back Wedge
  - d. AASHTO & NCMA
4. The AASHTO method requires a minimum design length of:
  - a.  $L=0.7H$
  - b. Various lengths
  - c.  $L=0.6H$
  - d. none of the above
5. The NCMA method can be used for complex MSE walls:
  - a. sometimes
  - b. never
  - c. only for strip loads
  - d. only for tiered walls
6. Which design method can address complex structures with tiered geometry and/or strip loads?
  - a. AASHTO
  - b. NCMA
  - c. Tie Back Wedge
  - d. none of the above
7. What two software programs are considered the industry standard for designing MSE walls.
  - a. MiraWall & KeyWall
  - b. MSEW & SrWall

- c. StrataWall & RisiWall
- d. ABWalls & TensWall

8. What are the two primary reinforcements used in MSE walls?

- a. Reed Mats and Tree Branches
- b. Geogrid and Geotextiles
- c. Steel Mats and Steel Strips
- d. B and C

9. How many segmental block systems are readily available to be used in a MSE structure?

- a. 3
- b. 5
- c. 7
- d. >10

10. How many reinforcement products are readily available to be used in a MSE structure?

- a. 3
- b. 5
- c. 7
- d. >10

11. Which is better, a mechanical or frictional block system?

- a. mechanical
- b. frictional
- c. does not matter
- d. neither

12. Blanket drains are required.....

- a. never
- b. when ground-water is close to the MSE wall foundation
- c. sometimes
- d. always

13. Blanket and chimney drains are required.....

- a. never
- b. when ground-water is close to the MSE wall foundation
- c. when ground-water rises above the MSE wall foundation
- d. sometimes

14. What information is needed to complete a MSE wall design?

- a. soil properties
- b. grading information
- c. block/reinforcement properties
- d. all of the above

15. What percentage of the structure is comprised of soil?

- a. 35%
- b. 50%
- c. 98%
- d. 99%

16. What are the two main soil properties needed for design?
- a. effective friction angle
  - b. unit weight
  - c. effective cohesion
  - d. A and B
17. What is the best type of soil to use in a MSE structure?
- a. coarse grained (sands/gravel)
  - b. fine grained (silts/clays)
  - c. both
  - d. neither
18. What are the advantages of using coarse grained soils?
- a. easy to place and compact
  - b. higher friction angle
  - c. less susceptible to creep
  - d. all of the above
19. If soils classify as silt or clay a \_\_\_\_\_ engineer should be involved in the design to make sure the soil does not exhibit creep behavior.
- a. civil
  - b. geotechnical
  - c. MSE wall
  - d. structural
20. A \_\_\_\_\_ shear test is required when using coarse grained soils.
- a. quick
  - b. direct
  - c. indirect
  - d. none of the above
21. A \_\_\_\_\_ shear test is required when using fine grained soils.
- a. unconsolidated undrained
  - b. consolidated drained
  - c. consolidated undrained
  - d. unconsolidated drained
22. What Reduction Factors (RF) applied to the reinforcement?
- a. creep
  - b. durability
  - c. installation damage
  - d. all of the above
23. Is it required to choose a specific SRW facing unit and reinforcement for design?
- a. yes - each SRW and grid combination is unique
  - b. no - all blocks are the same
  - c. yes - only for walls <20-ft
  - d. yes - only for walls >20-ft
24. Connection capacity is determined by \_\_\_\_\_.

- a. full scale field tests
  - b. a one point pullout test
  - c. applying several normal loads and tension load to a specific SRW and grid combination
  - d. interpolating a bi-linear from a two point pullout test
25. What are the external failure modes for MSE walls?
- a. sliding
  - b. overturning
  - c. bearing Capacity
  - d. all of the above
26. What are the internal failure modes for MSE walls?
- a. sliding
  - b. tensile overstress
  - c. pullout
  - d. all of the above
27. Is a global stability analysis required is a MSE wall design?
- a. yes - only for walls <20-ft
  - b. yes - for every MSE wall
  - c. yes - only if slopes are present above or below the wall
  - d. yes - only if buildings are present above the wall
28. What are the global stability failure modes that need to be addressed for MSE walls?
- a. deep seated addressing slip surfaces below and behind the MSE wall
  - b. internal slip surfaces passing through the MSE wall
  - c. compound internal slip surfaces passing through and behind the MSE wall
  - d. all of the above
29. A deep seated global stability analysis must be performed for all MSE walls. Which professional is responsible for conducting that analysis?
- a. The civil engineer who set the site grades
  - b. The geotechnical engineer as they are the most qualified team member with knowledge of the subsurface conditions at the wall location.
  - c. The MSE wall engineer
  - d. Any of the above.
30. Who is responsible for conducting internal and compound internal global stability analyses?
- a. civil engineer
  - b. geotechnical engineer
  - c. MSE wall engineer
  - d. none of the above
31. The minimum factor of safety for global stability as noted in NCMA and AASHTO is \_\_\_\_\_?
- a. 1.30
  - b. 1.50
  - c. 2.00
  - d. none of the above
32. Engineers who design MSE walls must have a background in \_\_\_\_\_ engineering.

- a. civil
  - b. structural
  - c. geotechnical
  - d. environmental
33. Contractors who build MSE walls > 6-ft tall should have constructed a minimum \_\_\_\_\_ sf of wall.
- a. 50,000- sq ft
  - b. 150,000- sq ft
  - c. 250,000- sq ft
  - d. 500,000- sq ft
34. Low spots along the wall alignment \_\_\_\_\_ :
- a. are not aesthetically pleasing
  - b. collect water and creates a situation in which washout or wall failure can occur
  - c. are not a problem
  - d. none of the above
35. When developing the grading plan the civil engineer should \_\_\_\_\_.
- a. add swales to walls with crest slopes greater than 5-feet in height
  - b. remove low spots from walls
  - c. provide scour protection
  - d. all of the above
36. At parking lots the civil engineer should drain water away from wall.
- a. True
  - b. False
37. Which underground utilities should be located outside the reinforced zone if possible?
- a. storm and sewer pipes
  - b. curb inlets and manholes
  - c. electrical/cable conduits
  - d. all of the above
38. What are the primary reasons attributed to MSE wall failures?
- a. poor design/construction
  - b. inadequate compaction
  - c. drainage
  - d. B and C
39. How often should compaction be checked during MSE wall construction?
- a. whenever the contractor asks for a test
  - b. 2 compaction tests per day
  - c. one test every 100 to 150 linear feet of in-place fill and 2-foot vertically
  - d. none of the above
40. What is the design life of a MSE structure?
- a. 10-years
  - b. 25-years
  - c. 50-years
  - d. 75-years