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LESSONS LEARNED:

Geotechnical Site Development

OBSERVATIONS AND LESSONS FROM THE SCHOOL OF EXPERIENCE

SEGMENTAL RETAINING WALLS

Normally, a site civil engineer attempts to avoid the use and cost of retaining walls. However, there are situations where retaining walls are required. Retaining walls are often required to increase the buildable area of a site, provide the required grades for site drainage, and reduce pavement and site gradients. Segmental Retaining Walls (SRWs) are masonry block face walls which utilize reinforcing geogrids in the retaining wall backfill. SRWs are engineered structures, just like the building structures on the site, which require exploration of the existing subsurface conditions, engineering design, quality construction, and construction testing and monitoring.

Unlike a conventional retaining wall, a segmental retaining wall uses the soil it retains to provide stability to the retaining wall. This statement may seem paradoxical, but it is the reinforcing layers placed in the wall backfill that stabilize the soil mass. In essence, the soil which is reinforced becomes part of the retaining wall structure. For this reason, the retaining wall designer must fully understand the soil mechanics, and groundwater and surficial water flow considerations, involved in the structural design. Not all soils types are appropriate for use in SRWs. For these reasons, typically it is the geotechnical engineer that has the breadth of knowledge best suited to design segmental retaining walls.

The following are abbreviated lists of items to keep in mind when considering using SRWs on your site.

I. SELECTION CONSIDERATIONS:

- Whether the wall will be constructed in a cut or fill situation
- Proximity of buildings and traffic loads, and location of property boundaries and utility line locations
- Site soil/rock, groundwater, and proposed surficial water flow conditions
- Global (slope) stability of the SRW including the slopes proposed above and below the wall
- Availability of suitable borrow fill materials
- Aesthetics and Cost

II. SELECTION OF BLOCK TYPE AND REINFORCEMENT:

SRWs offer a tremendous amount of design flexibility. The size of the block generally allows for curves, tiers, and various layout schemes that fit the needs of the site. The design is usually specific to a specific block type and reinforcement type. The substitution of other block types and/or reinforcement is typically not acceptable without re-evaluating the design of the wall system.

III. SELECTION OF DESIGNER:

There are a number of professionals that can design SRWs. These include the geotechnical engineer, the civil engineer, the structural engineer, and often a design-build contractor with engineering capabilities. However, as stated previously, since the majority of the wall structure consists of soil, the designer must have adequate knowledge and experience in soil mechanics to design SRWs. The designer selected should be capable of considering the geotechnical, civil, and structural factors that must be addressed in the design.

IV. COMMON PROBLEMS:

- Irrelevant Design Parameters - Too often retaining wall designs are developed which do not consider the actual site soil properties, property line locations, surcharge loads, and the cost and availability of proposed borrow fill soils.
- Designs by non-local design engineers who are not knowledgeable with the site soil and geologic conditions.
- Lack of adequate drainage – both subsurface and surficial.
- Lack of global (slope) stability analyses of retaining walls. Often this important analysis is not coordinated resulting in neither the geotechnical engineer nor the retaining wall designer performing these analyses.
- Use of Wrong Soils – Soils used for construction that do not have the strength and drainage characteristics that meet or exceed the design parameters.
- Inadequate strength, length, and vertical spacing of geogrids.
- Poor compaction in the reinforced soil zone and poor workmanship.
- Protection of the SRW from water during construction, immediately after construction, and for the life of the SRW.
- Lack of adequate construction monitoring, testing, and observation.

We hope that these "Lessons Learned" will be helpful to you in your next project.

Respectfully,

ECS Corporate Services, LLC