

## Geotechnical Design using Standard Plan and Bridge Standard Detail Sheets

The *Standard Plans* and *Bridge Standard Detail Sheets* contain design and construction details for commonly used structures. These pre-engineered designs use assumed design parameters and site conditions and eliminate the need for special designs at many sites. Examples of standardized designs commonly used by GS include sound walls, earth retaining systems, overhead sign foundations, standard class piles, mechanically stabilized embankments and culverts.

The intent of standardized designs is to minimize engineering time involved with repetitive designs while standardizing field explorations, material fabrication, and construction efforts. In many cases, projects could be designed for more efficient use of materials, but this would be offset by the additional costs for exploration, engineering, custom fabrication of forms and materials, construction, increased quality control and inspection.

Standard designs that involve soil-structure interaction use assumed soil strength parameters and site geometry. For example, standard sound wall designs use three assumed soil strengths ( $\phi = 25^\circ, 30^\circ$  or  $35^\circ$ ) and two assumed ground conditions (flat or sloping). If the site parameters meet or exceed those of the standard plan then the standard design is acceptable. If the site conditions do not meet or exceed these minimum soil strength design values or ground conditions, then the standardized design may not be used and a special design will likely be required. Likewise, the sound wall site investigation procedures in this manual would not apply as those are tailored to standard site conditions.

In many cases it may be obvious that the minimum design requirements are exceeded, and detailed investigations and calculations are not necessary. For example, where the proposed location for a Standard Plan Type 1 retaining wall places the footing on rock or intermediate geo-materials, the footing bearing stress will usually not exceed the factored bearing resistance regardless of the extent of fracturing, weathering, hardness, or strength. In this case the site investigation may be focused more on constructability issues, such as ease of rock excavation, than geotechnical design.

### Modified Standard Plan Design

When the required minimum design and geometric conditions are not met for a standard design, it may be possible to adapt an alternative standard design by selecting a more conservative option. For example, if the factored gross nominal bearing resistance at a proposed wall site is not sufficient to support a proposed 10-foot Type 1 retaining wall on a spread footing, then the geoprofessional should evaluate a 12-foot Type 1 retaining wall constructed to a height of 10 feet. The taller wall will have a larger footing width, which will produce a larger factored gross nominal bearing resistance and a reduced footing gross uniform bearing stress. In most cases, recommending construction of a larger wall footing will be more economical than constructing the wall on deep foundations. Sometimes it is feasible to modify the site conditions to meet the

standard design requirements, such as slope flattening or ground improvement to increase bearing resistance, and the feasibility of those options should be evaluated prior to selecting a special design.

### **Usage**

It is expected that the geoprofessional make every effort to recommend the standard or modified standard plan designs that are available in the Standard Plans or Bridge Standard Detail Sheets in their projects. Special designs should be used only when all standard designs or modified standard plan designs are deemed infeasible.

The procedures of the following standard plan sections are to be used when investigating, designing and recommending standard plan structures. If site conditions do not allow construction of a standard plan or modified standard plan structure, then the procedures of that section no longer apply and the geoprofessional should modify the site investigation as appropriate to support the planned special design.