



## Connection Strength

The proper evaluation of the structural connection between geosynthetic soil reinforcement and modular block retaining wall facing system has been a significant design consideration since the publication of the 1993 National Concrete Masonry Association (NCMA) Design Manual for Segmental Walls and the American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for the design of mechanically stabilized earth (MSE) structures.

Structural and civil engineers have become acutely aware of the need to properly evaluate "connections" as a result of the Hyatt walkway collapse in Kansas City some years ago and no longer neglect these more mundane structural calculations. The authors of these "state of the practice" documents recognize that the design of a structural system must be comprehensive and include an analysis of all its structural components, especially those items not easily determined such as the connection strength between a geosynthetic reinforcement and the wall facing system and wall stability during construction loading.

These documents require that the connection strength between a specific geosynthetic reinforcement and specific wall facing system be evaluated in a laboratory for its ultimate strength and strain characteristics under conditions that simulate the field installed condition. The load capacity of the connection at a specific location is compared to the maximum calculated load in the soil reinforcement and a factor of safety is calculated. This connection strength calculation is made at each reinforcement level and a minimum safety factor of 1.5 against rupture must be maintained.

The typical result of the connection strength analysis in taller walls is that the geosynthetic reinforcement to modular wall unit connection controls the wall design process and limits the maximum tensile load that wall system reinforcement can accept at various levels. The designer must then utilize stronger soil reinforcement or closer vertical spacing of the soil reinforcement to resist or lower the tensile loads in each element in order to maintain acceptable connection safety factors in accordance with published design standards.

Since the connection strength analysis can be a limiting design factor and require additional soil reinforcement costs to satisfy the required design standards, those not skilled in retaining wall design sometimes ignore, neglect, or down play the connection strength evaluation as a means of reducing cost, increasing competitive position, or otherwise hiding a potential structural limitation in the proposed retaining wall system. This practice is not professional and leads to structure designs that provide less than the required levels of design safety and potential "negligence" claims in the eyes of the legal community when there are performance problems.

Keystone Retaining Wall Systems has laboratory tested all major geosynthetic soil reinforcement types with the Keystone Standard and Compac wall units and will continue to evaluate the connection strength requirements of each structure as required by good engineering practice and published design standards. The connection strength evaluation is an integral part of the design process and can not be neglected.