CITY OF SAN MARCOS
ENGINEERING DIVISION

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AN APPLICANT'S GUIDE TO PROCEDURES FOR:

RETAINING WALLS

(EFFECTIVE June 8, 2001)

ABSTRACT

There is an increasing number of earth retaining systems being proposed in the construction industry. Several of these alternative applications have suffered notable failures in California endangering life and property. This Policy defines the parameters that are required by the City of San Marcos Engineering Division to maintain an adequate level of public health, safety, and welfare. Any retaining wall shown on a plan or constructed under a permit issued by the Engineering Division must meet the minimum requirements outlined below.

EXEMPTIONS

A. Walls that are constructed in strict conformance with Section C of the current San Diego Area Regional Standard Drawings may be constructed per the standards without calculations, but they must include provisions for drainage systems as outlined in the Design Parameters below.

B. Walls less than three feet in height (measured from the top of footing) are exempt from this policy.

C. Permits for retaining walls issued under a Building Permit are not subject to this policy.

REQUIRED DESIGN PARAMETERS

1. The Project Soils Engineer is required to provide specific recommendations and design parameters for the on-site soils and/or specify parameters for import material. The recommendations must include design parameters for the retained, reinforced, and foundation soils. Any imported soils must be tested and certified by the Project Soils Engineer as suitable for the specific application.

2. Design calculations and construction drawings, prepared by a qualified engineer registered in California, must be submitted for all proposed walls.

    a. The design calculations submitted for any project must be based on the design parameters provided by the Project Soils Engineer. In the event the design calculations are based on a computer program, the calculations submitted to the City must include at least one set of complete hand calculations for review. The hand calculations must include all equations and assumptions used and must detail the external and internal calculations. The results of the hand calculations must demonstrated conformance with the computer program results.

    b. The minimum Factors of Safety for the wall designs shall be as follows:

        i. Base Sliding – 1.5
        ii. Overturning – 2.0
        iii. Bearing – 2.0
        iv. Global Stability – 1.5

c. The Engineer of Record for the overall project shall submit a certification that states, with no disclaimer, that he/she has reviewed the calculations and that he/she concurs with and approves the design and calculations and is satisfied that the design meets all applicable standards.

3. The project plans must include details for all of the specifics necessary to build the wall including:

   a. Scaled plan view of the wall, including elevations of top and bottom of wall and any adjacent slopes or surcharge,

   b. For walls over ten feet in height or for sloped footings, profile with dimensions of all features including any soil reinforcement systems,

   c. Typical cross sections including surface and subsurface drainage systems,

   d. Any details and construction specifications required to build the wall, including bearing pad parameters, connection of geosynthetic reinforcement to wall units, wall abutment at other structures, wall termination, and reinforcement details around utilities or other obstructions.

4. Where geogrids are installed, specific recommendations must be made on the plan regarding allowable penetrations of the geogrid and specifications for those penetrations.

5. Use delta (δ) angle equal to 2/3 of the phi (ϕ) angle in any calculations involving phi.

6. The available sliding resistance must be reduced by an appropriate Masonry Friction Reduction Factor (μ) applied to the underlying soil friction coefficient tan 2/3 ϕ (or tan δ). This factor is as follows:

   a. USCS Soil Types GW or GP use ϕ=37-42° and μ = 0.7
   b. USCS Soil Types GM, SW, or SP use ϕ=33-40° and μ = 0.65
   c. USCS Soil Types GC, SM, or SC use ϕ=28-35° and μ = 0.6
   d. USCS Soil Types ML or CL use ϕ=25-32° and μ = 0.55

7. Drainage facilities, satisfactory to the City Engineer, shall be provided for all walls over three feet in height. The following criteria shall be observed:

   a. For all Regional Standard (Section C) and similar custom designed walls, the drainage system shall be Miradrain or equal. This shall include continuous vertical and horizontal drains with filter protection leading to an approved outlet meeting the NPDES requirements in effect at the time of construction.

   b. Segmented wall designs shall include permanent drainage interceptors above the wall to assure that projected 100-year flows are diverted entirely away from the wall and carried to an approved outlet meeting NPDES requirements at the time of construction.

   c. Segmented wall designs shall be prepared in accordance with specific recommendations from the Project Soils Engineer regarding drainage behind and through the wall system. The design must provide features adequate to avoid buildup of hydraulic pressure in the soil behind the wall and to prevent migration of fine material from the backfill. Minimum back drain design shall include 3 cubic feet per foot of filter material specified by the Soils Engineer with a minimum 4-inch perforated PVC pipe (SDR-35 or equal).

CERTIFICATION PRIOR TO ACCEPTANCE

Upon completion of the wall, and before reliance on any wall for issuance of a Building Permit, the Project Engineer and Project Soils Engineer of Record shall submit certification to the City stating that the wall has been constructed in accordance with this policy, the minimum requirements of the manufacturer, the design plans and specifications as approved by the City, and their recommendations.

GENERAL PROVISIONS

1. Keystone and/or Loffelstein type walls will not be permitted where slopes occur away from the toe of the wall. The minimum level area (less that 10% grade) of two times the overall height of the wall or 10', whichever is greater, must be provided at the toe of the wall.
2. The maximum height of any Loffelstein type wall shall be eight (8) feet.

3. No geogrids shall be utilized in Loffelstein type wall designs.
4. For segmented walls, soil samples shall be taken to analyze agricultural requirements for verification of landscape suitability in the wall face backfill. All walls shall be planted and irrigated in accordance with approved landscape plans.
5. All backfill shall be compacted to a minimum of 90% of the maximum density based on ASTM 1557-82.
6. Prefabricated wall components shall be free from imperfections in molding, honeycombing or open textured concrete, cracks or other imperfections. Units must meet all dimensions and tolerances of the manufacturer's specifications.
7. No surcharge from any structure subject to a Building Permit will be allowed to be placed upon any segmented retaining wall system.