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November 11, 2004

Mr. William E. Koffel, P.E.
President
Koffel Associates, Inc.
3300 North Ridge Road
Suite 275
Ellicott City
Maryland 21043

**RE: Koffel Associates, Inc.
Letter dated August 25, 2004
To: John Guy**

and

**VEROT OAKS BUILDING BLOCKS
ENGINEERING EVALUATION
SEISMIC REQUIREMENTS
KA 03773-001**

Dear Mr. Koffel,

Please find the following seismic review as requested of me to evaluate VOBB dry stacked concrete building blocks. Accordingly I have evaluated subject blocks in relation to ACI 530.

Standard VOBB building practices are to use #4 rebar for steel anchors installed every 6 to 48 inches to match the cells in the VOBB block. The #4 rebar steel anchors are installed protruding from the foundation per ACI 530, 2.1.4. Steel is then continued up through the wall with #4 rebar through the height of the wall to the J-anchors which secure the top sill plate to the wall. The cells that receive the rebar are filled with concrete. The anchoring rebar, subsequent rebar and J-anchors are recommended to be spaced out horizontally every 6", 12" or 18". The anchorage connections between VOBB walls and the wood framed floors or roof are to be installed per ACI 530, 1.13.2.2.2.2 .

Per VOBB building practices, the subject VOBB blocks are dry stacked in rows one on top of another, with each row offset from the adjacent row above and below to form a running bond pattern. Three inherent design features of VOBB wall systems using 18" blocks which provide strength to the wall systems is as follows:

- When the blocks are stacked to form a corner, the three cells in the corner are filled with concrete and #4 rebar; as described above.
- Likewise the cells in the blocks that form an intersection of two walls are also filled with concrete and #4 rebar; as described above.
- When rebar and cement are introduced into cells on a 12" spacing, the running bond stacking of the block in conjunction with having an odd number of cells (3) per block, result in the tying together of the running wall system to be a monolithic structure.

Standard concrete masonry units (CMUs) construction is to stack blocks in rows cemented together with mortar. Mortar products are not considered to be structural components for tension applications. When seismic forces are imparted into current code approved CMU wall systems in the direction of the of the weak axis (normal to the wall), the mortar joints between each row of CMUs is in compression on one side, and tension on the opposing side. It is the tension side of the joint that fails when horizontal loads exceed the tensile strength of the mortar. A standard CMU wall built with mortar to bind the blocks together, creates a wall system layered with weak mortar joints the entire height of the wall.

It is the use of #4 rebar and concrete filled cells that make VOBB wall systems superior to standard CMU's. VOBB block wall systems are superior because of the steel reinforcement for tension and the VOBB blocks can only impart compression loading into adjacent blocks. Therefore VOBB wall systems are not diminished in capacity as standard CMU's are from horizontal loading normal to the wall.

The walls are to be anchored to the roof and floors that provide lateral support, and the anchorage shall provide a direct connection between the walls and the floor or roof construction Per ACI 530, 13.3.3 .

If the acceleration forces listed in ASCE 7-98, Table 9.4.2.1b are considered to reflect the seismic lateral forces in the various Seismic Design Categories per ACI 530, 1.13.3 , 1.13.4, 1.13.5, 1.13.6 and 1.13.7 and said forces are induced into a single story VOBB wall system, the connections are capable of withstanding the subject forces.

Every wall design is unique and a case by case evaluation should be made before any wall system design is confirmed. Each building situation may have unique circumstances due to design of the building and wall systems, soils, or other variables. The VOBB block design may be used, but needs to be evaluated for every case and seismic condition.

Sincerely,



Steven Doerr, P.E.
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