Soils & Structures Inc.

Structural Engineering

Geotechnical Engineering

Construction Material Testing

Geotechnical Drilling

Structural Steel Inspection

July 15, 2012

LiveWall, LLC
PO Box 533
Spring Lake, MI 49456

Attention: Mr. David MacKenzie

Regarding: LiveWall–Structural Loading Calculations

Dear Mr. MacKenzie:

At your request we have reviewed your LiveWall system with regard to its loading characteristics when installed to an exterior wall of a building and compared these characteristics to current loading requirements for buildings.

It is our understanding the LiveWall system consists of a series of containers which are anchored to the wall of a building. The containers are installed with a vertical spacing of 12 inches and when full of saturated soil and plant material have a maximum weight of 15plf. The maximum effective weight of this system is 15psf with a center of gravity approximately 4.5 inches off the face of the building. In the appendix to this report (Appendix A) we have provided a schematic which illustrates our understanding of the LiveWall system.

Buildings in the United States are required to be designed and constructed in accordance to requirements of the International Building Code (IBC) which references American Society of Civil Engineers – Minimum Design Loads for Buildings and Other Structures (ASCE 7) for structural loading requirements. These documents require exterior walls to be designed for two basic structural loads which are vertical gravity loads and lateral wind loads. Following is a brief overview of these loading requirements as they relate to exterior walls:

Vertical Gravity Loads
These loads are transferred to the exterior walls through the supported floors and roofs and can vary significantly due to the type and size of building. *Typical values for this type of loading can vary from 1000plf for a very small building to 20,000plf for a large multi-story building an average value for a two story commercial building might be on the order of 5000plf.* Vertical loading is supported by the compressive resistance of the exterior wall (i.e. column action).

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Lateral Wind Loads

When wind blows against a building it produces pressures normal to the surface of the wall. These wind pressures vary due to the wind speed (i.e. faster wind speeds create greater pressures). Wind speed design requirements vary across the United States although a vast majority of locations (90%) require structures to be designed for a wind speed of 90mph. *Wind pressures produced by a 90mph wind speed are on the order of 15psf-20psf.*

In the appendix to this report we have provided calculations performed for a 12ft wall height. The purpose of these calculations was to determine the equivalent vertical gravity load and lateral pressure produced by the LiveWall system when attached to the exterior wall of a building. The vertical gravity load is a direct result of the systems weight whereas the lateral pressure results from the torque produced on the wall via the eccentric nature of the loading (i.e. LiveWall system center of gravity does not coincide with that of the wall).

The results of our calculations based upon the 12ft wall height are as follows:

Equivalent Vertical Gravity Load = 165plf
Equivalent Lateral Pressure = 1.0psf

When comparing the results of our calculations to the IBC code requirements discussed earlier, it can be readily seen that the structural loading produced by the LiveWall system is extremely small when compared to the IBC structural loading requirements.

The purpose of this report was to discuss the results of our calculations and compare these results to current structural loading requirements of the International Building Code (IBC). We have not performed any analysis nor do we make any claim as to the structural integrity of the LiveWall system or its anchorage. We feel it important that the building owner or owners representative responsible for installing this system have the existing wall system and anchorage of LiveWall to the existing wall analyzed by a licensed professional engineer to determine if the existing wall and anchorage to this wall can safely support the weight of the LiveWall system.

If you have any question or would like to discuss further please feel free to give me a call.

Sincerely,

Soils & Structures Inc.

Brian T. Murphy, P.E.
Senior Structural Engineer
BTM/bm

Appendix A

Structural Calculations

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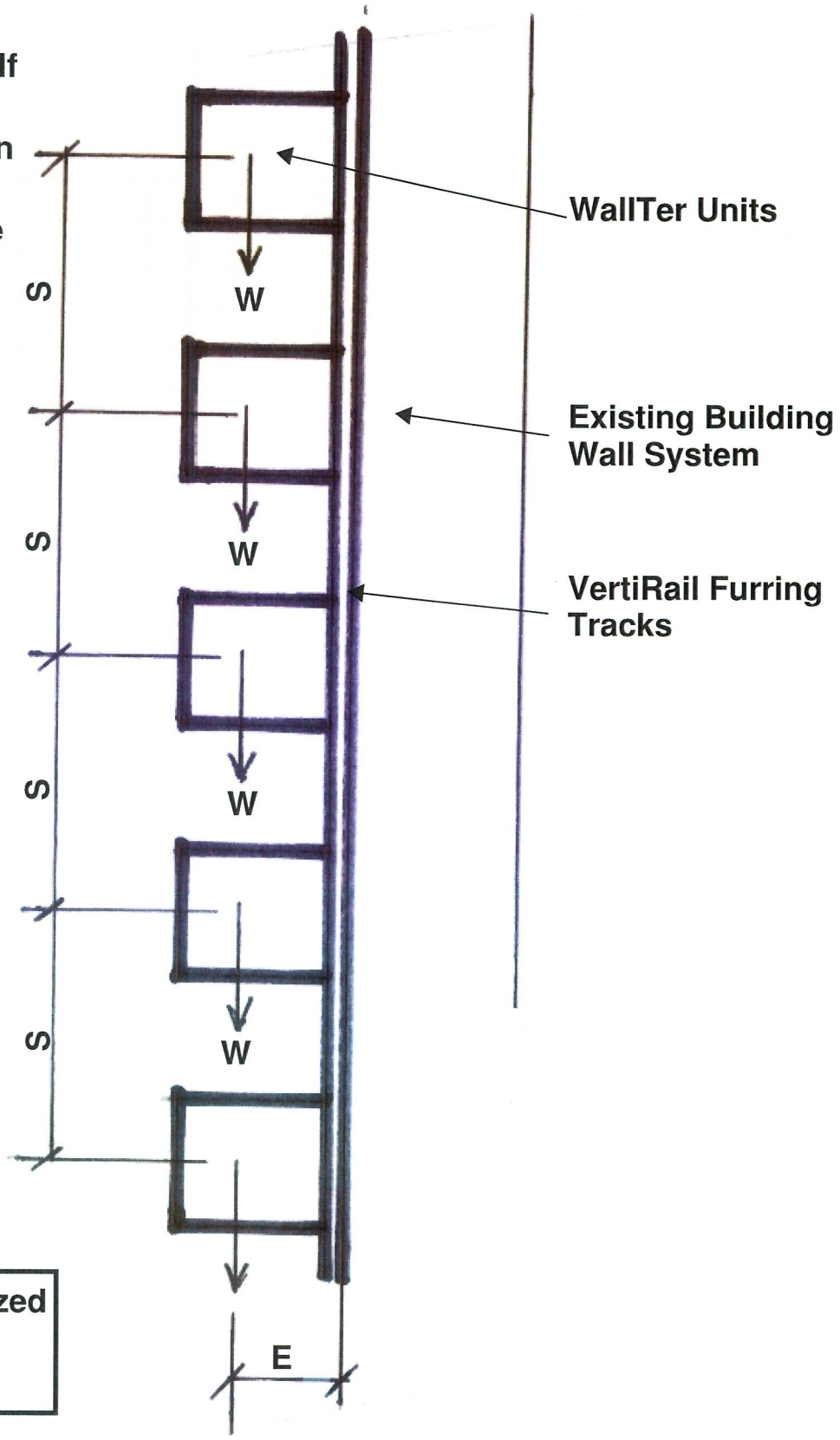
JOB LiveWall
SHEET NO. ____ OF ____
CALCULATED BY BM DATE 7/12/2012
CHECKED BY ____ DATE ____
SCALE ____

Weight per Tier (W) = 15plf

Spacing of Tiers (S) = 12in

Center of Gravity Relative to Face of Wall (E) = 4.5"



LiveWall Schematic Utilized for Structural Loading Calculations

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JOB LiveWall
SHEET NO.
CALCULATED BY BM
CHECKED BY
SCALE

OF
DATE 7/12/2012
DATE

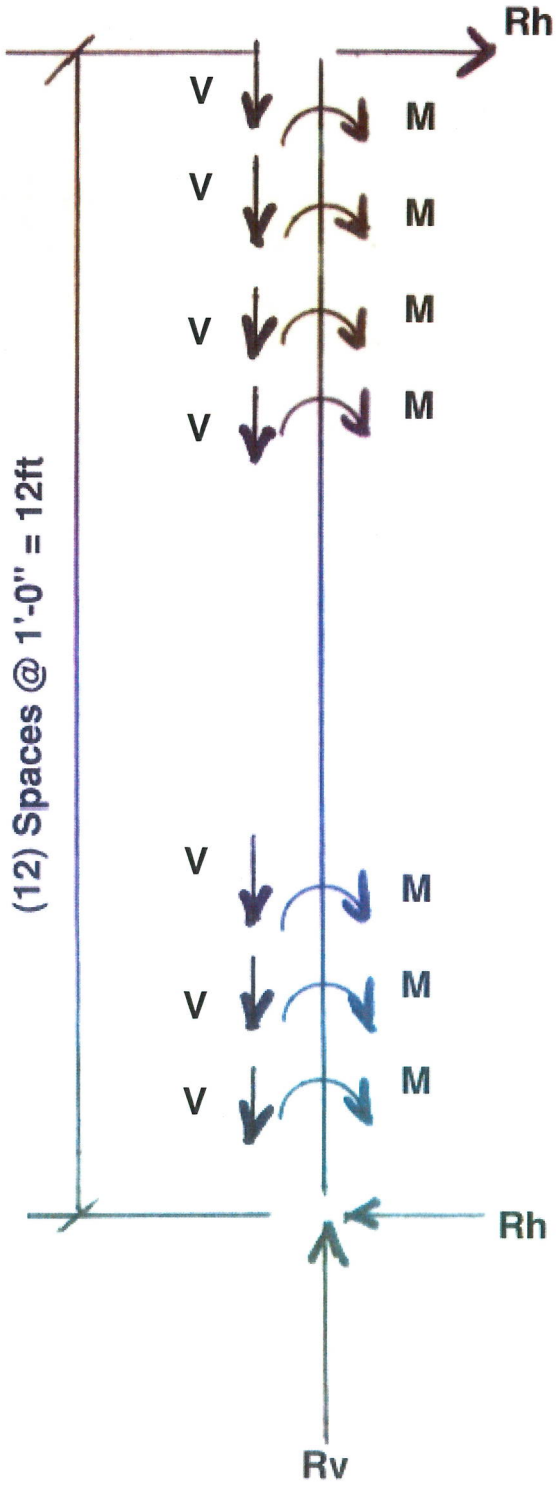
Vertical Reaction per Tier
(V) = 15lb

Moment per Tier
(M) = 67.5in-lb

Total Vertical Reaction
(Rv) = 165lb

Horizontal Reaction Top and Bottom
(Rh) = 5.2lb

Maximum Bending Moment
(Mmax) = 59.4in-lb



Structural Loading Diagram for 12ft Wall Height

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JOB LIVE WALL
SHEET NO. ____ OF ____
CALCULATED BY BM DATE 7/12/2012
CHECKED BY ____ DATE ____
SCALE ____

Calculation of Equivalent Wall Pressure

Based Upon Horizontal Reaction (Rh)

Rh = 5.21lb =wl/2 where l=12ft

Solving for w = 0.87psf **Governs**

Based Upon Maximum Bending Moment (Mmax)

Mmax = 59.4in-lb = 4.95ft-lb = wl^2/8

Solving for w = 0.28psf

Equivalent Uniform Wall Pressure = 0.87psf (i.e. 1.0psf)