



AMERICAN  
ENGINEERING  
TESTING, INC.

No. PW070103-01

CONSULTANTS  
• GEOTECHNICAL  
• MATERIALS  
• ENVIRONMENTAL

June 6, 2003

Mr. Kai Knag  
Professional Land Art  
2219 7<sup>th</sup> Avenue  
Rapid City, South Dakota 57702

Subject: Stability Review of Building 1731 Rock Wall  
Harmony Heights Apartment Project  
Rapid City, South Dakota  
AET # 18-00248

Dear Kai:

### **Introduction**

This letter presents the results of American Engineering Testing's (AET) review of the stability of the existing rock wall in front of Building 1731 of the Harmony Heights Apartment complex. As you are aware, AET provided geotechnical studies for the Apartment complex project in 2000 and 2001 and has provided construction observation and testing services throughout the construction period.

### **Project Information**

As requested AET has reviewed the stability of the existing rock wall, constructed in front of Building 1731 and along the south shoulder of Harmony Heights Lane. We understand approximately 175 feet of the rock wall has been constructed within the Harmony Heights Lane Right-of Way. As such, the City of Rapid City has requested the stability of the wall be reviewed.

As mentioned above, the portion of wall in question runs along the south shoulder of Harmony Heights Lane for a distance of approximately 175 feet. The toe of the wall ranges from approximately 8 to 10 feet from the back of the street curb. A new concrete sidewalk will soon be constructed in this area. The top of the wall is set out in front of the building for a distance of 30 to 40 feet. As measured from the northeast end, the wall is a one tier system for a distance of approximately 40 feet. At this point, the wall steps up to a two tier system for an additional 30 feet. The remainder of the wall is a three tier wall with maximum height of the order of 8 ½ feet. The distance of each horizontal step between tiers is approximately 4 feet.

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Rapid City, South Dakota  
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The rock wall consists of stacked boulders of various sizes. In general, individual rocks measure on the order of 2 to 4 feet in width, 1 - 2 feet in height and are set back into the slope an average of 3 feet. We understand the site sandy clay to clayey sand soils were placed as backfill behind the rocks. We also understand the runoff from the roof of Building 1731 will be collected in a subsurface pipe and routed to the northeast and just beyond the beginning of the rock wall system. The soils above the wall will be seeded.

### Stability Review

The stability of the maximum section of wall was evaluated under the above stated conditions. We have assumed the ground surface above the wall will be seeded and runoff from the building discharged through the underground pipe. We have also assumed the rock wall will be maintained and that the backfill behind the wall was placed to the specified compaction given in the earlier soils report.

Soil parameters for density, cohesion and friction angle were obtained from past work at the site. The wall was assumed to be built on and backfilled with, the site sandy clays/silty sands, which had the lowest cohesion and friction angle values. The individual rocks were given a friction angle of 15 degrees with no cohesion factor.

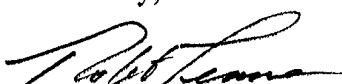
Results of the stability runs are presented at the end of this letter. Our calculations indicate a factor of safety in excess of 1.5 can be obtained using the above stated parameters and the current geometry of the rock wall. The shear plane with the lowest factor of safety falls immediately behind the stacked rock themselves. Placement of the concrete sidewalk and thickening the edge of the walk adjacent to the toe of the wall should provide additional resistance to sliding.

Based on our review it is our opinion the rock wall will be stable as constructed. Proper drainage should be maintained away from the face of the wall. Periodic maintenance of the rock face may be required to minimize soil loss from behind the individual rocks.

### Closing

The conclusions contained in this letter represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering practices at this time and location. Other than this, no warranty is intended or implied. If you have any questions or need additional information, please call our office at (605) 388-0029.

Sincerely;

  
Robert Temme P.E.  
South Dakota Manager

