



January 22, 2015

Housing and Community Initiative
Attention: Deane Robertson
30 S Nevada Ave, Suite 604
Mail Code 640
Colorado Springs, CO 80903

RE: 1134 Pando Avenue
STE JOB: 150111

Mr. Robertson:

At your request personnel of Soil Testing and Engineering Inc. (STE) made a site visit to the above referenced site on January 20, 2015. It is our understanding significant amounts of water entered the crawlspace during heavy precipitation events in the summer and fall of 2014.

The purpose of our site visit was to visually observe the interior of the crawlspace, including foundation components and exterior drainage and grading, and provide our professional opinion as to the cause of water entry into the crawlspace and the viability of the foundation walls. For the purpose of this letter, the front of the house is considered south.

The recommendations contained in this letter are based upon the conditions observed on January 20, 2015. This report is intended for use by the client, and only for the purpose stated, within a reasonable time of issuance. The scope of the project, geologic conditions (both on and off site), climate conditions, state of the art, and other variables may change over time. If another engineering firm is retained for site work and excavation observations, they must complete their own subsurface investigation. This report can be used for comparison only.

Visual observations

The structure observed is a one story residence consisting of a main level over a crawlspace. Vinyl siding is present on the exterior face. A concrete driveway is present adjacent to the eastern side of the house and extends southward to Pando Avenue.

A covered attached deck exists on the northeast portion on the rear wall of the home. A concrete sidewalk is present along the northern side of the deck. A concrete patio exists between the west side of the deck and the crawlspace access located near the northwest corner of the house.

A plastic membrane is present between the foundation and fence along the west side. It runs from the southwest corner north beyond the northwest corner of the house.

Based on information available to date, it is our professional opinion the foundation can be modified to extend the life of the structure. The existing drainage and grading must also be modified to redirect surface water away from the house to reduce the potential for water intrusion into the crawlspace.

Our investigation consisted of limited observation of the foundation system and exterior drainage and grading. Items observed include the following.

Information obtained from El Paso County:

Office

- The house was built in 1955.
- The home was purchased by Ms. Wagner in 2008.

Information provided by owner

- A portion of the foundation cracks were patched prior to the most recent purchase.
- Due to movement of framing on the main level, the foundation was stabilized by Concrete Stabilization Technologies Inc. utilizing an "Expanding Structural Polymer".
- The crawlspace flooded in 2014 during periods of heavy precipitation. The majority of the water intrusion appeared to be along the western and north western portions of the foundation.
- A plastic membrane was placed on the western side of the foundation to collect surface water from the west. The plastic appeared to reduce the amount of water entering the crawlspace.
- According to the owner, the main level framing, doors, and windows appear to be performing well at this time.
- Ms. Wagner has tried to plant flowers adjacent to the foundation west of the front concrete stoop. She was unable to dig the soil in the backfill due to the amount of construction debris (i.e. concrete, wood, brick, etc.).

Visual Observations by representative of STE:

The main level living area was not observed due to comments provided by the owner that the inside was performing well.

Crawlspace

- The foundation consists of a concrete stemwall/footing system. The interior central support also consisted of a stemwall/footing foundation with an opening between the southern and northern crawlspace areas near the west exterior foundation wall.

- The foundation was evaluated for reinforcing utilizing a Bewahrungssucker rebar locator. Based on information obtained reinforcing was not utilized in the foundation system.
- The concrete was tested with a Swiss Style concrete hammer at several locations on the interior face of the foundation. The strength of the concrete in all areas tested was in excess of 3000 psi.
- A portion of the cracks were covered up with some type of concrete mortar grout. The grout flaked off easily from the foundation and cracks during testing. A portion of the cracks have been partially injected with an epoxy type material. The owner indicated the epoxy was placed utilizing a caulking gun and only a portion of the cracks were epoxied due to a limited supply of material. The depth of penetration into the foundation could not be determined.
- Numerous cracks were present in the exterior foundation sections. They ranged from hairline to in excess of 3/8 of an inch. The cracks indicate both heave and settlement type movement. A portion of the cracks extend through the footing.

The central support wall has fewer cracks and were generally minor. The exterior foundation walls at the majority of the foundation cracks also indicate vertical and horizontal type movement both to the interior and exterior.

- An exterior vent was present in the top of the foundation in the west wall close to the northwest foundation corner. Evidence of water entry was present on the foundation face below the vent. The foundation was stained and some spalding of the face below the vent was apparent.
- The soil in the crawlspace appears to be a moderately to highly expansive clay. At the time of our observation the surface soils were dry with one inch wide desiccation cracks over the entire crawlspace.

The cracks in the soils are the result of drying of the previously saturated clay resulting in shrinkage of the clay. Where tested, the cracks extended a minimum of 12 inches below the ground surface.

- The "stabilizing" Expanding Structural Polymer was observed under the portions of the northern and eastern foundation footing. STE is unfamiliar with this system and cannot comment on its effectiveness.

Exterior:

- Where the foundation was exposed, some cracks were visible. Most were open and appear to be consistent with cracks observed in the crawlspace.

- The south front entry stoop and sidewalk directs surface water to the east onto the driveway. The backfill area adjacent to the foundation west of the front entry has settled and generally ponds water adjacent to the foundation.
- The driveway slab along the east side is cracked with displacement resulting in ponding areas evident near the foundation.

The downspout at the southeast corner discharges onto the driveway adjacent to the foundation.

The ground surface, along the east side of the covered deck, ponds water at the northeast foundation corner. At the time of our walk, approximately 2" of ice was present on the ground surface.

The roof gutter system has been removed from the northeast corner. The gutter appears to have been removed when the deck roof was constructed. The gutter was removed from the northeast corner to beyond the decks western edge, allowing collected roof water to discharge onto the ground below.

A concrete patio extends from the west side of the deck to the crawlspace entry near the north west corner. The gas meter is located to the west of the deck. The slab was formed around the meter creating ponding areas. This area is located under a portion of the roof without a gutter system.

This allows collected water to pond in the backfill adjacent to the foundation and will also allow the water to infiltrate the expansive soil beneath the patio slab.

The drainage beneath the deck could not be observed.

The grade of the patio could not be observed, due to the ice and snow accumulation. It appears to direct surface water to the north and west.

- A polyethylene membrane was placed on the ground surface along the western side between the foundations and fence to the west. Four inch CMU blocks was placed at both edges of the membrane.

Ponding water was present on the membrane surface at several locations.

The downspout at the southwest corner has been extended to the south. The discharge appears to be adequate.

An air conditioning unit is present near the southwest corner. It appears water ponds around the base.

The home to the west does not have a roof gutter system on the northeast portion of the roof. The ground surface also appears to drain toward the west side of this address directing collected surface water near the western foundation section.

Results:

The soils present in the crawlspace and the soils in the area are moderate to highly expansive. They consist of residual clays derived from the Pierre Shale over the Pierre Shale.

Again, based on information available, this home was constructed in 1955. Construction practices and standards at that time did not generally address this expansive nature of the soils. Replacing the foundation may not be economically feasible. As discussed previously, it is our objective professional opinion, the foundation can be modified to extend the life of the structure. This would include modifications to the drainage and grading to reduce the potential for future water intrusion and foundation movement. However, the recommendations and suggestions contained in this letter are not a warranty or guarantee against future movement.

Water intrusion into the crawlspace appears to be associated with poor grading, lack of a gutter system along portions of the roof, downspout discharges, inappropriate backfill, etc. Surface water infiltrated the backfill adjacent to the foundation and enters through cracks and beneath the footing. Ponded water also appears to enter through the vent at the northwest corner.

The foundation system does not appear to have reinforcing, allowing for vertical and horizontal movement.

The structure is located in a moisture sensitive environment consisting of expansive soil and future movement is to be anticipated.

Recommendations:

The following recommendations can be used to reduce the potential for water intrusion and extend the life of the structure.

Again, water intrusion in the crawlspace appears to be collected surface water from this address and surrounding area entering the backfill zone around the foundation. Based on information provided and our observations the backfill contains conspicuous amounts of construction debris and has settled creating ponding areas in the soft backfill.

The cost to remove and replace the backfill may not be economically feasible. As such, the drainage and grading is to be modified to direct water away from foundation components. Generally accepted drainage and grading include the following:

- The ground surface within 10 feet of the building must be sloped away from the building with a minimum gradient of 5%. This is equivalent to six inches of fall across this 10-foot zone. Concrete flatwork should be sloped away from the building with a minimum of 2% gradient. Where this is not possible, a well-defined swale should be constructed to intercept the surface water and carry it quickly and safely around and away from the building. Plastic should not be utilized beneath

decorative rock or bark, etc. A breathable filter fabric should be utilized in lieu of plastic membranes.

- A shallow surface interceptor drain can be installed in the swale located on the west side of the home.
- Decorative edging, sidewalks and other flatwork should be planned and constructed so that they do not restrict rapid surface flows away from the foundation region.
- Roof downspouts should be extended across all backfill zones and discharged into an area of positive drainage away from the structure.
- No sod, grass, shrubs, flowers, trees, or other vegetation requiring water should be placed within five feet of the foundation or within any backfill zone. Sprinklers must not discharge water within five feet of the foundation or within any backfill zone.

Attached to this letter is a detail showing the suggested Surface Intraceptor Drain. The drain must have a gravity daylight discharge at the surface. It must be understood the interceptor drain will be located near the surface and is susceptible to freezing.

The driveway slab should be removed and replaced with an appropriate slope away from the foundation.

The ponding area around the gas meter needs to be filled or covered to reduce the potential for water intrusion adjacent to the foundation and beneath the patio slab.

The roof gutter system is to be replaced, so that collected roof water is directed to downspouts that are properly discharged.

A roof gutter system is suggested for the northeast portion of the house to the west. It should be extended to an area of positive grading away from both foundation systems.

Again, reinforcing was not apparent in the existing foundation. This results in cracking associated with horizontal and vertical movement. Portions of the cracks were not addressed, some have been covered with a concrete grout and a portion appeared to have been partially filled with an epoxy type system. We recommend all cracks opened or covered, over 1/16 of an inch in width, be injected with an appropriate pressure injection system. This would include foundation cracks on the exterior above the ground surface if the pressure injected epoxy material does not penetrate the exterior face of the foundation. This modification should strengthen the foundation and enhance the performance of the foundation performance. It must be understood future movement of the foundation is anticipated.

The modifications are intended to extend the life of the structure.

General Notes

The following are considered general notes for construction and repair:

- All work is to be accomplished by experienced personnel in accordance with all applicable local, state, and federal codes, rules and regulations. When differences exist between job specifications and the governing code, the more stringent shall control.
- All utility lines in the vicinity of excavations are to be located prior to the start of any excavation. Utility lines, subsurface drains, etc. are to be restored to their original condition or repaired as necessary.
- During the backfill removal and replacement process, extreme care is to be taken, so as not to damage existing foundation components.
- The interior of the foundation system adjacent to the area being worked should be monitored throughout the process.
- All backfill placed on the site to change grade, replace driveway, etc. is to be compacted to 90% of its maximum Proctor dry density ASTM D-698 at approximately $\pm 2\%$ of its Proctor optimum moisture content. All soil is to be compacted to mechanical means; no water flooding techniques of any type are to be used.
- Excavations must be properly shored or sloped in accordance with local, state, federal, or OSHA guidelines or regulations. The contractor is responsible for providing proper shoring and/or sloping to provide adequate safety.
- All concrete placed on site is to be made using a Type II cement. The minimum recommended 28 day compressive strength of concrete is 3500 psi.
- Safety to the homeowner and employees of the contractor is of the utmost importance. All provisions for safety are required to be taken.
- The contractor shall obtain and be responsible for all permits from all governing bodies.

Closing

This report is based upon limited visual observations, information provided to us on site, and our knowledge of the soil conditions in the area. As with any project of this nature, hidden conditions may arise during the repair process, requiring modifications, additions, and or deletions to the recommendations contained herein.

This report has been prepared in accordance with generally accepted engineering standards of practice for the time and region. No other guarantees or warranties are either expressed or implied.

It is agreed that the professional services of the engineer do not extend to or include construction supervision of the contractor's work or performance. It is further agreed that the owner with defend, indemnify and hold harmless the engineer from any claim or suit whatsoever, including, but not limited to, all payments, expenses or costs involved arising

from, or alleged to have arisen from the contractor's performance or the failure of the contractor's work to conform to the design intent. It is the contractor's responsibility to ensure that adequate construction supervision is provided so that the intent of the recommendations can be met.

We trust this provides the information you requested. Should questions arise concerning this matter, do not hesitate to call.

Respectfully submitted,

SOIL TESTING AND ENGINEERING INC.



Larry W. Chisman, Principal

LWC/kal
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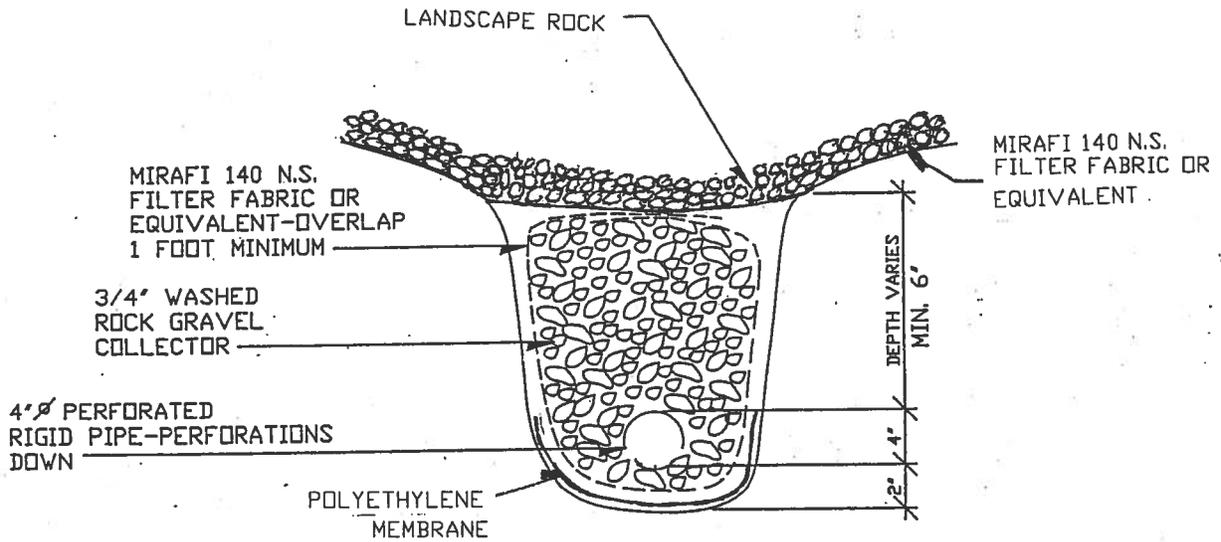
**THIS DOCUMENT WAS
PREPARED UNDER MY
DIRECT SUPERVISION:**



Francis Magnusson

CLIENT: REDEVELOPMENT SPECIALISTS
OF COLORADO SPRINGS

PROJECT: 1134 PANDO AVENUE



**SURFACE INTERCEPTOR TRENCH
DRAIN DETAIL**

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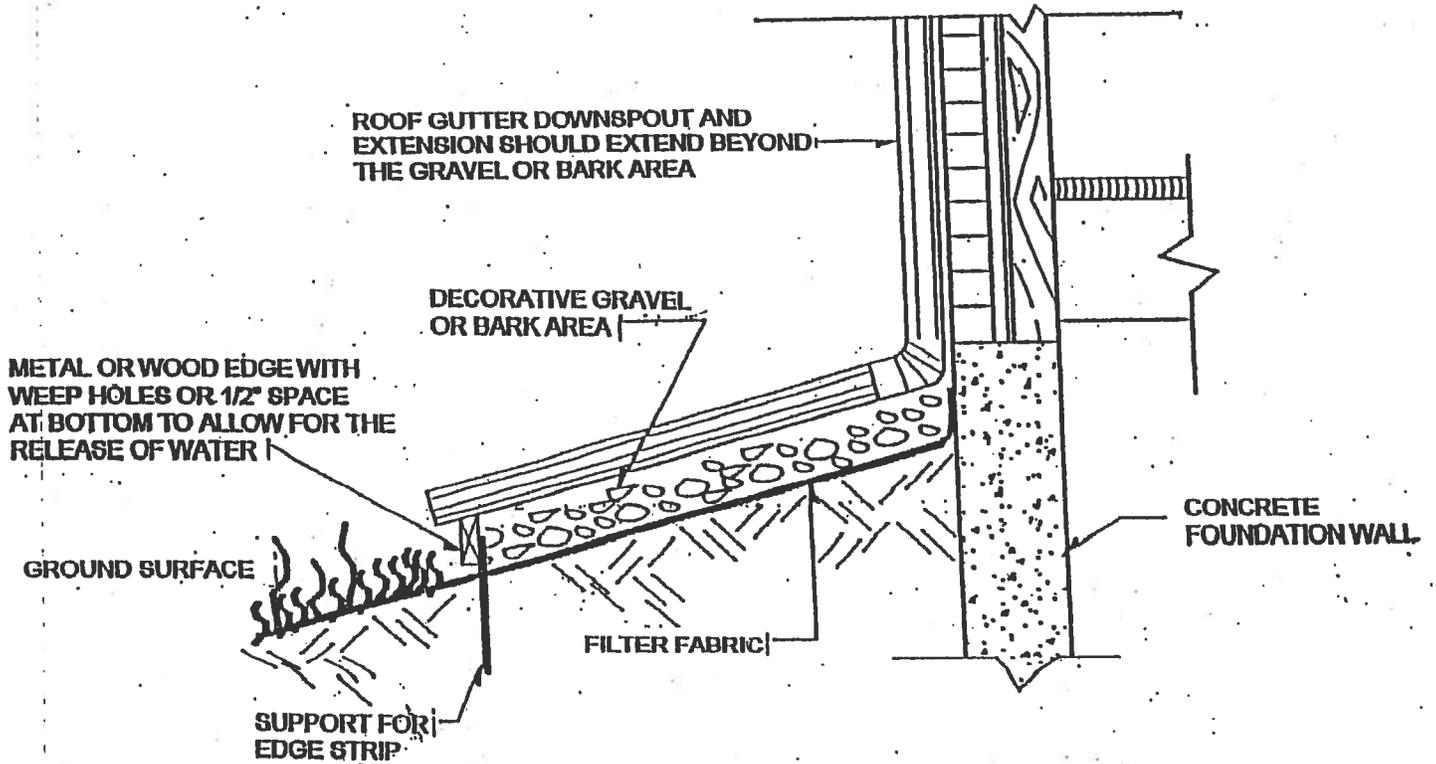
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SOIL TESTING & ENGINEERING INC.

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EXTERIOR GRADE AND DOWNSPOUT

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