April 21, 2000

LFR 315-01013-00-000

Ms. Ellen Nevins
1 Silverthorne Drive
Belle Mead, NJ 08502

Subject: 1 Silverthorne Drive, Belle Mead
Report on Construction Issues

Dear Ms. Nevins:

During two site visits, the first on February 15, 2000, and the second on April 3, 2000, I examined a number of conditions at the referenced property, many of which have been determined to constitute deficient construction. In this context, the term "deficient" means that which does not conform to one or more of the following:

- The original Construction Documents, as filed with and approved by Montgomery Township Building Department;
- The applicable governing building Codes (NJUCC, BOCA, NEC, etc.);
- The Performance Standards of the New Jersey New Home Warranty Program, as published by the Department of Community Affairs, Division of Codes and Standards; and
- Industry and trade standards of materials and workmanship.

The enclosed report organizes the deficiencies by the Uniform Construction Index (UCI) categories. The UCI is organized by construction type, materials, sequence, and trades, and offers a framework for discussion and remediation. The above Documents and Standards are referenced where applicable. Each deficiency is briefly described, and the causes noted where possible. The recommended remedial action is provided for each deficiency.

Please contact me at extension 451 if you have any questions.

Sincerely,

James B. Huffman, PE
Principal Engineer

JBH/ymt
Enclosure
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April 20, 2000
1 Silverthorne Drive, Belle Mead

CONSTRUCTION DEFICIENCIES

UCI Section 2: Site Work

1. ROOF LEADERS

Some roof leaders discharge into 4" corrugated HDPE underground drain lines, while others discharge directly at grade, immediately adjacent to the foundation wall.

Recommendation:

Extend the roof leaders currently discharging at grade, to discharge at least 8' from the building.

2. PONDING

At the exterior perimeter of the house, there are several areas where improper foundation backfilling procedures have resulted in ponding of stormwater (both surface water and the discharge from roof leaders). In addition to unnecessary moisture migration through the concrete, the resulting saturation of the soils adjacent to the foundation walls can significantly increase the lateral soil pressure on the wall. Also, when these saturated soils freeze, the resulting lateral forces against the foundation wall can become very large, and result in failure of the wall.

Recommendation:

Regrade the area in the immediate vicinity of the building, adding soil as needed, to assure positive drainage in all areas. Note that, because the foundation walls are plain (unreinforced) concrete, nominally 8" in thickness, the Code limits the height of unbalanced fill to 7'.

UCI Section 3: Concrete

1. CAST-IN-PLACE WALLS

Some portions of the concrete foundation and retaining walls were poorly consolidated at the time of placement, and poorly finished after the forms were stripped. In particular, on the north side, near the garage and basement steps, there are several areas exhibiting evidence of the above-described deficiencies.

Recommendation:

Clean the affected areas (blast or acid etch) and patch with a color-matched epoxy-based concrete repair product. Finish to match the surrounding area.

2. CRACKED SLAB

The edge of basement slab is badly cracked near areaway door. Because the exact relationship of the footing, slab, and sill is not known, it is not possible to positively attribute this crack to a particular cause. However, based on a review of the Construction Documents, it appears very likely that the footing does not step down to proper frost depth in the vicinity of the door, and that saturation of soils and frost action are responsible for the cracked slab.

Recommendations:

Make certain that the areaway drain functions properly.

Fill the crack using an injectable epoxy-based concrete repair product. Monitor the crack for further movement.

3. BASEMENT SLAB

The elevation of the surface of the basement slab varies as much as 2.64" over a distance of approximately 30'. A series of measurements was taken using a transit and stake, and there is no evidence that the slab was intentionally loped for drainage. The Performance Standard for slabs is 1/240, or ½ inch over 10'. The surface variations of the subject slab greatly exceed the performance standard.

Recommendation:

Remove and replace the slab.

UCI Section 4: Masonry

1. BRICK VENEER

The brick veneer extends approximately 4" past the supporting concrete foundation at both ends of the front wall. This condition results in excessive bending stresses and failure of the first overhanging unit. This condition is not only unsightly, but allows water intrusion, which results in further frost damage to the brick veneer. Proper design and execution can avoid this problem, while still providing for the desired overhang to hide the edge of the siding on the adjacent wall. Correctly locating the brick shelf a few courses below grade would allow proper corbelling and avoid concentrated bending stresses.

Recommendation:

Install a galvanized steel plate or shelf angle to properly support the brick. Provide flashing and weeps. Repoint the area to match.

UCI Section 5: Metals

1. RAILINGS AT EXTERIOR BASEMENT STEPS

There is no grout or sealant at the bases of the metal railings. Rainwater can freely enter the base holes, and frost action will eventually destroy the surrounding concrete.

Recommendation:

Remove the railings. Properly clean both the metal and concrete. Reinstall the railings, filling the annular spaces with an appropriate non-shrink grout.

UCI Section 6: Wood and Plastics

1. EXTERIOR WOOD STEPS AND RAILINGS

The three sets of exterior wood steps do not appear on the Construction Documents, nor is there any mention of them in the notes. (In fact, the Construction Documents for the subject building are left-right reversed from the actual building. The Construction Documents are strictly "generic" and make no accommodations for actual grades or other conditions at the site.) The existing steps appear to have been designed and fabricated on-site to accommodate the actual elevation differences between the grade and the doors. Though the steps and railings are constructed of CCA treated southern yellow pine, a suitable material for the application, other aspects of their design and construction violate Code requirements and good building practice. The railings do not meet the strength requirements for a 200-lb. lateral point load (BOCA 1615.8), nor do the risers meet the dimensional uniformity requirements (BOCA 1014.6.2). In addition, the fasteners are severely corroded, and clearly unsuitable for this exterior application.

Recommendation:

Remove the existing steps and railings. Design, fabricate, and install new steps in compliance with the applicable sections of the Code.

2. FAMILY ROOM FLOOR

There is a very pronounced "ridge" in the floor of the family room. This "ridge" is located directly above the W8x18 steel beam spanning north-south in alignment with the east wall of the kitchen. The fact that the portions of the floor to the east and to the west of the steel

beam are not coplanar is obvious to the casual observer. A series of careful measurements with a transit indicates that there are two components to the cause of the problem. First, the subject steel beam is set ¼" higher than the parallel W8x18 steel member (summer beam) at the west edge of the room. (Note that this measurement is relative, and that it may be that the west beam is ¼" lower than intended.) Second, the primary east-west joists are excessively deflected over their 15' span. Moving eastward from a line 6' east of the summer beam, the 2 x 10 Hem-Fir joists (and floor surface) rise 11/16" over a horizontal distance of approximately 8'. This variation exceeds the Performance Standard of 1/240, or ½" in 10'. Note that this problem is exacerbated by the fact that the joists break and lap over the east beam.

Recommendation:

Remove the finish flooring. Reset the steel beams, and adjust the floor framing and subfloor as required. Note that this may require removal of some or all of the plywood subfloor. Reinstall the finish flooring, and repair any finishes (gypsum board, trim, etc.) damaged in the process.

3. CRACKED CERAMIC TILE FLOORS (SUNROOM, KITCHEN, & SHARED BATH)

The ceramic tile floor of the sunroom is cracked along a north-south line directly above the central W8 x 18 steel beam which supports the inboard ends of the two sets of 2 x 10 joists. There are also two rectilinear cracks in the ceramic tile on the kitchen floor, one approximately 39" in length and the other approximately 26" in length. In addition, three adjacent tiles are cracked in the floor of the second floor hared bath. These cracks appear to follow the edges of the cement board or plywood, and are most likely the result of improper fastening of the subfloor and/or cement board. Calculations indicate that the joists under the sunroom and the kitchen provide sufficient strength and stiffness for the application. The joists under the bath are not visually accessible, and detailed conditions are, therefore, not known.

Recommendation:

Remove the tile and cement board completely. Refasten the plywood subfloor using #8 x 2" laminating screws @ 6" O.C., and 4" O.C. at butt joints. (Ordinary sheet rock or "all purpose" screws are not satisfactory.) Block any loose edges, and screw the plywood to the blocking on both sides of the joint. Install ½" cement board, fully bedded in thin set cement, and staggering the edges at least 12" laterally and 16" longitudinally from the joints in the plywood. Fasten the cement board using #8 x 1-1/4" screws (especially made for cement board installation) @ 6" O.C. along joists and in the field, and 4" O.C. at all edges. Bed and tape the joints. (These steps will insure that the plywood and cement board will function as a single, stiff layer. As an alternate to cement board, a good grade of ½" solid core plywood could be used.)

UCI Section 7: Thermal & Moisture Protection

1. RAKE TRIM

Portions of the aluminum rake trim are loose, and one section at the north gable end has completely fallen off the building. Unfinished wood is exposed to the weather.

Recommendation:

Fabricate and install replacement trim, using a sufficient number of aluminum or stainless steel nails. Inspect all exterior aluminum trim, and refasten as necessary.

2. SILL SEAL AT BEAM POCKET

At the south end of the basement, a misplaced and abandoned beam pocket in the concrete wall has resulted in a large air leak and possible water entry point.

Recommendation:

Fill the pocket with masonry, and seal the sill plate with minimally expanding foam.

3. WEATHER SEALING AT WIRING PENETRATIONS

Communication wiring penetrations between the basement and the outside were left unsealed, allowing air, water, insects, and rodents to enter.

Recommendation:

Fill the oversized holes with expanding foam sealant. Seal the siding to the cables with an elastomeric sealant, such as silicone. (Note that foam sealants will not hold up to weather and UV light.)

4. SILL SEALING AT FOUNDATION ELEVATION CHANGES

Large gaps are visible between the concrete and the treated wood framing at locations where the top of foundation changes elevation.

Recommendation:

Seal the gaps with minimally expanding foam.

5. ATTIC INSULATION

A section of fiberglass batt insulation is missing. The location is just north of the attic scuttle. Also, the depth of the blown-in insulation varies widely, resulting in a reduced effective R-value for the ceiling.

Recommendation:

Replace the missing insulation. Spread the existing blown-in insulation to a uniform depth

UCI Section 8: Doors & Windows

1. EXTERIOR BASEMENT DOOR AT AREAWAY

The exterior door between the basement and the areaway is improperly installed. The evidence indicates that either the rough opening in the concrete was formed too small, or the door unit is too large for the opening. The exterior casing, rather than being located behind the face of the concrete (as shown in the Construction Documents, sheet A-1B, and as dictated by standard practice) is well proud of the concrete, creating a most unsatisfactory water-catching detail. The head casing has been covered with aluminum coil stock in a feeble attempt to shed water from this area. (See also UCI Section 9, Item 1.)

Recommendation:

Remove the door unit. Either resize the opening or furnish a new door, properly sized for the opening. Install the door with proper detailing.

2. FRONT DOUBLE DOORS

The poor fit of these doors allows excessive infiltration of air and wind-driven water, especially along the center and bottom edges. Measurements of the reveals at the edges show variations of as much as 1/8" over 3'. The evidence strongly suggests that all three jambs were not properly shimmed and fastened to the framing during installation.

Recommendation:

Remove the interior and exterior casing. Remove jamb fastenings as required. Straighten, shim, and refasten the jambs to the framing. Adjust the weather-stripping. Reinstall the casings, and refinish as required.

3. SITTING ROOM DOORS

The space between the two door panels is excessively wide. The evidence indicates that the side jambs were improperly shimmed during installation.

Recommendation:

Remove the side casings. Remove jamb fastenings as required. Straighten, shim, and refasten the jambs to the framing. Reinstall the casings, and refinish as required.

UCI Section 9: Finishes

1. EXTERIOR PAINTING

Exterior painting was never completed in some areas. In particular, the basement door at the areaway has never been painted, only primed. The primer is excessively weathered at this point, and paint will not adhere properly to these surfaces.

The paint on the wood trim around doors and windows is failing in many areas. It appears that the bond has failed between the paint and the wood, indicating that either no primer was used, or that the bare wood was exposed to the weather too long before the finish was applied.

Recommendation:

Remove all loose paint. Prepare (clean and sand) all surfaces. Prime and paint in full compliance with the manufacturer's instructions. (See also UCI Section 8, item #1 above.)

2. STAIR NOSINGS

The nosings at the landing of the main stair are proud of the flooring, creating a dangerous trip hazard at these locations. The thickness of the two materials are apparently not equal, and no allowance was made for this difference when installing the stairs.

Recommendation:

The nosings and flooring must be made flush. This will require either A) that the flooring be raised, or B) that the stairs be removed and reinstalled. Though the first option will require the removal of flooring to the next thresholds, it may be the preferred solution, since the latter risks creating non-compliant differences in riser heights. Re-trim and finish all disturbed areas.

3. TILE AT MASTER BEDROOM FIREPLACE

The tile surface of the fireplace at the master bedroom is "hazy". It is apparent that it was never properly cleaned following grouting.

Recommendation:

Carefully mask the surrounding areas, acid clean the tile, and reseal the grout.

UCI Section 16: Electrical

1. EXTERIOR OUTLETS

The Construction Documents (sheet E-1, note 4) require that "all exterior outlets shall be waterproof." The National Electrical Code (NEC) also requires that exterior outlets in "wet" locations (e.g. not under the front porch roof) be of the type which remain waterproof when in use (i.e. when a cord is plugged in). The existing outlets do not conform to the requirements.

Recommendation:

Replace the outlet covers to conform to the requirements of the Construction Documents and the NEC.

2. ALUMINUM BRANCH CIRCUIT WIRING

Branch circuit wiring for the oven and a compressor/condensor unit is aluminum. The circuit breakers for these circuits are not labeled for use with aluminum wiring.

Recommendation:

Replace the subject circuit breakers with properly rated devices, or replace the branch circuit wiring with properly sized copper conductors.

3. JUNCTION BOX COVERS

At least two junction boxes are missing the code-required covers. One is located in the basement ceiling near the double columns at the south end. The other is in the attic near the scuttle.

Recommendation:

Install the required box covers. Inspect the remainder of the building for similar oversights.

JAMES B. HUFFMAN, P.E. E-mail: jbhuffman2@comcast.net

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24 June 2004

Geoffrey Johnson
Johnson & Conway, LLP
18 Sycamore Ave.
H0-Ho-Kus, NJ 07423

RE: Ellen Nevins v. Toll Bros. et al.
Docket No. SOM-L-1102-1
ADDENDUM to INITIAL REPORT (ref.: Letter/Report to Ellen Nevins, dated 4/21/2000, by James B. Huffman, PE, Principal Engineer, LFR Levine-Fricke)

Dear Mr. Johnson,

The following items are additions to the initial report referenced above:

1. Foundation Walls – Structure

(UCI Section 3: Concrete, Item #1, Cast-in-Place Walls)

The building code in place at the time this building was constructed was NJUCC, based on BOCA 1993. For the conditions present, this code restricts the height of unbalanced fill against a plain 8" concrete wall to 7'-0". The unbalanced fill along the front of the house substantially exceeds this limit. The Construction Documents do not show or call for any type of reinforcing in the concrete walls, nor does the Subcontract Agreement for concrete work require any wall reinforcement. Thus, there is no evidence to indicate that there is any reinforcement in the walls, and it follows that the walls do not meet the minimum requirements of the code. An under-designed (or laterally overloaded) wall could crack or fail in bending.

Recommendation:
Design and install suitable interior or exterior reinforcements (pilasters, buttresses, etc.) for the portions of the foundation walls which do not meet the minimum code requirements. Note that necessary grade changes (see item 3 below) must be taken into account.

2. **Foundation Waterproofing**

(UCI Section 3: Concrete, Item #1, Cast-in-Place Walls; and UCI Section 7: Thermal & Moisture Protection)

There is evidence of water intrusion and efflorescence on the inside surface of the foundation walls below the family room fireplace and beneath the south wall of the family room. These observations were made on 5/4/04, and led to a more thorough investigation of foundation waterproofing.

This house was purchased with a "foundation membrane system" (Toll option #071806). No specification could be found for this item in either the Construction Documents or the subcontractor agreements. Observations and measurements made on 6/23/04 indicate that the "foundation membrane system" does not extend to grade in all areas.

The cast-in-place concrete basement / foundation walls appear to have been partially coated with a spray-on material, light green in color. Observations were made at the following four locations around the building: a) east side, immediately south of the steps at the laundry room; b) east side, at the east edge of family room fireplace; c) west side, at southwest corner of the living room; and d) west side, immediately north of the entry porch. At location (a), the top of the spray-on coating was 16" to 18" below current grade, or 18" to 20" below the initial grade (see item 3 below). At location (b), the top of the coating was 13" to 14" below current grade, or 15" to 16" below initial grade. At location (c), the coating extends to the elevation of the brick shelf, which is approximately at grade. At location (d), the coating again extends to the elevation of the brick shelf, which, at this location, is 8" below grade.

Recommendation:
Identify the spray-on material. Establish the material's suitability and correct application procedures. Excavate around the perimeter of the building and clean the surfaces as required. Install waterproofing as needed to meet manufacturer's specifications and requirements. Waterproofing should extend to within 4" of the final grade.

3. **Site Grading**

(UCC Section 2: Site Work, item #2, Ponding)

Section 1813.7 of BOCA 1993 reads as follows:
Site grading: The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 12 units horizontal (1:12) for a minimum distance of 8 feet measured perpendicular to the face of the wall or an approved

alternate method of diverting water away from the foundation shall be used. The procedure utilized to establish the final ground level adjacent to the foundation shall account for all additional settlement of the backfill.

The above requirements have not been met. Slopes are level or negative in many areas. Observations and measurements at the three small slabs (at the bases of the three sets of wood steps) on the east side of the house indicate that the backfill has settled an additional 2" since the slabs were poured.

Recommendation:
Regrade the area in the immediate vicinity of the building, adding or removing soil as needed, to assure positive drainage in all areas. (This recommendation is the same as that in the original report.) Note that any grade increases may affect the structural requirements for the foundation walls (see item 1 above), and will affect the waterproofing requirements (see item 2 above).

4. Chimney Flashing

(UCI Section 7: Thermal & Moisture Protection)

The materials and design for the five sets of flashings at the three masonry chimneys are poorly chosen. The result is a relatively short life expectancy for the system, and relatively high maintenance requirements for the life of the building.

The existing base flashing is cut from mill-finished aluminum, and counter-flashing is cut from anodized aluminum. In some applications, these materials would be appropriate and have a long life expectancy. However, in contact with the highly caustic Portland cement mortar in fresh brick masonry, aluminum is subject to rapid deterioration. Aluminum is considered a poor choice for flashing masonry.

The base flashing appears to be installed correctly, stepped between each course of shingles. The counter-flashing, however, is merely adhered to the surface of the brick. This joint between the brick chimney and the counter-flashing relies on a surface applied adhesive, is exposed to sunlight and thermal stresses, is expected to have a relatively short service life, and will require frequent maintenance. Properly designed and installed counter-flashing must penetrate at least part way through the bed joints of the brick. It can either be installed as the chimney is constructed, or can be installed in saw cuts made in the bed joints after the masonry has cured.

Recommendation:
Remove the existing base and counter-flashing. Choose a more suitable material (copper, lead coated copper, or terne coated stainless steel), and install the base and counter-flashing in accordance with the methods shown in the SMACNA Architectural Sheet Metal Manual, the recognized standard for this work.

Please contact me if you have any questions regarding the above.

Sincerely,

James B. Huffman, PE

cc: Ellen Nevins