HISTORICAL

LANNING ENGINEERING
PO Box 470
Ester, AK, 99725-0470

January 26, 2005

04-1002

Wilton Adjustment Service, Inc.
PO Box 70350
Fairbanks, AK, 99707

Attn: Mr. Brian Bell

RE: REPORT on LIMITED STRUCTURAL ENGINEERING INSPECTION
2829 Horseshoe Way, Lot 21, Horseshoe Manor Subdivision
North Pole, Alaska

Mr. Bell:

I am pleased to send you this report of my findings about sheetrock cracks in this house. My brief was essentially to make a visual inspection of reported cracks in various walls, make some preliminary calculations and report on my opinion of the causes of the cracks and potential follow-up issues that might be investigated further.

This is a one-story wood single family residence with an attached single car garage located on a one-acre lot about ½ mile north of the Badger Road/Richardson Highway intersection in North Pole. This lot is located just outside the North Pole City Limits. The house has on-site well and septic system. Records at the FNSB appraisers' office indicate that this home was built in about 1984 and is therefore about 20 years old.

This letter details the observations I made during my inspection that you requested for this home. The owners, Mr. and Mrs. Morris were there during the inspection.

INTRODUCTION-LIMITATIONS OF THIS REPORT

As you are aware, the limited and specific purpose of this inspection was to visually inspect reported sheetrock cracks and assumed structural problems related to those cracks. This report is only part of our professional service to you, it was prepared for you, Mr. Bell and your client Country Insurance & Financial Services, and your purposes exclusively, and it should not be assumed to meet anyone else's needs. If any conditions are found that contradict my understanding of this residence, I should be notified immediately so I might reconsider my conclusions and recommendations.

This was not a foundation nor subsurface soils investigation. Fairbanks is in a discontinuous permafrost area and the only way to assure the long term stability of a building foundation is to perform an adequate subsurface soils investigation.

HISTORICAL

To summarize, I performed a short walk through inspection of the premises in an attempt to visually look for particular reported structural issues.

This is a very limited inspection because it is not possible to determine how well a house is built unless it is inspected during construction or by removing portions of the sheetrock, roofing, etc. The result is that one probably can see problems that have already occurred, but cannot determine the likelihood of future problems. An example is that a person can see if a house has had settlement problems but can't see if it will settle in the future. Another example is not being able to determine how a house might react during an earthquake or flood. These and other questions can only be determined with more extensive inspection and testing. Therefore, I cannot guarantee that I have found all the problems that might exist.

SCOPE OF INVESTIGATION

I visited this site on Friday January 21st, 2005 to look at the building.
In addition:

- I have reviewed various public source information and private reports, including:
  - American Plywood Association, Design/Construction Guide "All Weather Wood Foundation", 1978
  - Fairbanks Soils, Alaska, 1959, by the US Soil Conservation Survey
  - Fairbanks North Star Borough Base Map 222B4 for section 4, T2S, R2E. FM
  - Inspection of Residence by Bryan F. Borgesson, PE dated September 25th, 2004
  - Fairbanks North Star Borough Appraisers' Office Information
  - Recorded Plat of Horseshoe Manor Subdivision, 78-148, FRD
  - Recorded Plat of DEWITT Subdivision, 85-6, FRD
  - Wilton Adjustment photographic report.
- I spoke with you and the owners of the home James and Jennifer Morris about these problems.
- I have performed preliminary calculations regarding the floor joists and AWW wood wall studs.

GENERAL OPINION OF THE BUILDING

In general, it is my opinion:

- that this home was poorly conceived for its site in North Pole,
- that given it floor plan, it was poorly designed,
- that given the shallow water table and AWW foundation, it is buried too deeply, and
- that it was poorly constructed originally and during its latest basement remodel.
- Given the slab-on-grade in the lean-to garage, total replacement of the foundation will be more difficult than normal.

The records of the FNSB indicate that this home had structural problems serious enough to reduce the appraised valuation in 1990 and 2000. In my opinion, it is likely that additional serious structural and other deficiencies could be found if the framing was exposed, including those related to Wilton Photographs # 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 19, 20, 21, and 22.

Note that the same developers, *Atsinger & Stevenson,* built two more similar homes in this subdivision in 1984. All three homes have suffered significant structural problems.

HISTORICAL

BUILDING CODES

This house was located outside the city limits of Fairbanks when it was built. This generally means that no independent inspection of the house was made during construction. The typical result is a dwelling with more building, mechanical and electrical code violations than average.

The 1979 Uniform Building Code (UBC) went into effect in the City of Fairbanks in October of 1979, which is before this house was built. That code would be considered the default building code for this home.

EXECUTIVE SUMMARY

The reported sheetrock cracks fall into 4 categories:

1. Vertical Expansion/Contraction cracks located in the exterior wall "prow" are caused by expansion/contraction of the walls from moisture and/or temperature. There are two issues here, normal movement of the walls and structural connection across the corner. These can be seen in Wilton Photographs # 24, 25, 26, and 27.
    a. Normal expansion/contraction of the exterior plywood and interior sheetrock caused by moisture changes and temperature changes will cause a vertical crack in the sheetrock in this type corner. A proper sheetrock installation would include sheetrock expansion joints to absorb movement without stressing the sheetrock.
    b. Secondly, it is difficult to adequately connect the two angled walls over a "prow" corner in order to restrain the two walls from separation and/or separate movement. At a minimum, these walls should be connected to prevent separation. This would not prevent sheetrock cracking since they could move separately. It is very difficult to connect these walls structurally to restrain separate movement and is not usually necessary. So cracks are likely to develop as the walls move or flex normally. Further investigation by removing exterior plywood would determine if the walls are adequately connected across the corner. Again, if adequately connected, sheetrock expansion joints would help prevent the cracking.
2. Diagonal cracks located above doorways in the interior walls, which bracket the main area used as a living room/kitchen/dining room, are caused by the lack of basement bearing walls under 1st floor bearing walls. The floor is constructed of 2x12's joists spanning 20 feet. These floor joists are grossly overloaded based on standard floor and snow loads. Almost any snow load and normal living loads on the 1st floor will cause excessive deflection of this floor system which would allow the 1st floor walls to flex and crack above the central door. Bearing walls or support beams should be installed under the 1st floor bearing walls to prevent this. Wilton Photographs #28 and 29.
3. Diagonal cracks/excessive deflection located next to windows in the basement caused by lack of adequate number of studs near the windows. In general, the basement walls have say ½ to 1 inch deflection caused by the soil loads on the outside of the basement. In my experience, deflection of up to about ½ would not be considered abnormal. Where there is over one inch of deflection, it is my opinion excessive and some effort should be made to either strengthen the walls or reduce the soil load against them.

HISTORICAL

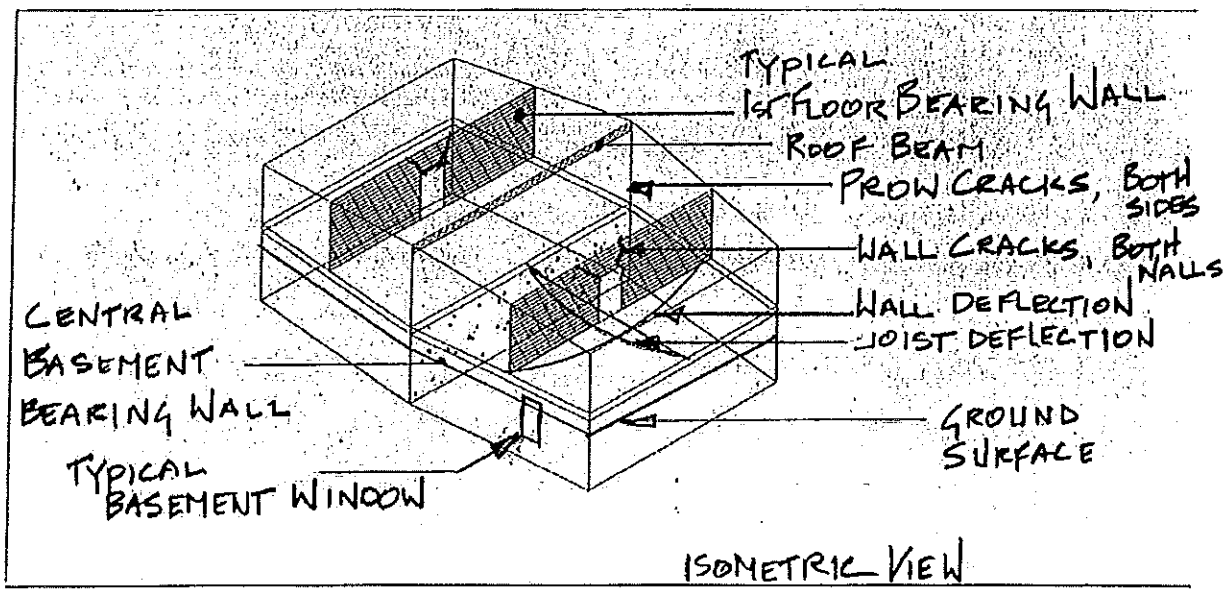
Note, however, that this type deflection in wood foundation walls is progressive. As the walls bow inward, the soil on the outside settles. This process never reverses. These walls are still fairly new and will likely deflect more due simply to time (wood creep). Typically, the permanent creep deflection under a permanent load is assumed to double the original deflection. It would not surprise me to find the long term deflection of these walls excessive.

Recently, new windows were added to the basement and the beam action of the studs was interrupted across the window. This significantly reduced the strength of the wall. Furthermore, the plywood sheathing is interrupted. In small areas, load redistribution by the plywood to different studs or joists is a significant contributor to wall and floor capacity. Cutting the sheathing to install a window requires that additional strength must be supplied by the studs at the edge of the windows.

To determine how many studs were located next to a window, we drilled a hole next to the windows in the master bedroom. We found only one stud at the window edge which means that no additional studs were added at the window. This is clearly inadequate when one recalls that at least 2 studs must have been removed to install the window leaving a net loss of strength in the wall. The lack of support is reflected in the excessive deflection and cracking near the windows. This problem is seen in Wilton Photographs #13, 14, 18, 42, 43, 44, 45, 46, 47, and 48.

It seems possible that these single studs holding the windows could fail by breaking. These must have additional studs added for additional support.

4. There are several cracks related to minor foundation settlement, including those in Wilton Photographs #16, 17, and 24.

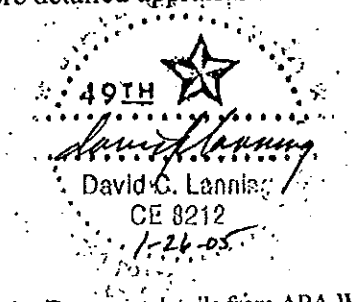


HISTORICAL

AREAS OF POTENTIAL FURTHER INVESTIGATION

1. There are 2 other homes in this subdivision that were built at the same time by the same developers. These homes are located at 2845 and 2877 Horseshoe Way. These homes also suffered structural problems serious enough to reduce the borough valuation; in 1998 for 2845 and in 1990 for 2877. These might be re-examined to determine what repairs were made there and if they exhibit similar problems.
2. In my discussions with the owners, it appears that Mr. Borgesson is familiar with these other homes and also with the previous owner of this home.
3. The depth of the water table could be easily determined by removing the water supply suction line going into the open 1 ½" diameter galv. steel well casing in the basement.
4. Exposure of various framing members would give a more detailed appraisal of the extent of structural problems here.

Sincerely yours,
LANNING ENGINEERING



David C. Lanning, P.E.

Attachments: FNSB records for 2845 and 2877 Horseshoe Way, Soils Map/Basemap, details from APA Wood Foundations

cc: Wilton Adjusters, file

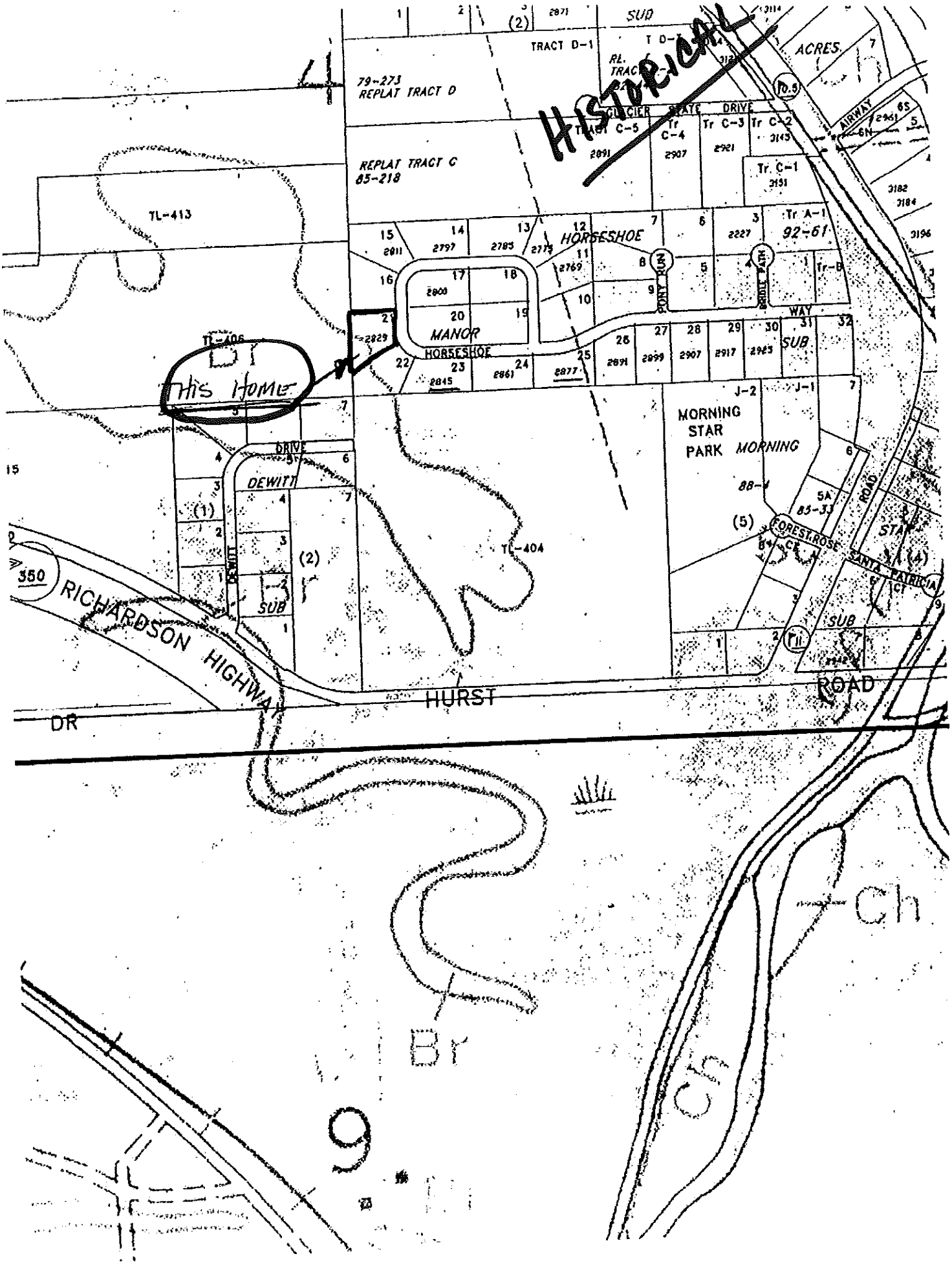
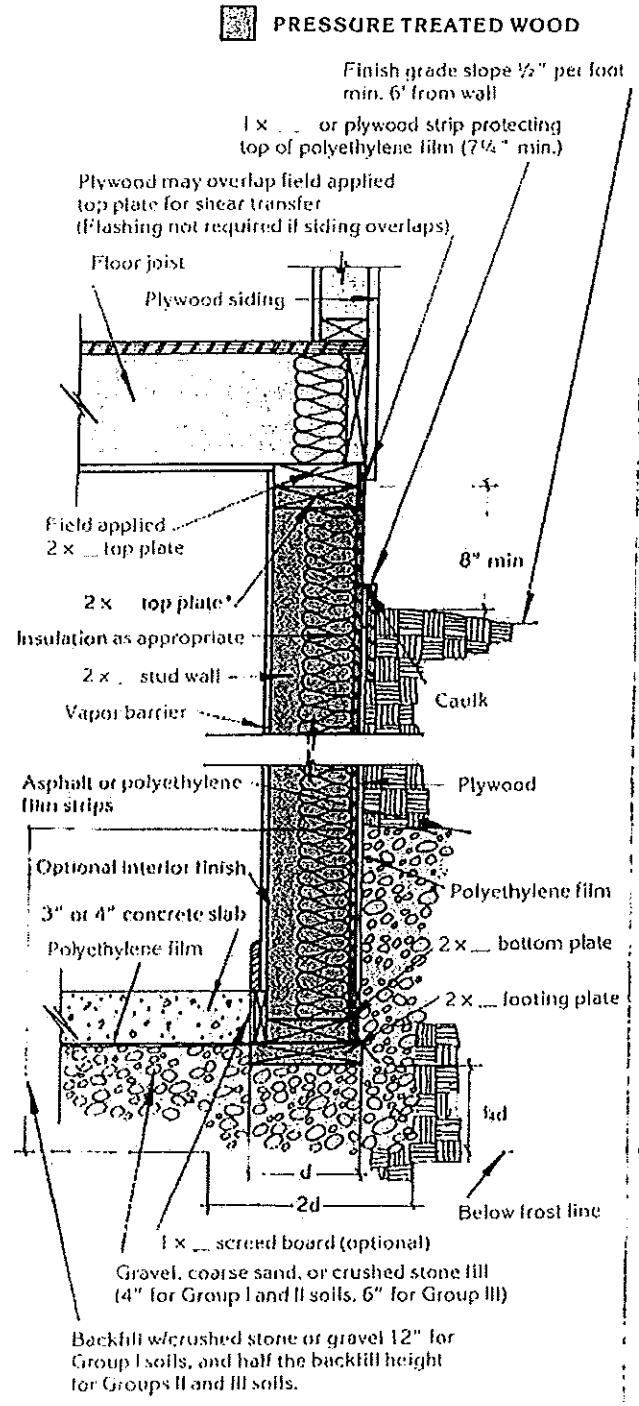

HISTORICAL
THIS HOME
TL-413
TL-406
TL-404
79-273
REPLAT TRACT D
REPLAT TRACT C
85-218
TRACT D-1
HORSESHOE
MANOR
HORSESHOE
PONY RUN
BRIDLE PATH
WAY
92-61
SUB
DRIVE
DEWITT
MORNING
STAR
PARK
MORNING
STAR
ROAD
FOREST ROSE
SANTA PATRICIA
RICHARDSON HIGHWAY
350
HURST
ROAD
DR
AIRWAY
ACRES
Br
Ch
9

FIGURE 12—Basement Wall



*Not required to be treated if backfill is more than 8 in. below bottom of plate. Typical for all following details.

Historical

For brick up to 18 feet high minimum knee wall framing is 2 x 4 studs 16 inches on center, with a 1 x 4 bottom plate and a 2 x 6 top plate. Lumber may be species grade combination "D" if brick is no more than 16 feet, 8 inches high. Provide double studs under all butt joints in the top plate. Footing plates for knee walls must be 2 x 10's where 2 x 4 studs are called out in Table 10 and 2 x 12's where 2 x 6 studs are

FIGURE 13—Basement Bearing Partition