GILES FLYTHE
ENGINEERS

Raleigh Office:
7334 Chapel Hill Road
Suite 200
Raleigh, NC 27607
919.465.3801

Charlotte Office:
8819 University East Drive
Suite 200
Charlotte, NC 28213
704.810.1808

December 15, 2022

John & Drennan Fuller

Re: Wall Removal Letter
93 Marian Lane
Spring Lake, NC

Dear Mr. & Mrs. Fuller,

At your request, a limited structural evaluation for removing wall sections in the home located at the subject address was performed on December 12, 2022. The evaluation was performed by Tyler Royster, EI of Giles Flythe Engineers. It is our understanding that you plan to remove the following sections of wall:

Wall #1 – This section of wall spanning front to rear is located near the front of the home approximately 10'-0" from the left perimeter wall. The section of wall to be removed begins approximately 27'-6" from the front perimeter wall of the home and extends to the front approximately 13'-6".
Wall #2 – This section of wall spanning left to right is located near the front of the home approximately 14'-0" from the front perimeter wall of the home. The section of wall to be removed begins at the left perimeter wall and extends to the right approximately 10'-0".
Wall #3 – This section of wall spanning left to right is located near the front of the home approximately 14'-0" from the front perimeter wall of the home. The section of wall to be removed begins at the right perimeter wall and extends to the left approximately 10'-0".
Wall #4 – This section of wall spanning front to rear is located near the front of the home approximately 10'-0" from the right perimeter wall. The section of wall to be removed begins approximately 13'-6" from the front perimeter wall of the home and extends to the rear approximately 4'-6".

We have provided recommendations below regarding the removal of these sections of wall. The contractor should verify all dimensions prior to ordering materials. For purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing and facing the front door of the home. If the contractor has any questions or concerns regarding the method of construction or if conditions vary from what is described below, the engineer should be consulted. Likewise, if any changes to sizes or modifications to the structure are desired other than what is explicitly described below, the engineer should be consulted. All construction and workmanship shall adhere to the 2018 NC Building Code.

ASSUMPTIONS

- Based on the observed site conditions, it appears that a portion of the wall (colinear with Wall #4) was previously removed. The ceiling joists in the attic overlap above the wall that makes up Wall #4 and were noted to be unsupported at the front 14'-0" of the home. We have included these unsupported ceiling joists in our calculations and have specified the appropriate attachment.

RECOMMENDATIONS

Wall #1, 2, & 3

- These walls are not load-bearing and may be removed.

Wall #4

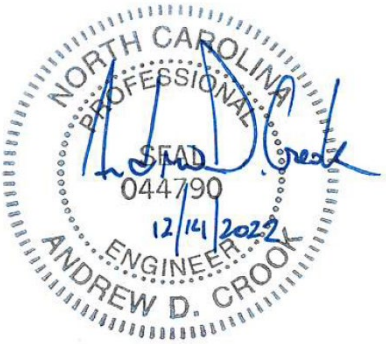
- We recommend installing a 2-1.75”14” LVL beam spanning a maximum of 19’-0” between the load-bearing points. The new beam should be supported by 3-2x4 jack studs at each of the load-bearing points.
    - To install the new LVL beam as a flush beam, temporary walls should be installed directly beneath both sides of the existing ceiling joists (not greater than 18” from the existing Wall #4) and the ceiling joists should be cut back to allow the installation of the new member with the bottom of the new LVL beam installed flush with the bottom of the existing ceiling joists. The existing ceiling joists should be attached to the new LVL beam with new Simpson LUS26 hangers (or equivalent). New CS16 straps that extend a minimum of 1’-4” in each direction should be installed along the bottom edge of the discontinuous ceiling joists.
- A new 16x16 grouted CMU block pier should be installed below the jack studs at the rear bearing point. The new pier is to be supported by a new 30”x30”x10”-thick concrete footing at the rear bearing location. Note, 2x blocking is to be installed between the jack studs and masonry piers within the floor cavities. Note, the contractor shall verify the presence of a minimum 12” wide continuous concrete footing below the front foundation wall. If the concrete footing is not present or inadequate, we recommend installing a new 24”x24”x10”-thick concrete footing below existing foundation wall at the front bearing location.

General Notes:

- All new lumber should be SPF No.2 or equivalent. All lumber exposed to concrete/masonry or weather must be pressure treated.
- All new LVL members are to be E2.0, Fb=3100 PSI (or equivalent) and plies are to be attached per manufacturer specifications. LVL members exposed to weather should be wrapped per manufacturer specifications.
- Install pressure-treated blocking to provide full uniform bearing of the above floor framing onto the new block piers.
- All new concrete is to have a minimum 28-day strength of 3000 psi.
- New concrete footings are to be installed a minimum 12” below grade (to the bottom of the footing) and in no case less than frost depth.
- Soils below new foundation components to be contractor verified to be a minimum 2000 psf bearing capacity.
- All detailing, fabrication, and placing of reinforcing steel shall be in accordance with the latest “Manual of Standard Practice For Detailing Reinforced Concrete Structures,” ACI 315.
- Clear concrete cover over reinforcing bars shall be 3” for footings and other concrete cast against the ground.
- All new metal hangers/ties/clips to be installed per manufacturer specifications.
- All fastening shall conform to R602.3(1) in the 2018 NC Building Code: Residential Code.
- With any structural changes, finish material cracks and minor movements are typical and expected. These are associated with settlement and allowable deflection generally observed after construction of an addition or significant remodel.
- Installation of the above recommended repairs may require temporary shoring of the in-place structural components. Shoring methods are the responsibility of the contractor.

We trust that this letter provides the information you require. Please contact us at (919) 465-3801 if you have any questions. Thank you for the opportunity to be of assistance to you.

Sincerely,



Tyler Royster, EI
Project Engineer
Giles Flythe Engineers Inc.
NC Lic. No. C-2871

Andrew Crook, PE
Project Manager
Giles Flythe Engineers Inc.
NC Lic. No. C-2871

Enclosed: Wall Removal Location Sketch

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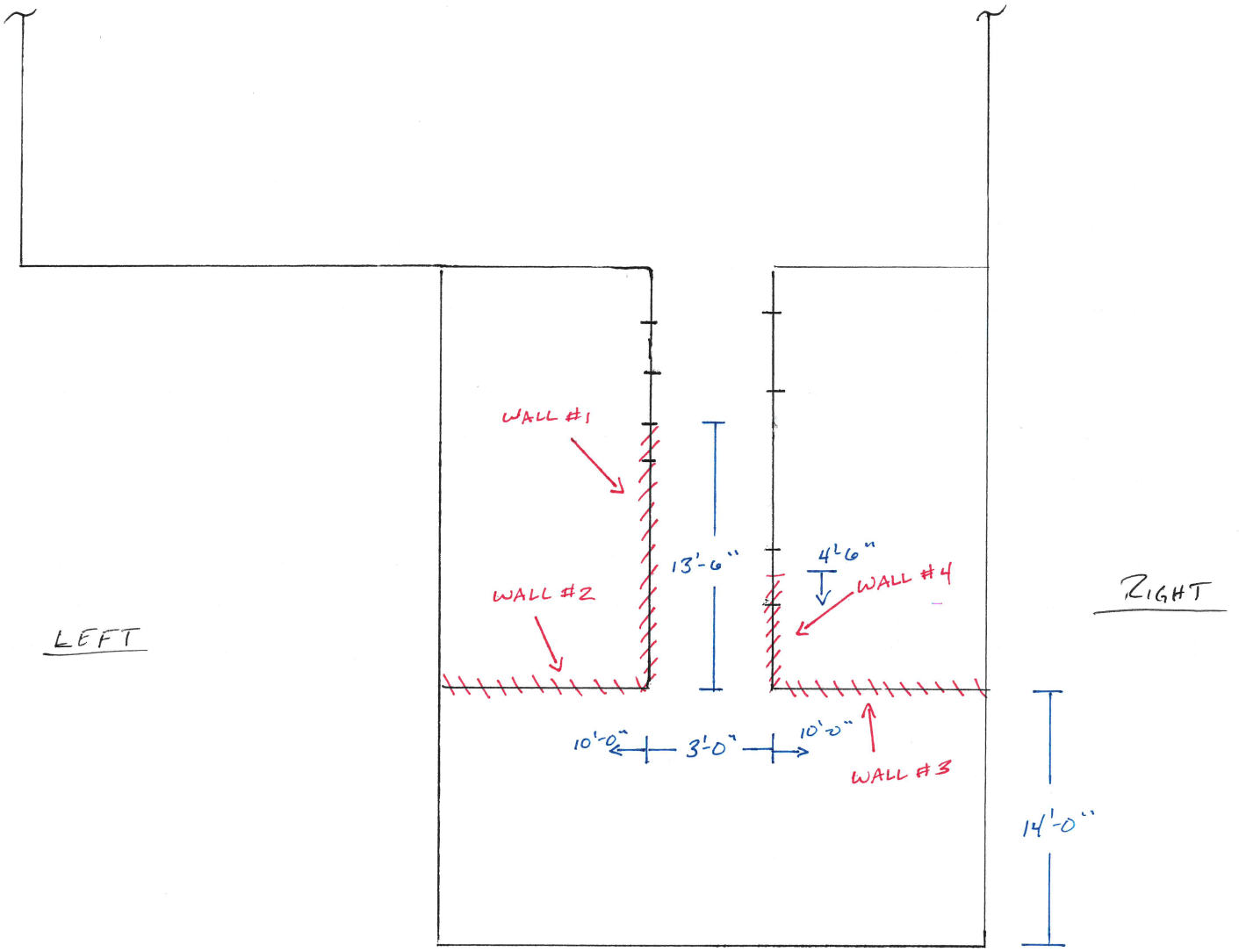

Note: Sketch is for location purposes only. See attached report. Dimensions are approximate.

Wall Removal Location Sketch

Not to Scale

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December 15, 2022

John & Drennan Fuller

Re: Limited Structural Inspection
93 Marian Lane
Spring Lake, NC

Dear Mr. & Mrs. Fuller:

At your request, a limited structural inspection of the above property was performed on December 12, 2022. The report that follows has been prepared based on that inspection. The inspection was performed by Tyler Royster, EI of Giles Flythe Engineers.

The scope of this project was limited to the inspection and evaluation of the condition of the wall and floor framing. The report is intended to cover only those premises that may be examined visually without excavation, removing surface materials, and disassembling components.

No tests, measurements, or calculations have been made except as described in this report. We have not investigated for toxic materials or wastes, or examined public records regarding this property. The scope of the inspection does not assure that the property conforms to any regulations, restrictions, or building codes that may be in effect at its location.

DESCRIPTION

The single-story wood-framed home (with a crawl space) is constructed on concrete masonry unit (CMU) perimeter foundation walls with masonry piers supporting floor girders. The house was built in 1983 according to Harnett County Real Estate Tax Records, however, the framing observed is similar to pre-1950 construction. For purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing outside and facing the front door of the home.

Upon our arrival, access to the interior was provided by the homeowner. The items in the scope detailed above were subsequently inspected.

Note that the original builder was not interviewed and no plans for construction of this home were provided. The information presented in this report is gathered from the conditions visible at the site, as they existed at the time of the inspection. A limited photo log is included with this report.

OBSERVATIONS

Interior:

1. The owner indicated that the construction of the home was likely built as barracks for World War II and were later relocated to the property in 1983. The home is currently being renovated by the homeowner and is not presently occupied.
2. Multiple instances of visible wood-destroying insect infestation were noted throughout the interior of the home in the floor and wall framing.
3. Variable floor slope was noted throughout the interior of the home and minor drywall cracks and finish material separations were visible at the time of the inspection.

Exterior:

4. The foundation walls were noted to be covered by stone veneer at the exterior perimeter of the home. The CMU foundation walls were not visible from the exterior. No significant cracks were noted in the stone veneer at the time of the inspection.
5. Multiple instances of water damage were noted in the siding at the exterior perimeter of the home. The condition of the wall framing could not be determined due to the presence of the siding material at the time of the inspection.
6. Gutters and downspouts were installed on portions of the home. Grade was noted with a relatively neutral slope along the perimeter wall(s) of the home.

Crawl Space:

7. Visual inspection of the crawl space was limited due to the low overhead clearance, installation of insulation between joist bays, and the presence of rigid ductwork and utilities throughout the crawl space. The following observations are based on the limited areas that were accessible at the time of the inspection, including those which were visible above areas of removed subfloor.
8. Evidence of moisture intrusion in the form of efflorescence and water staining was noted on the perimeter foundation walls. Water staining and what appear to be organic substances on the wood framing were also noted. Additionally, widespread evidence of moisture and wood-destroying insect intrusion was noted throughout the wood framing of the crawl space at the time of the inspection.
9. Multiple auxiliary wooden supports were noted in the crawl space supporting floor joists.
10. A vapor barrier was not installed and the moisture content in the floor framing was elevated at the time of the inspection. Multiple moisture readings were taken with a General MMD4E moisture meter and measured lumber moisture contents of up to 18.6%. Saturated soils were noted in the rear right corner of the crawl space.
11. The floor framing was noted to consist of 2x8 floor joists spaced at approximately 24” on center spanning front to rear at the rear of the home, and left to right at the front of the home with a 4x8 central girder on supporting piers generally spaced approximately 6’-0” on center and up to 9’-0” on center. Damaged floor framing was noted in the following areas:

a. At the rear of the home, multiple floor joists were noted to exhibit significant wood-destroying insect deterioration. The joists were probed with an awl and exhibited up to 3" of cross-sectional losses at the time of the inspection.
b. The central spans of the rear girder, beginning approximately 17'-0" from the left perimeter wall and extending to the right approximately 23'-0" were noted to be significantly deteriorated due to previous moisture/wood-destroying insect activity. The girder exhibited cross-sectional losses of up to 2". Additionally, a section of the central girder was noted to be missing and improperly supported at the right side of the crawl space beginning approximately 2'-0" from the right foundation wall.
c. Multiple CMU piers were noted to be improperly installed and were noted to be cracked at the center of the crawl space. The presence of concrete footings beneath the CMU piers could not be determined at the time of the inspection.
d. At the front of the crawl space, multiple floor joists were noted to exhibit significant wood-destroying insect damage. The joists were probed with an awl and exhibited up to 2" of cross-sectional losses.
e. Multiple sections of subflooring throughout the crawl space was noted to exhibit significant wood-destroying insect damage. The homeowner stated that the subfloor would be removed and replaced in its entirety.
f. An unsupported girder splice was noted in the front girder of the rear section of the home located approximately 28'-0" from the rear perimeter wall and 22'-0" from the left perimeter wall.

DISCUSSION

Several of the components of the floor framing do not meet current Residential Building Code standards; however, these components may have met the Code in effect at the time of original construction. We have provided recommendations below to address immediate structural deficiencies in the areas of concern, but these should not be construed as to increase the structural capacity to that which would meet current live load requirements. Further structural repairs may be required in the future if the moisture and insect infestation concerns are not addressed and/or if a significant remodel is planned. The homeowner has stated the intention to replace a majority of the floor framing in the home to ensure the wood-destroying insect and moisture damage is eliminated as well as to reduce the deflection in the flooring caused by the currently overspanned joists. We have provided recommendations and general specifications below to replace the floor framing system.

Positive grade away from the foundation should be created to reduce moisture infiltration under the foundation. Additional soil consolidation and settlement can occur due to water infiltration into soils and subsequent drought conditions which dry out the soils below foundations. Creating positive drainage away from the perimeter foundation wall(s) is vital to the long-term structural integrity of the foundation.

The moisture content of the floor framing noted in the home at the time of the inspection is considered elevated to high. Moisture levels of the framing can fluctuate based on weather conditions and seasonal changes in humidity. Prolonged elevated moisture content of the framing can lead to excessive deflection and structural damage. We have provided a recommendation below to help regulate moisture levels in the crawlspace.

The significant damages to the floor framing are likely due to the moisture content in the crawl space in combination with previous wood-destroying insect activity. If the floor framing continues to experience the high moisture content noted above, the wood framing will continue to deteriorate and lose strength. The previous repairs in this section of the crawl space are considered to be incomplete and are inadequate to support the imposed loads on the floor framing. The high moisture content and damaged framing components in the crawl space are structural concerns. Additionally, the existing floor joist spans and girder spans exceed the maximum allowable spans per the 2018 North Carolina Building Code: Residential Code. A floor framing member that is overspanned may cause overstressed conditions, variable floor slope and allow for excessive deflection at the midspan of the joist. We have provided recommendations to address these issues.

The auxiliary girders and supported noted in the crawl space are not considered permanent supports per 2018 North Carolina Building Code: Residential Code. These were likely installed to compensate for damaged floor framing and/or alleviate minor deflection or “bounce” in the floor. The auxiliary supports were noted to be installed improperly. We have provided recommendations below to remove these supports and address the floor framing.

The recommendations presented in this report are based on our experience and understanding of the concerns to provide a reasonable solution based on the conditions that were visible and/or known to us on the date of inspection. As this report is based on the circumstances at one point in time, conditions may change which may result in additional repair recommendations. Further, the recommendations are the opinion of the Engineer to address significant structural-related concerns and may not rectify cosmetic issues.

RECOMMENDATIONS

If there are any questions or concerns regarding location or method of repair contact the engineer before construction.

1. We recommend removing the existing subfloor and wall finish material throughout the home to determine the extent of the moisture/wood-destroying insect damage in the floor framing. Wall studs that exhibit cross-sectional losses of 1/2" or greater should be replaced in like kind and be continuous from the bottom sill plate to the wall top plate. Joists that require repairs shall be determined as follows:

a. When probed with an awl, either face of the joist can be penetrated to a depth of 1/2-inch or greater within the following zones:
    i. Within 12-inches of a bearing end;
    ii. Within the central 1/3 span (approximately 4-feet long at the center span).

2. We recommend removing the bottom 2-3' of siding at the exterior of the home and evaluating the existing perimeter band/girder for moisture/wood-destroying insect damage. If the perimeter band exhibits greater than 1/2" of cross-sectional losses, we recommend replacing the damaged portions with a new 2-2x8 member. The floor joists should be attached to the new perimeter band with Simpson LUS28-2 hangers.
3. We recommend replacing the existing central girders in both crawl spaces to properly support the floor framing. Each new girder shall consist of a 4-2x8 member and shall span continuously between supports and be supported by new 8x16 CMU piers spaced at a maximum of 5'-6" apart. The new CMU piers shall bear directly on new 20"x20"x8"-thick concrete footings (unless otherwise noted). Provide 2x pressure-treated blocking between the floor girder and new piers. (See attached sketch)
4. We recommend replacing all damaged floor joists with new 2-2x8 floor joists attached at both ends with new Simpson LUS28-2 joist hangers. The floor joists should be spaced at a maximum of 16" on-center. We recommend fully sistering the remaining floor joists with a new 2x8 member attached with (3) 10d nails at 16" on-center. The newly sistered joists should be attached at both ends with Simpson LUS28-2 hangers.

   NOTE: Should the owner request an inspection of the repairs, we would recommend this inspection be conducted prior to installation of the new subfloor material such that all repair areas can be fully examined.
5. We recommend ensuring that stormwater drains positively away from the home to minimize the risk of future water infiltration. This can be accomplished by gutters, downspouts, and leaders at the exterior perimeter of the home and ensure that they remain clear of debris and properly functioning to direct the drainage away from the home. Also, creating a positive grade around the perimeter of the home will aid in stormwater evacuation. Water infiltration can cause further undermining of the soil and foundation settlement. Grade adjustments are to be achieved by cutting soils.
6. To help further reduce and regulate moisture levels in the crawl space, we recommend installing a new vapor barrier throughout the crawl space to cover all exposed soils. This is especially important where floor framing is in close proximity to ground (less than 18"). Also, we recommend opening the foundation vents and ensuring the vents are clear of debris to allow air circulation in the warm seasons. If moisture levels remain high (greater than 15.0%), an appropriately sized dehumidification system may be required.

General Notes:

- All new lumber should be SPF or SYP No.2 or equivalent. All lumber exposed to concrete/masonry or weather must be pressure treated.
- All new LVL members are to be E2.0, Fb=3100 PSI (or equivalent), and plies are to be attached per manufacturer specifications. LVL members exposed to weather should be wrapped per manufacturer specifications.
- Install pressure-treated 2x blocking and/or flat shims above new piers to provide a full-contact bearing surface for the framing above.
- All new concrete is to have a minimum 28-day strength of 3000 psi.
- New concrete footings are to be installed a minimum 12" below grade (to the bottom of the footing) and in no case less than frost depth.
- Soils below new foundation components to be contractor verified to be a minimum 2000 psf bearing capacity.
- All new metal hangers/ties/clips to be installed per manufacturer specifications.
- All fastening shall conform to R602.3(1) in the 2018 NC Building Code: Residential Code.
- Installation of the above-recommended repairs may require temporary shoring of in-place structural components. Shoring methods are the responsibility of the contractor.
- With any structural changes, finish material cracks and minor movements are typical and expected. These are associated with settlement and allowable deflection generally observed after the construction of an addition or significant remodel.
- All hollow masonry piers to be capped with 4" solid masonry or concrete for 1-story and 8" solid masonry or concrete for greater than 1-story.
- Masonry pier unsupported height must be no greater than 4 times the least dimension. If all cells are fully grouted, the unsupported height may be increased to 10 times the least dimension.

CONCLUSION

We trust that this report provides the information you require. Please contact us at 919-465-3801 if you have any questions. Thank you for the opportunity to be of assistance to you.

Sincerely,

NORTH CAROLINA PROFESSIONAL SEAL 044790 ENGINEER ANDREW D. CROOK 12/14/2022

Tyler Royster, EI
Project Engineer
Giles Flythe Engineers Inc.
NC Lic. No. C-2871

Andrew Crook, PE
Project Manager
Giles Flythe Engineers Inc.
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Enclosed: Limited Photo Log
Crawl Space Repair Sketch

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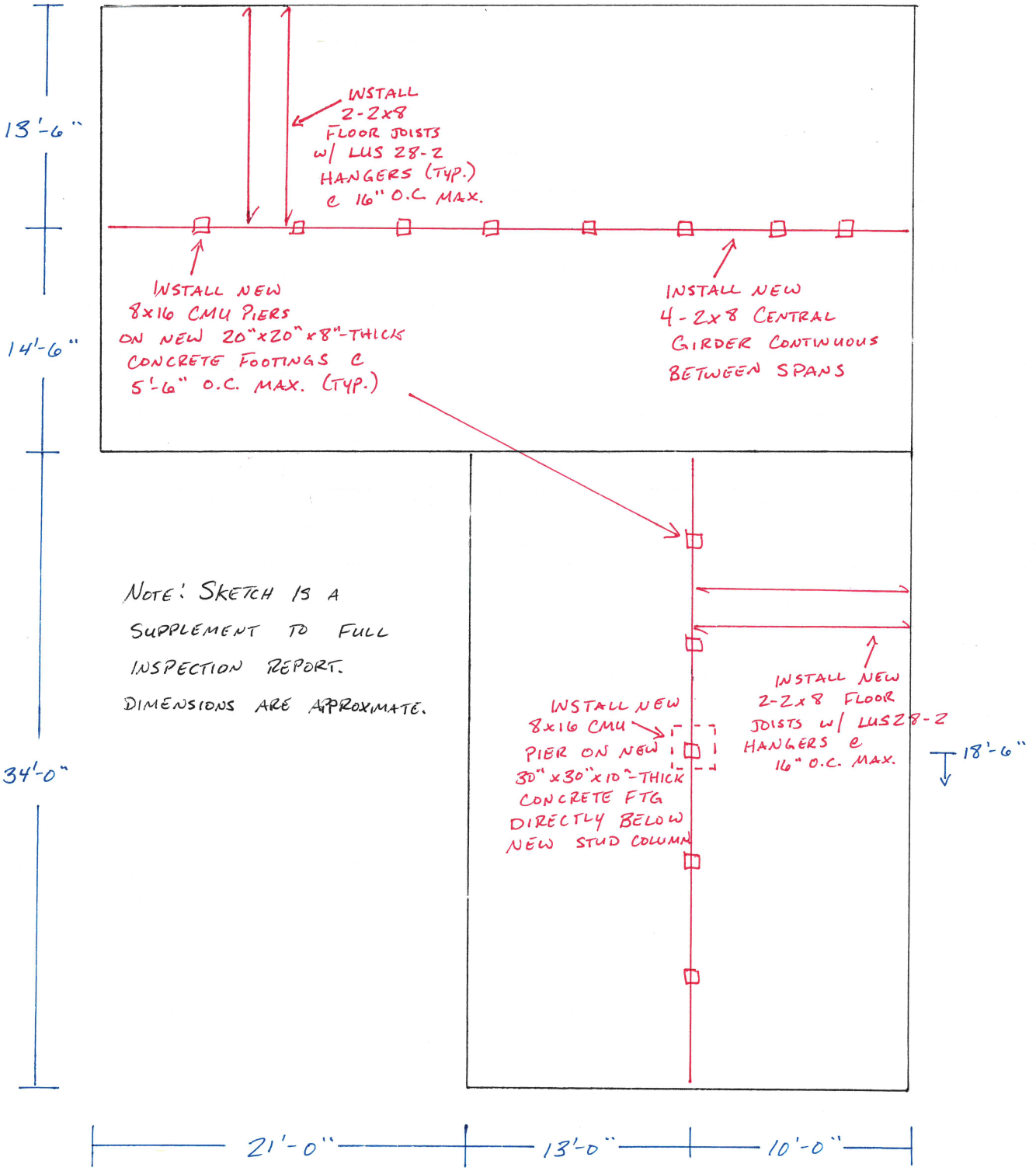


CRAWL SPACE REPAIR SKETCH

NOT TO SCALE

93 MARIAN LANE
SPRING LAKE, NC

Description A view of the front right corner of the home	
Photo No. **1**	

Description A view of the front left corner of the home	
Photo No. **2**	

Description A typical view of the stone veneer at the exterior perimeter of the home	
Photo No. 3	

Description A view of visible moisture damage in the exterior siding	
Photo No. 4	

Description A typical view of wood-destroying insect damage at the interior of the home	
Photo No. 5	

Description A typical view of wood-destroying insect damage at the interior of the home	
Photo No. 6	

Description A vire of the unsupported perimeter band splice	
Photo No. 7	

Description A typical view of wood-destroying insect damage in the subfloor of the home	
Photo No. 8	

Description A typical view of repairs made to the wall framing and the condition of the perimeter foundation wall	
Photo No. **9**	

Description A typical view of damaged CMU piers in the crawl space	
Photo No. **10**	

Description A view of wood-destroying insect damage in the wall framing at the interior of the home	
Photo No. 11	

Description A typical view of wood-destroying insect damage in the floor joists of the crawl space	
Photo No. 12	

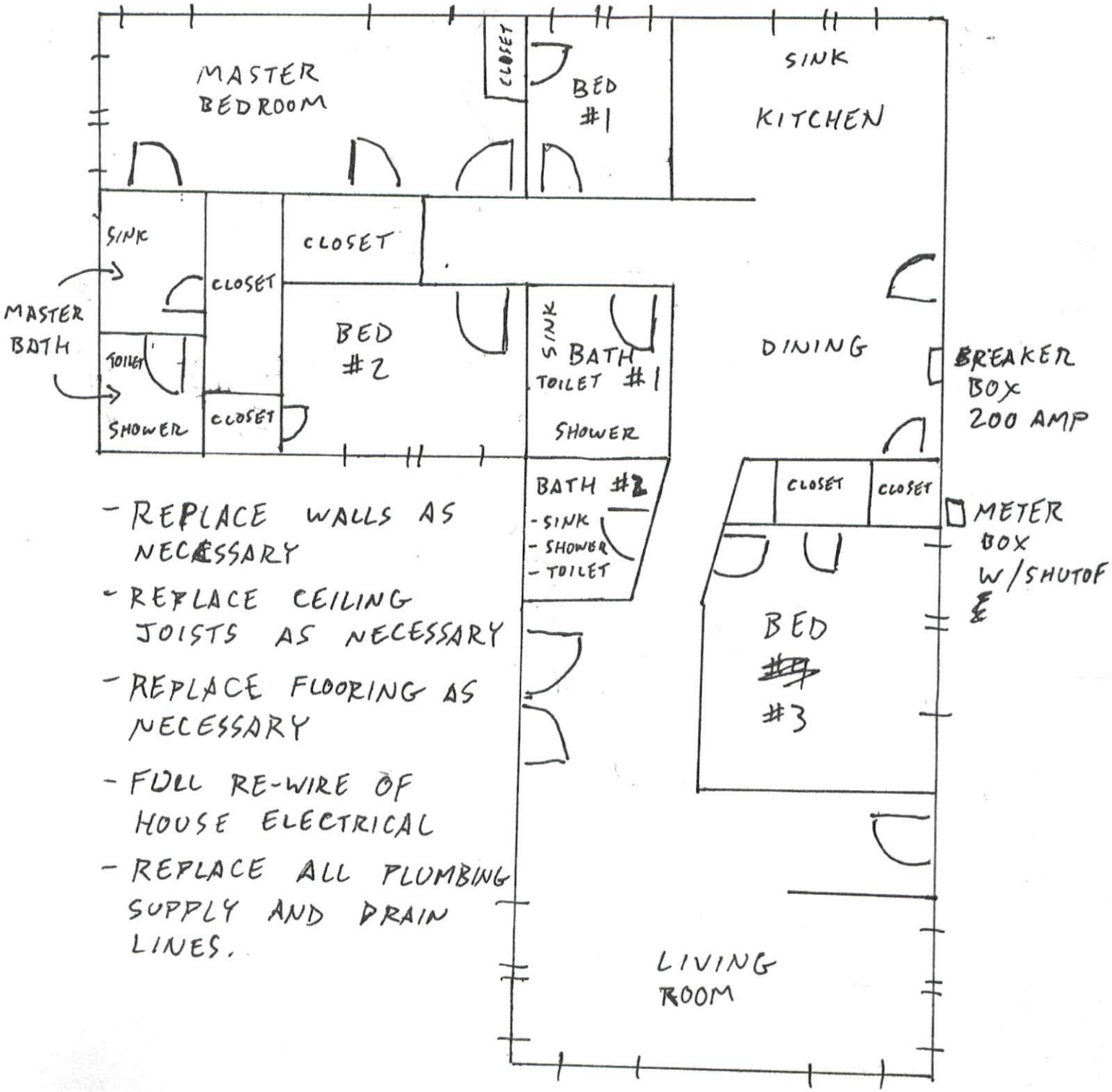
Description A typical view of moisture and wood-destroying insect damage in the floor joists of the crawl space	
Photo No. 13	

Description A view of the crawl space conditions at the right side of the home	
Photo No. 14	

Description A view of wood-destroying insect damage noted in the subfloor near the front of the home	
Photo No. 15	

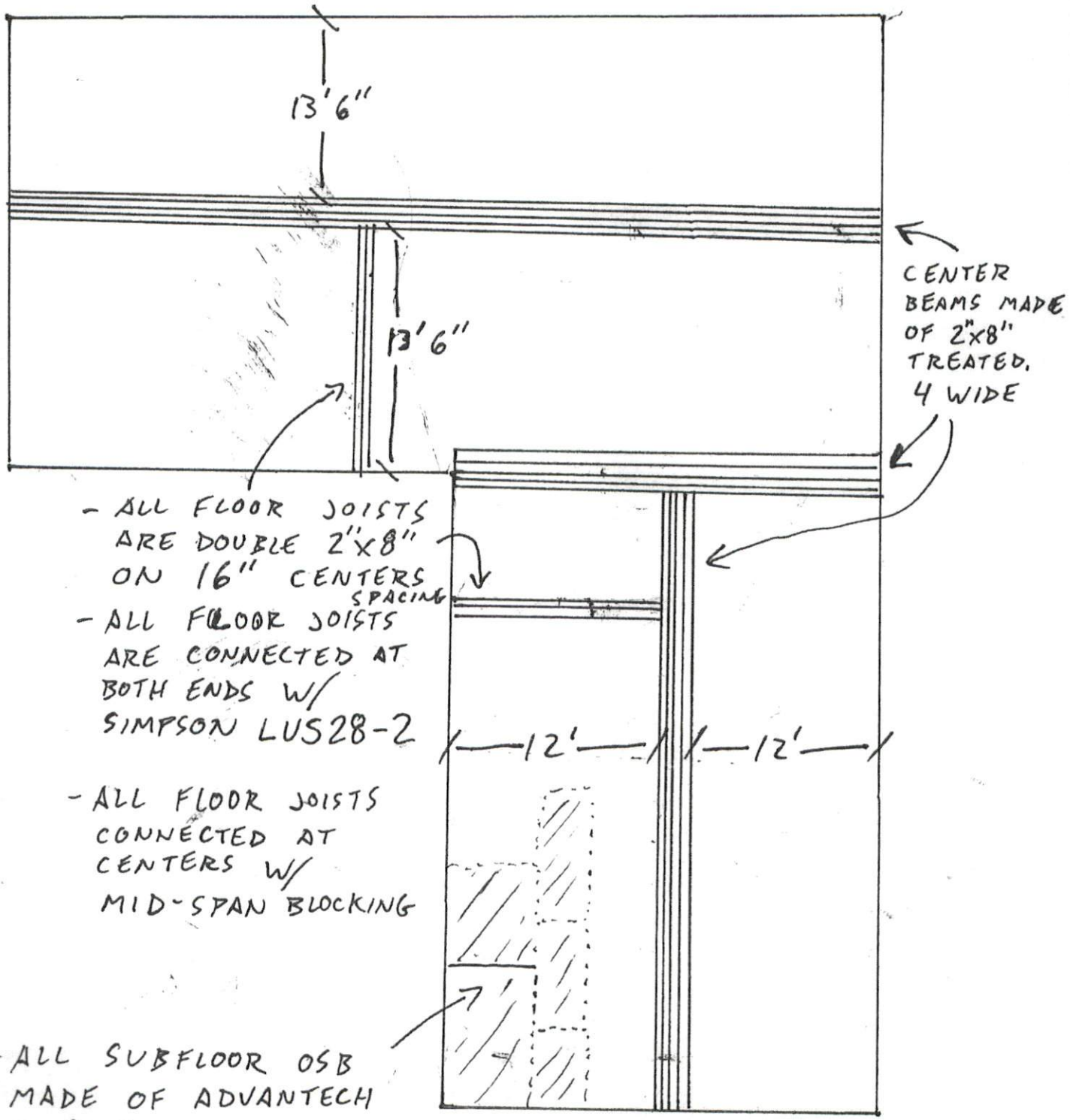
Description A view of improperly installed auxiliary supports in the crawl space	
Photo No. 16	

THE HOME HAD EXTENSIVE TERMITE DAMAGE AND ROT. I HAVE REMOVED ALL THE EXISTING ELECTRICAL AND PLUMBING. I HAVE ALSO REPLACE ALL FLOOR JOIST, SUBFLOOR, WALLS, AND CEILING JOISTS. THE NUMBER AND LOCATION OF BATHROOMS AND BEDROOMS HAS NOT CHANGED FROM THE EXISTING FLOOR PLAN AND STRUCTURAL DESIGN. I HAVE ADDED TWO UNSUPPORTED SPANS: ONE IN THE KITCHEN, AND ONE IN THE LIVING ROOM. THE BUILDING STRUCTURAL DESIGN FOR THESE TWO SPANS WAS PROVIDED BY A LOCAL STRUCTURAL ENGINEERING FIRM ALONG WITH THE DIMENSIONS AND REQUIRED FASTNERS. THESE TWO SPANS ARE MADE OF 2 LVL EACH, 14"x1.75". I PLAN TO INSTALL ALL NEW ELECTRICAL WIRING, LIGHT FIXTURES, AND OUTLETS USING 12/2 OR 12/3 FOR LOADS UNDER 20 AMPS AND 10/2 FOR 30 AMP LOADS. I PLAN TO INSTALL SINKS, TOILETS, AND SHOWERS IN THE THREE BATHROOMS. I PLAN TO INSTALL A SINK IN THE KITCHEN. ALL CEILINGS AND WALLS WILL BE INSULATED, AND COVERED IN 1/2" SHEET ROCK. ~~I ALS~~ I ALSO PLAN TO REPLACE THE HVAC SYSTEM AND ALL HVAC DUCTING.



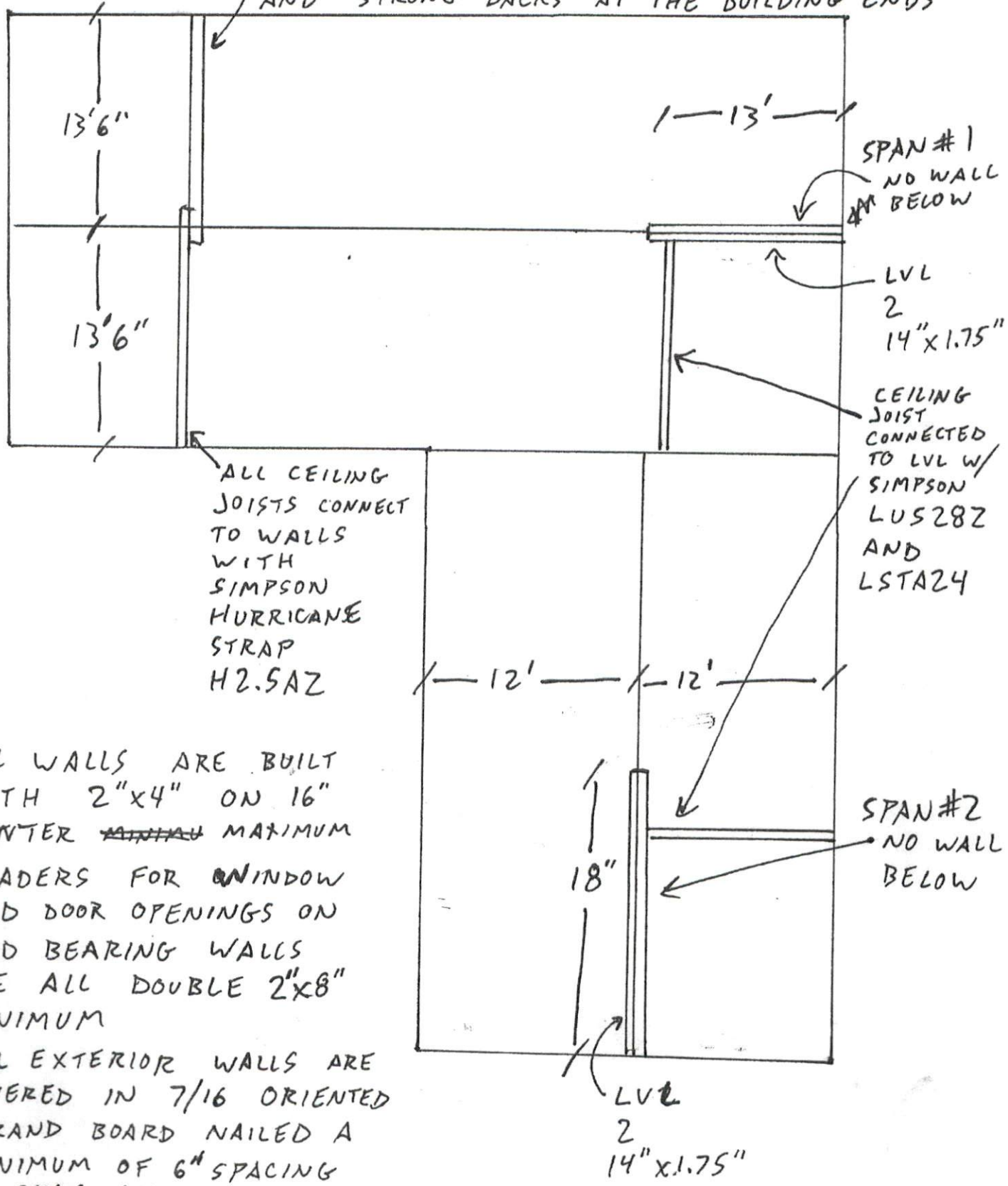
- REPLACE WALLS AS NECESSARY
- REPLACE CEILING JOISTS AS NECESSARY
- REPLACE FLOORING AS NECESSARY
- FULL RE-WIRE OF HOUSE ELECTRICAL
- REPLACE ALL PLUMBING SUPPLY AND DRAIN LINES.

FLOOR JOISTS



CEILING JOISTS

ALL CEILING JOIST ARE 2x8 ON 24" SPACING W/ MID-SPAN BLOCKING AND STRONG BACKS AT THE BUILDING ENDS



- ALL WALLS ARE BUILT WITH 2"x4" ON 16" CENTER ~~MINIMU~~ MAXIMUM
- HEADERS FOR WINDOW AND DOOR OPENINGS ON LOAD BEARING WALLS ARE ALL DOUBLE 2"x8" MINIMUM
- ALL EXTERIOR WALLS ARE COVERED IN 7/16 ORIENTED STRAND BOARD NAILED A MINIMUM OF 6" SPACING ON ENDS, AND 12" SPACING IN FIELD.