MacLeod Consulting, Inc.
29 Woods Road
Belmont, MA 02478
(617) 484-4733
fax (617) 484-9708
www.macleod-consulting.com

February 23, 2009

Dale F. Pleau
Mendon Town Hall
20 Main Street
Mendon, MA 01756

Re: Condition Assessment, Proposed Library
29 North Avenue Reuse

Dear Mr. Pleau:

At your request, I surveyed the structural condition of the St. Michael Church property at 29 North Avenue, Mendon. The purpose of the survey is to assess the buildings for reuse as a proposed renovation to a public library and town offices.

BACKGROUND

The property consists of three buildings – a church, a rectory, and a separated garage (photos 1 to 4). These structures were built from plans prepared by Alfred B. Capone, C.E in 1953. The plans are recorded by the building department in that year. The church is framed with wood and steel supported on unreinforced concrete masonry block walls. The structure is supported on unreinforced concrete foundation walls and footings. The exterior walls are finished with stucco. The church sanctuary is framed with wood trusses supported on masonry walls (photos 5 and 6; sketch 3). Undated drawings prepared by Pierre A. Belhumeur, AIA show renovations to the basement, site, and stairs. The architect's project number suggests these were prepared in 1987.

SURVEY

On January 14, 2009, I visited the St. Michael's Church property to visually survey conditions. Fr. Thomas Mahoney provided access to all the buildings.

Church

Much of the visible framing agrees with that shown on the original plans. Some alterations are not shown on plans. For instance, the organ located among the pews is sunken into the floor (photo 8), and the raised platform at the altar has a layout not shown on plans (photo 7; sketch 1). The 1987 alterations show folding partitions added in the basement (photo 13). These agree with the renovations plans.

I did not see any significant cracking in the finishes that would indicate movement in the structure. I saw some cracking in the plaster wall finish behind the altar that is most likely differential shrinkage between masonry and non structural wood walls. The basement appeared dry and free of odors that would indicate water problems.

I did see some anomalies that may require minor structural framing changes to accommodate improvements. These are as follows: A drain pipe is covered with a step in the choir room (photo 12). Stairs to the basement at the front side entry are steep (8 inch rise on 11 inch run) and have nonconforming winders (photo 11). Exterior stair railings at the side entry are leaning (photo 9). Some railing posts are not anchored. Several concrete stair treads are cracked (photo 10).

Rectory

In the rectory, the room layout and visible framing appear to agree with the original drawings. The porch next to the church has been enclosed into a sun room (photo 14). I saw an old leak stain on the second floor ceiling around the chimney. The rectory appears well maintained.

Garage

The detached garage is presently used to store furniture and theatrical props. It is congested making a thorough survey difficult (photo 17). The floor is finished with vinyl tile suggesting the structure served other than as a garage. I did see items stored in the loft (photo 18). The loft does not appear designed as a load carrying attic. The wood framed exterior walls are close to grade making them susceptible to infestation. I did smell mildew which may indicate the presence of decay causing organisms in the structure. Roof purlins extending out of the gable walls have rotted ends (photo 16). I saw a gap high up in the north wall (photo 15).

EVALUATION

The Massachusetts State Building Code, 780CMR, Seventh Edition is now in effect. It was long overdue as the last edition was published in 1997. The new edition includes changes in structural requirements that are more of a refinement to the past codes. It also includes changes in energy and access requirements that are beyond the scope of this assessment.

For lateral loading, Chapter 34 of the building code now categorizes work on existing buildings in five levels incrementally demanding increasing laterally strengthening as the scope of work or change in use increases. This can range from no strengthening to full compliance equal to new construction. This lateral strengthening is a requirement to meet wind and seismic loading.

Church

Library use is the same as church use, Assembly A-3, for assessing structural loading. There is no change in the Hazard Index of 4.

The first floor has the capacity to carry a live load of 60 psf which is the code requirement for library reading rooms. The framing is indicated on the original basement plan (sketch 1). Such rooms can accommodate the shorter book shelves in modern library design.

The basement floor is a slab on grade and should tolerate higher loading than the first floor.

The original drawings indicate a foundation soil drain which should provide a positive means to carry away surface water that seeps down through the soil.

The roof meets modern code requirements for self-weight, snow, and wind loading.

The bearing walls are unreinforced concrete block masonry. Such construction is no longer allowed, however, it is permitted to continue in use.

Work on this building would likely fall into a Level Two scope. The building presently relies on the interaction between roof truss frames and the exterior walls for lateral stability. For this Level Two scope, wind loading would apply a greater lateral load than would earthquake loading. The walls would be overstressed in a full code wind loading requirement and lead to cracking and possibly instability. I calculated these flexural stresses in the order of 150 psi (analysis 1 and 2) at the base of the wall which exceed 19 psi permitted for this type of construction. The associated movement at the eave is small, 0.15 inches (uncracked). The stability in the walls can be mitigated by developing a diaphragm in the attic crawl space spanning side to side from front to rear tying the roof framing to the front and rear masonry walls.

Exterior landing railings are bent. These are inadequately anchored. Plan on reinstalling railings.

The floor at the sunken organ is too low. Plan on reframing it.

The altar area is on an elevated platform. It may be raised off a structural floor or it may be framed one step up. I could not determine from my survey or review of the drawings. Plan on demolishing this raised floor and applying a subfloor and finish floor to the framing.

The front interior stairs to the basement are an 8-inch rise to an 11-inch run, steeper than permitted by code. These same stairs have a winder which is not permitted under the modern code. Plan on rebuilding this stairway.

A drain pipe protrudes into the floor area in the basement women's room. This could be reset below the floor to remove the step for a new room layout.

Rectory

Business use is the same as residential use for assessing structural loading having a Hazard Index of 2. This is Type V construction. Chapter 34 requires the Hazard index for Type VB to be increased by one for the new use. Therefore, the Hazard Index for the new construction is 3. This does not appear to trigger any additional compliance requirements. The scope of work will likely fall into a Level Two category and possibly a Level One.

The rectory floor joists have a capacity to carry 50 psf loading which is suitable for office loading. Some local strengthening may be needed to ensure the floors meet higher loading of corridors and lobbies unless this can be waived by the building inspector. Maintaining a layout with shorter spans in these areas would preclude such strengthening.

The basement stringers do not have the capacity to carry these office loads. These stringers can be easily strengthened be halving the spans from nine feet to four and one half feet by adding steel pipe posts at midspan.

Separated Garage

This structure is built as a separated garage with doors and space suitable for parking cars. It is presently used as a low hazard storage use which is the lowest Hazard Index. Any change would increase the Index.

The loft is accessible through a trap door accessed by a temporary ladder. This would indicate it was not intended for storage. Given the wear from storage in the loft, the presence of mildew, and some minor rot at the ends of roof purlins suggests some moderate amount of decay may be concealed within the walls especially near the foundation sills which are close to the ground. Expect some structural repairs to maintain this garage in its present use.

Non Structural

I did not attempt to identify any hazardous materials. I expect the buildings contain lead based paints. Tiles likely contain asbestos. I did not take note of insulation around piping as I am not qualified to assess hazardous materials.

Have an architect review access, energy, lighting, ventilation, and other life-safety and non structural code requirements.

Have a hazard waste materials consultant inspect the site for liabilities.

Summary

I expect a modest level of renovation to rehabilitate these buildings into a public library and a town office building. The separated garage can be easily repaired to continue as a utility storage structure. The work should fall within a Level 1 or Level 2 scope of work as defined in the Building Code, Chapter 34. Most of the work will be non structural changes to partitions, doors, MEP, and access work with a small amount of structural work to strengthen and upgrade the aforementioned deficiencies.

RECOMMENDATIONS

I recommend the following repairs as part of a program to renovate and rehabilitate these buildings to a library, office, and utility storage use.

Church

1. Attic diaphragm. Install a plywood diaphragm on the ceiling joists over the sanctuary from side to side and end to end. Include two layers 2 by 8 continuous around the border to tie the edges together. Anchor to the end CMU walls with hollow wall renovation anchors. Alternatively build a diaphragm horizontal truss on the joists to serve the same purpose.

2. Sunken floor. Remove the sunken joist framing beneath the organ and reframe the floor with joists matching the original framing.
3. Raised floor. Demolish the raised floor. Lay down a subfloor underlayment and finish with flooring or carpet to suit the program.
4. Interior stairs. Demolish the concrete winder stairs. Re-layout new concrete stairs with acceptable rise to run and acceptable treads and landings.
5. Exterior stair railings. At a minimum re-anchor stair railings at the side exit. Otherwise replace the railings.
6. Exterior stair treads. Cut out cracked stair treads removing weak material. Apply bonding agents and stainless steel/galvanized dowel reinforcement. Recast treads.
7. Drain pipe. Lower the drain pipe into the floor. Adjust local joist framing and patch the flooring.

Rectory

1. Strengthen basement stringer. Add four steel pipe columns at stringer midspan. Include footings and base/cap plates.

Separated Garage

1. Repair rotted purlin ends. Consolidate and patch eight ends of purlins using borax based preservatives and epoxy patching systems.
2. Repair opening in wall. Open and patch exterior stucco finishes to access concealed framing to patch opening under eave.
3. Repair sills. Open and patch exterior stucco finishes to access concealed framing along sills of walls. Cut out rotted wood and splice studs. Add preservative pressure treated wood to replace sills. This is an allowance as the extent of deterioration is unknown.

General

1. Have an architect review access, energy, and MEP requirements
2. Have a hazardous materials consultant survey the property.
3. These repairs should be included in a rehabilitation/renovation program with a design prepared by an architect and engineers experienced in building rehabilitation and experience in Massachusetts public work projects.

BUDGET

I recommend the following budget for structural work to be included in a minimal renovation/rehabilitation program. Should a broader program be desirable, then adjust the budget to include additional structural work.

Task	Amount
Church: attic diaphragm	$ 15,000
Church: sunken floor	2,500
Church: raised floor	2,500
Church: interior stairs	3,500
Church: stair railings	500
Church: stair treads	1,500
Church: drain pipe	500
Rectory: basement stringer	2,500
Garage: purlins	2,500
Garage: wall opening	2,500
Garage: sills	4,000
Subcontract subtotal	**$ 37,500**
GC Markup	7,500
Total	**$ 45,000**

Sincerely,

Arthur H. MacLeod, P.E., Principal
MacLeod Consulting, Inc.

Attachments: Three pages of photographs, six pages of original drawings, and two pages of analysis graphics.

1. Church viewed from west

2. Church viewed from south

3. Rectory front view

4. Separated garage front view

5. Church sanctuary

6. Roof framing over sanctuary

7. Raised floor at altar

8. Sunken floor at organ

9. Displaced railings at side entry

10. Cracked stair treads at side entry

11. Stair winders to basement

12. Step covering drain pipe in choir room

13. Removable partitions in church basement

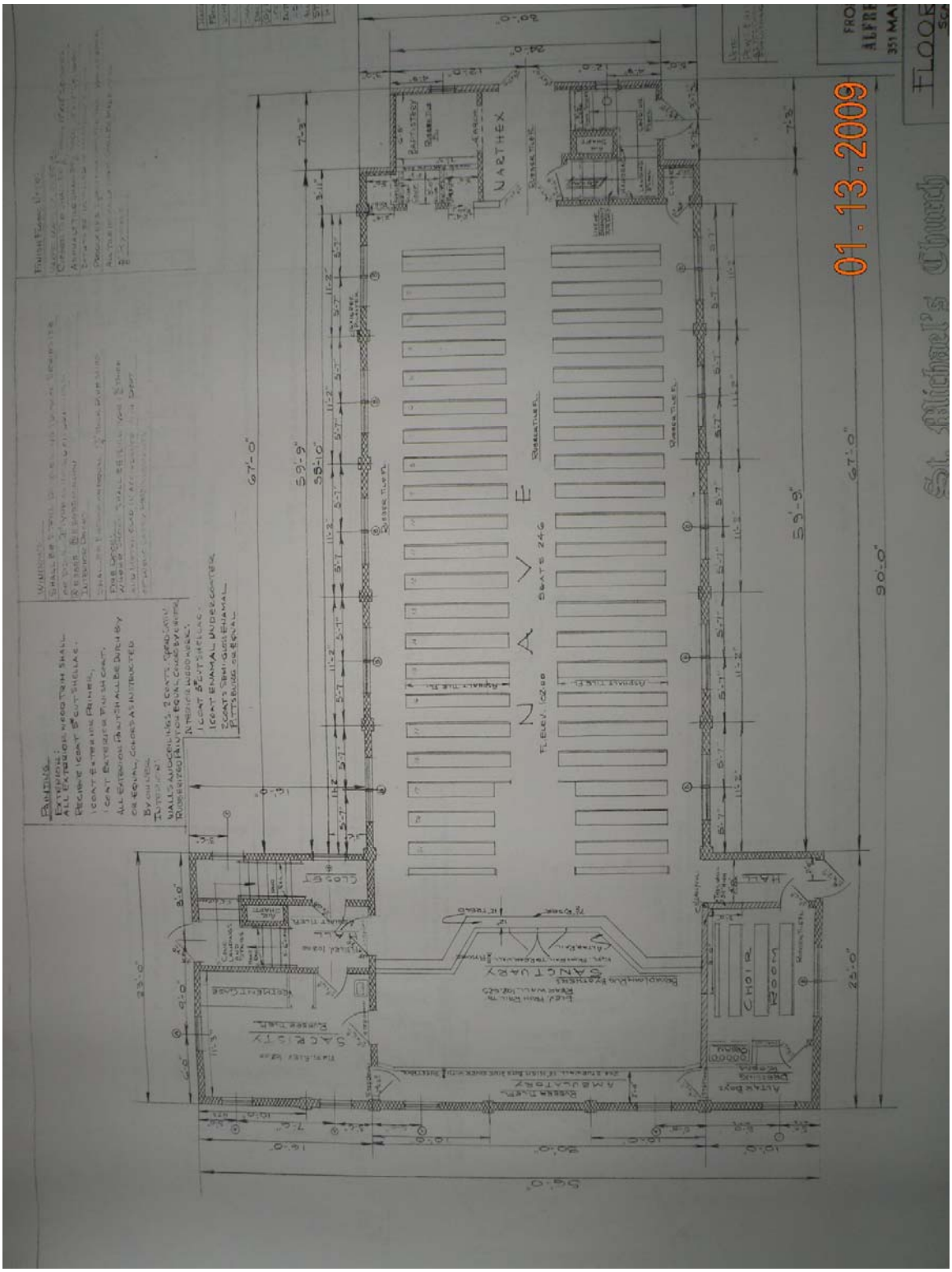
14. Enclosed porch in Rectory

15. Rear view of separated garage

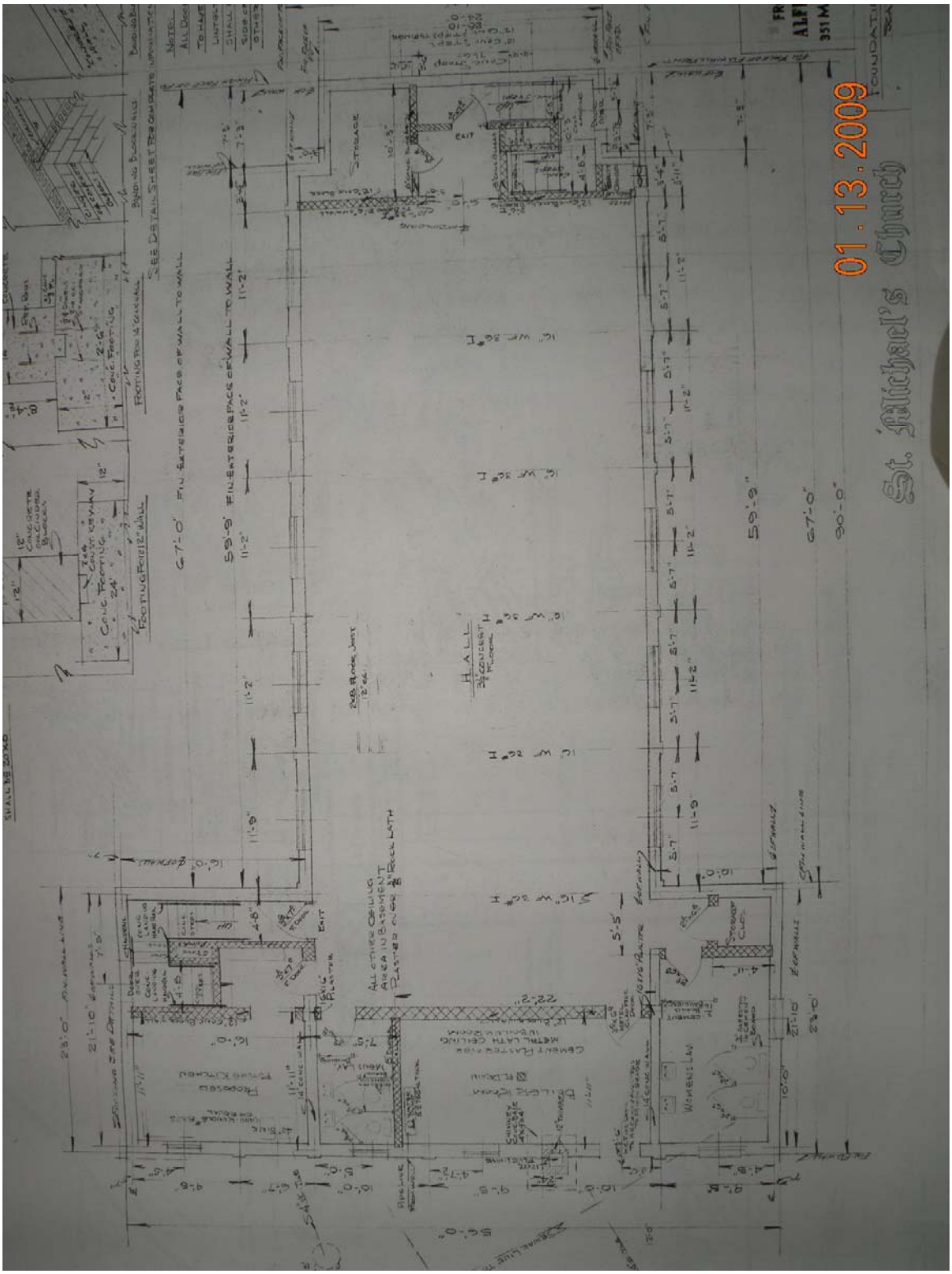
16. Rotted roof purlin ends

17. Interior of separated garage

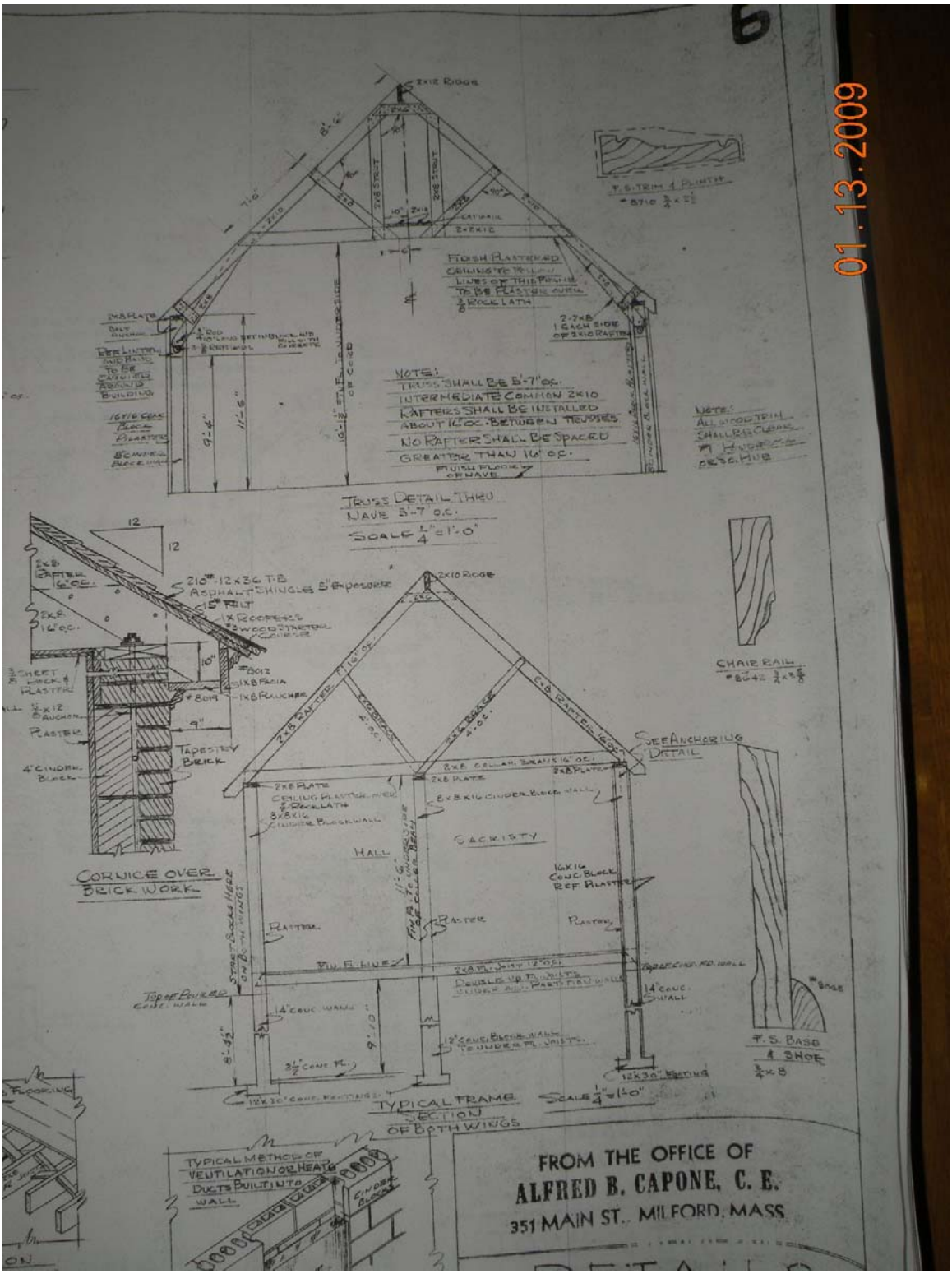
18. Loft in separated garage



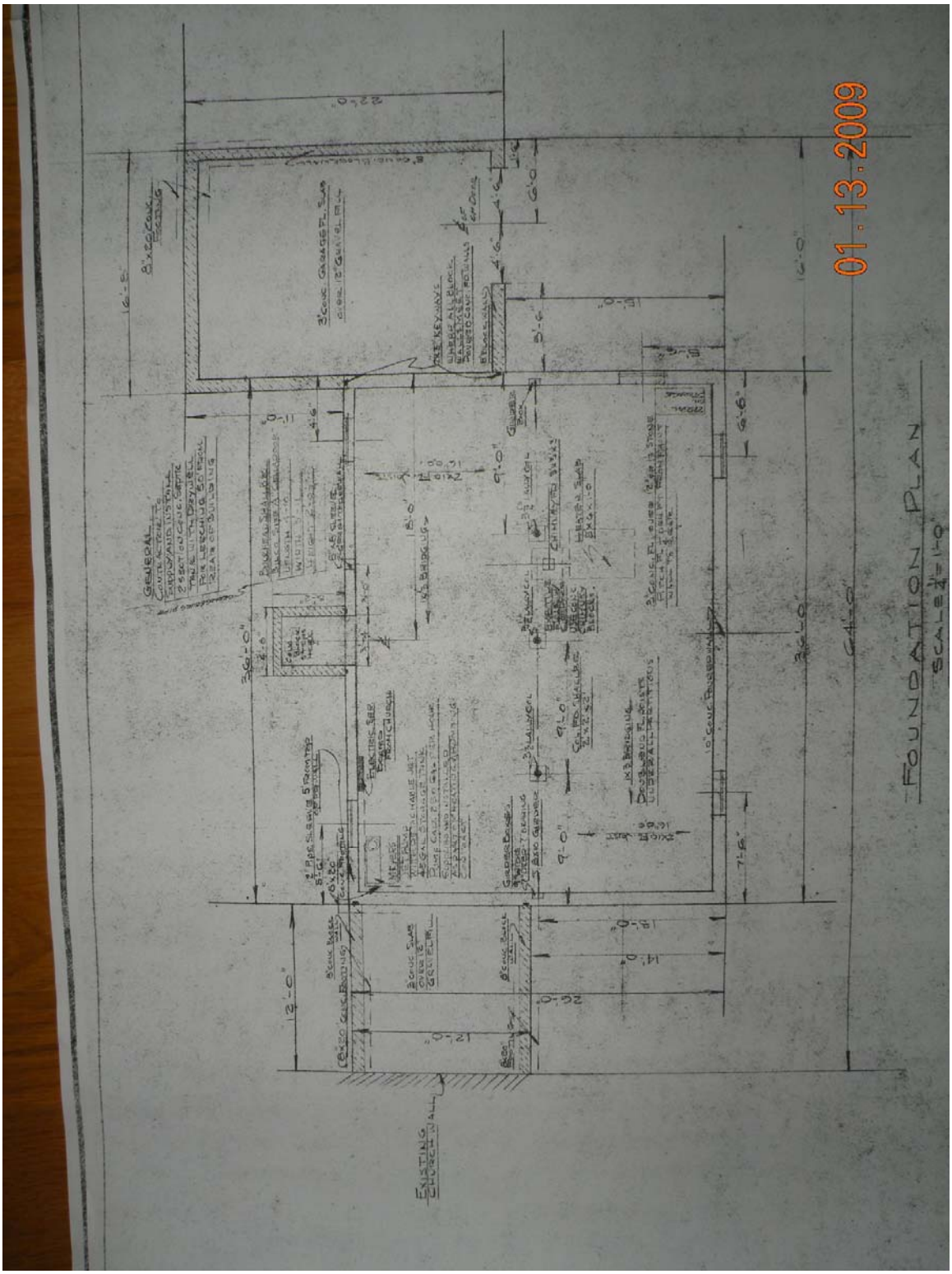
Church first floor layout



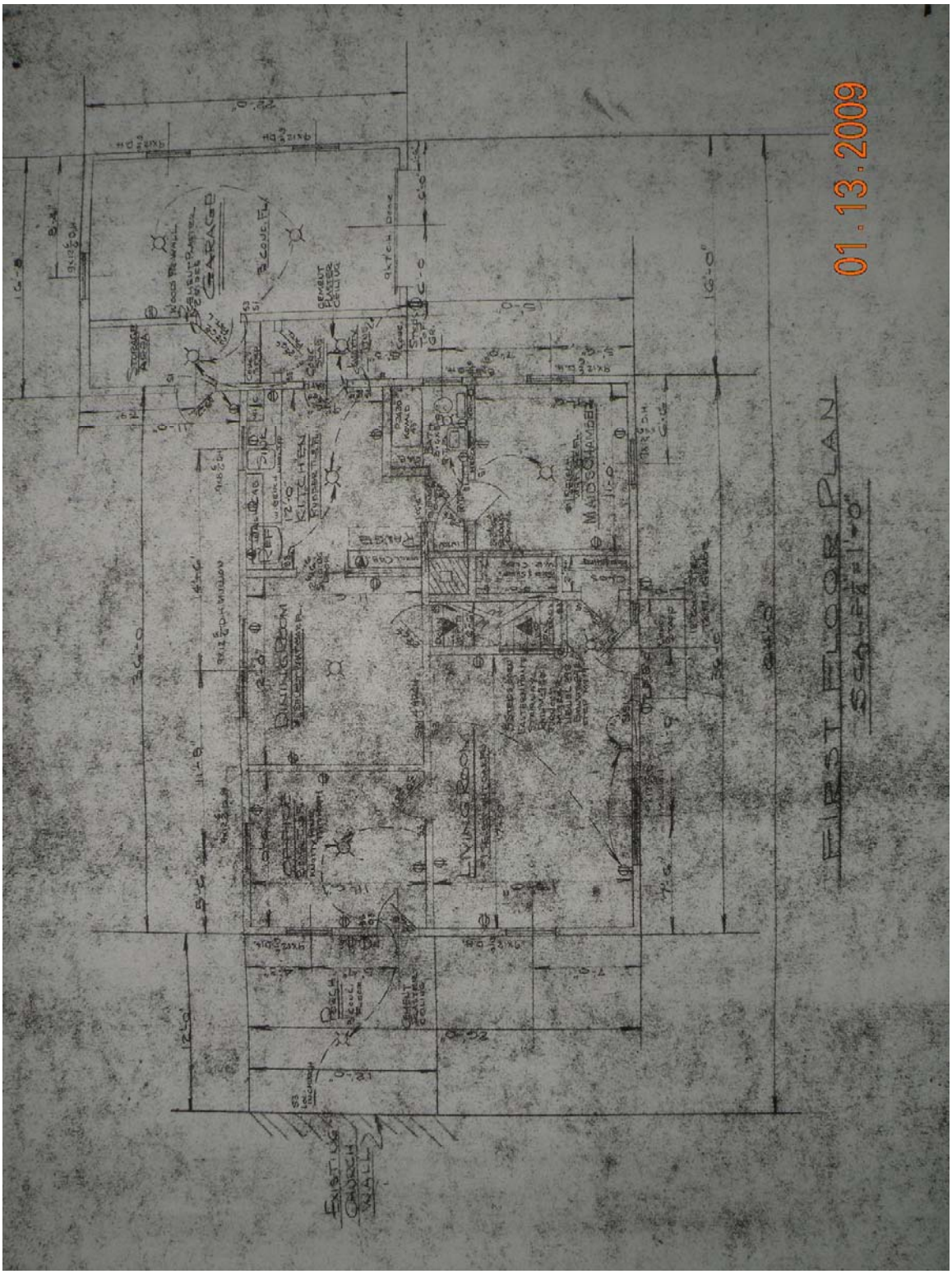
Church first floor framing superimposed on basement plan



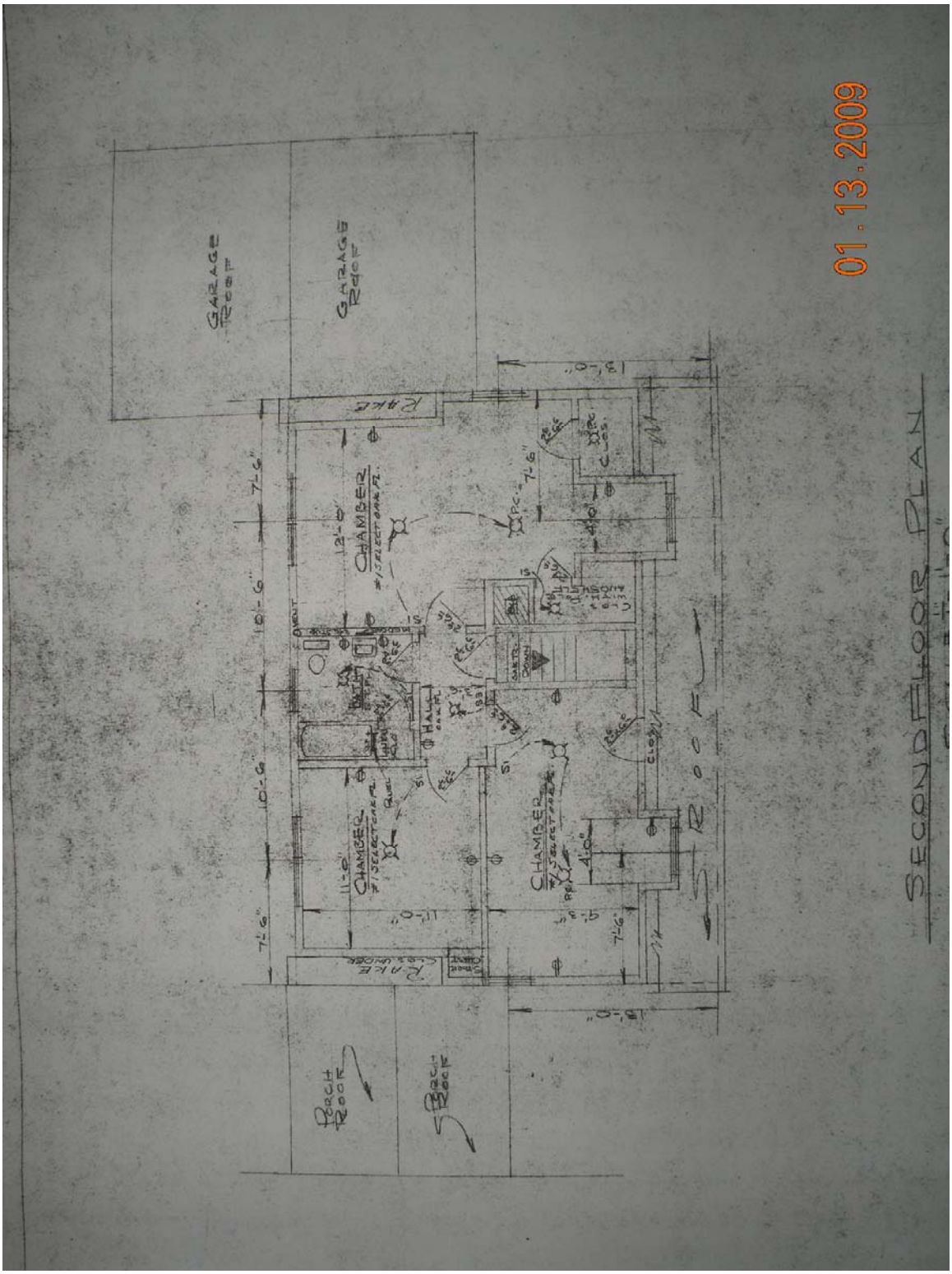
Framing building sections through church



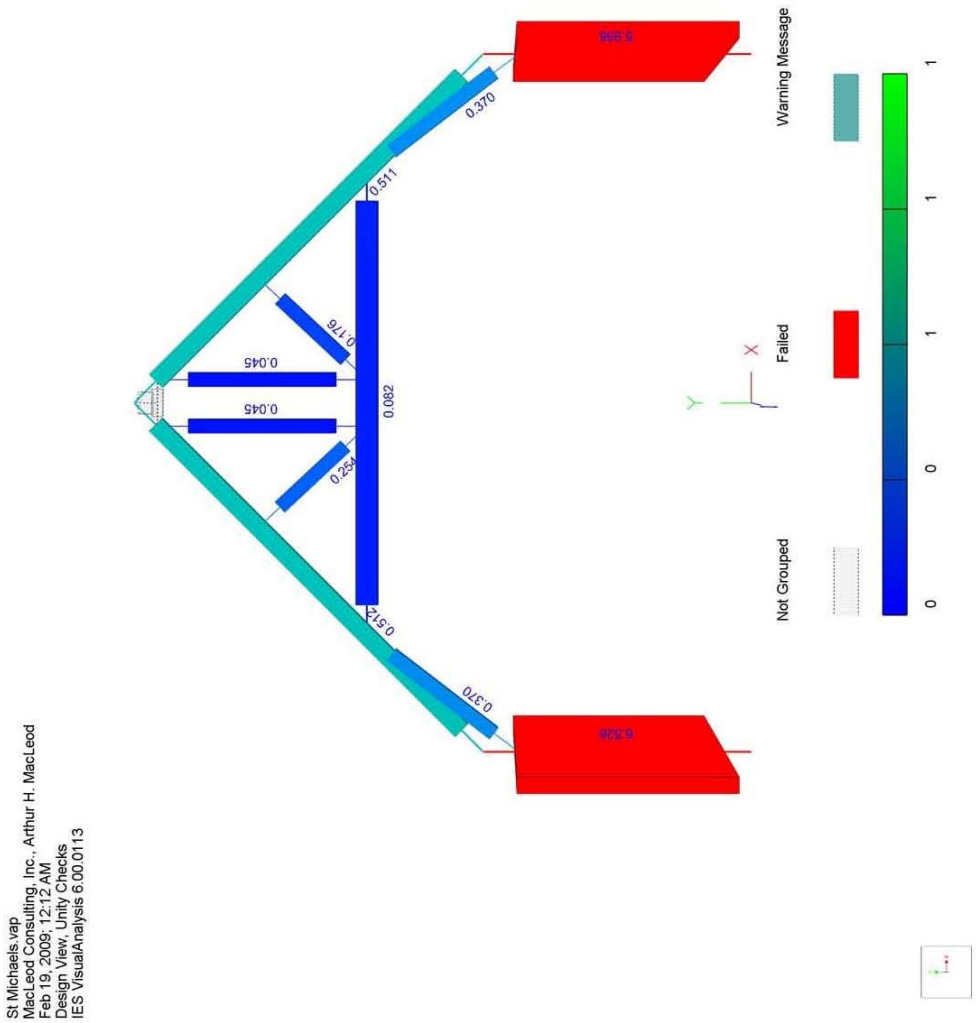
Rectory basement plan



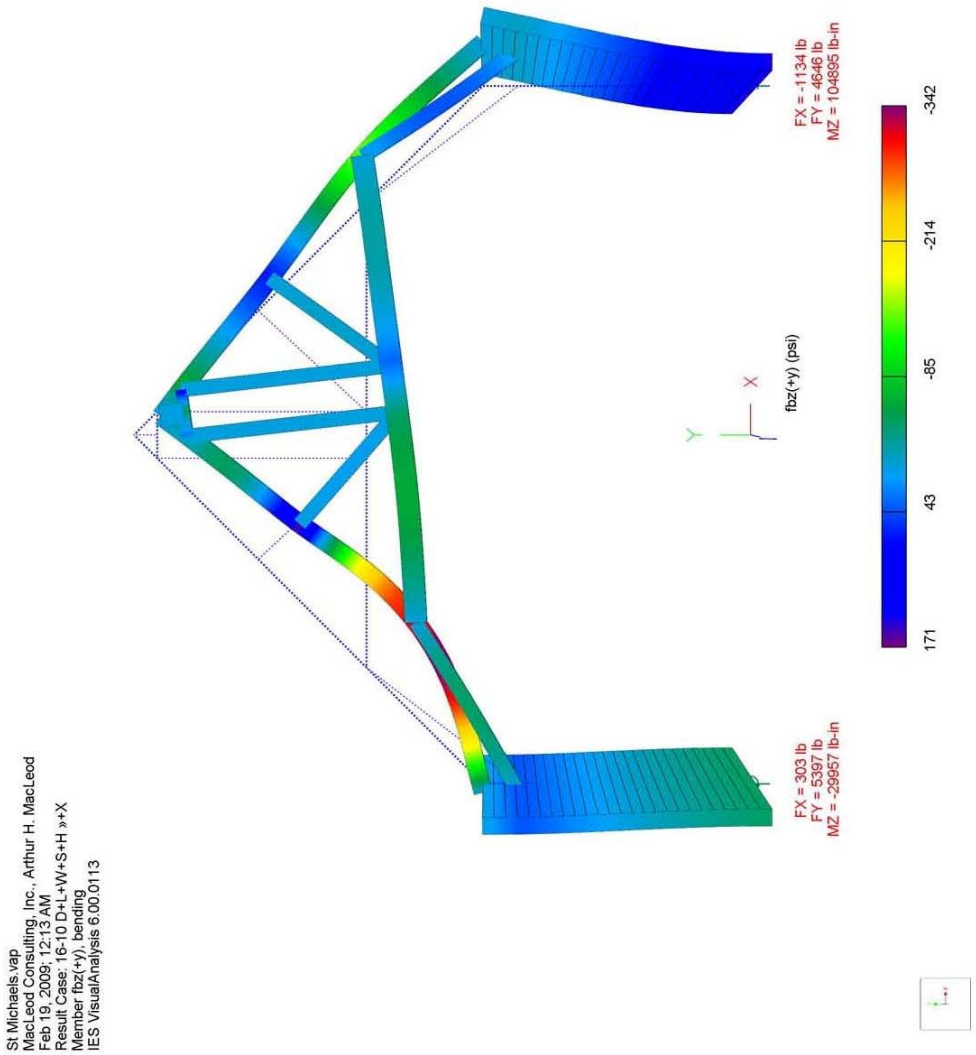
Rectory first floor plan



Rectory second floor plan



Stress index of building section through sanctuary



Flexural stresses in members of building section through sanctuary