TEKCON
MANAGEMENT LIMITED

ENGINEERING & MANAGEMENT SERVICES

REPORT AND INVESTIGATION OF STRUCTURAL INTEGRITY ALL SAINTS ANGLICAN CHURCH FOXTRAP, NEWFOUNDLAND

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REPORT AND INVESTIGATION OF STRUCTURAL INTEGRITY ALL SAINTS ANGLICAN CHURCH FOXTRAP, NEWFOUNDLAND

Prepared for:

All Saints Anglican Parish
P. O. Box 6077
Manuels, NF
A1W 1K4

Prepared by:

Tekcon Management Limited
P. O. Box 13576
St. John's, NF
A1B 4B8

May 18th, 1993

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May 18th, 1993

Rev. Edward King
All Saints Anglican Church
P. O. Box 6077
Manuels, NF
A1W 1K4

Re: Report on Structural Integrity
All Saints Anglican Church, Foxtrap

As per your request, we have reviewed your church in Foxtrap regarding your concerns of excessive movement to the structure during high winds.

We are forwarding herein two copies of our report accordingly.

We trust our report will be found adequate for your current needs. Should you require further clarification or more detailed investigation, please contact us at your convenience.

Yours very truly,

TEKCON MANAGEMENT LIMITED

L. J. Butler

Lorne J. Butler, P.Eng.

LJB/jbg

Encl.

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1.0 INTRODUCTION

On Monday, April 26th, 1993 Rev. E. King called Tekcon Management Limited expressing concern about the amount of movement being experienced, during high winds, at All Saints Anglican Church located in Foxtrap, Conception Bay. In particular, the east end wall, under the influence of high winds, had considerable movement.

Rev. King requested that Tekcon Management Limited visit the church and provide an opinion on the structural integrity of the church and to offer suggestions for corrective action, if necessary.

2.0 SITE VISIT & RELATED INFORMATION

On Tuesday, April 27th, 1993 Lorne Butler, P.Eng. of Tekcon Management Limited visited the site and met with Rev. King and Mr. Eric Taylor.

Rev. King and Mr. Taylor described the movement taking place as follows:

1. The east wall, shown in Photo No. 1 of Appendix B, moves considerably during high winds. On one occasion Rev. King cancelled the evening service because of his concern over the amount of deflection in the wall.

   On another occasion the stain glass window in the east wall blew out (or in).

2. Mr. Taylor stated that during high winds the interior suspended light fixtures moved considerably.

3. Mr. Taylor also observed that the nails which fasten the exterior siding were protruding in some locations at least an inch from the surface. This would indicate structural movement.

The church, built in 1931, is of wood frame construction. The perimeter foundation wall is concrete and the floor system is

timber construction supported on concrete piers. A crawl space exists below the floor system. The structure supporting the roof consists of a series of wood arches (or trusses) which can be seen in Photo No. 2 of Appendix B. The columns for these arches are resting on concrete piers as can be seen in Photo No. 3 of Appendix B. The roof construction consists of timber purlins, wood sheeting and asphalt shingles. The roof construction can be seen in Photo No. 4 of Appendix B. The exterior perimeter walls are of wood construction having both aluminum and vinyl siding applied recently over the original wood clapboard.

The interior components of the structure are covered with finish materials. A request was made to remove some of these finishes at specific locations in order to observe the condition and size of the structural elements which were covered from view.

We also requested a copy of the drawings for the church, if they were available.

2nd Site Visit

On Wednesday, May 5th, 1993 a second site visit to the church was taken for viewing of the structure which was now exposed in specific locations by removal of the interior finishes. We were advised that drawings for the church were not available.

Two of the columns supporting the roof structure were exposed. See Photos No. 5 and 6 of Appendix B. The columns measured 8" x 8" and are of BC Fir. They were in good condition and did not show any sign of deterioration.

A section of sheeting was removed from the arch as shown in Photo No. 7 of Appendix B. The interior finish sheeting and the T & G sheeting, as can be seen in the photos, were added some time after the church was built - in more recent years. An inspection of the cavity between the T & G sheeting did not reveal any structural members above the arch other than a BC Fir knee brace which can be seen in Photo No. 8 of Appendix B. The knee brace was in good condition. A section of the T & G sheeting was observed to have a large split as can be seen in Photo No. 9. It is difficult to say whether the split was caused from building movement or drying out of the material.

Interior panelling and sheeting was removed below two of the windows at the south side of the church. See Photos No. 10 and 11 of Appendix B. The studs are rough sawn 2" x 5". The studs showed signs of rot and deterioration, presumably from leaks around windows.

Additional photographs of the structure were taken above the ceiling. The location of each of these photographs is shown in

Figure 2 of Appendix B. The configuration as shown in Figure 1 of Appendix A is our best assumption of the structural arch and its components. This assumption is based upon site observations with limited structural exposure without reference to drawings which are not available.

During the site visit we were asked to consider the idea of reducing the height of the roof level of the Nave. The intent would be to have a uniform roof level extending from the roof of the side wings to the centre of the church and at the same time retain the interior arches. This approach will be discussed in our summary and conclusions.

3.0 ANALYSIS

The terms of reference for this report does not include a detailed structural analysis. Prior to corrective action, a structural analysis would have to be carried out. In order to analyze the structure completely, additional field work would have to be conducted involving measurements and location of all structural elements which would also require additional interior finishes to be removed.

This report will review the findings of the site visit, express opinions, and point out options for consideration.

The east wall, which is reported to have excessive deflection, was not exposed. Its construction is probably wood studs and sheeting similar to other exposed areas. The wall does not have any projecting pilasters which one might expect to see if wind columns were utilized in the construction. Regardless of its construction, the wall is obviously inadequate to resist the wind loads imposed upon it since the reported deflections would exceed those permitted by today's building codes.

This wall should be strengthened by the introduction of wind columns or some method of bracing. In order to carry out this work, the interior finishes would have to be removed and most likely concrete footings would have to be constructed to accommodate the additional structural elements.

As previously mentioned, the configuration of the arches as shown in Figure 1 is the existing arrangement of the structural elements that provide roof support and lateral stability. The configuration as shown is based upon the elements as seen above the finished ceiling and the elements as seen in areas where the interior finishes were removed.

Concern was expressed regarding the movement of the suspended light fixtures and the deflection of the exterior south wall during high winds. Any structure subjected to high winds will experience lateral movement (side sway). The design intent of any designer is to provide the necessary rigidity in a structure to limit the amount of movement to be in conformance with allowable values established by building codes. In order to reduce the side sway movement, the structure would have to be "stiffened" by the introduction of bracing and most likely columns and other elements would have to be reinforced to provide the rigidity required to reduce the side sway movement to an acceptable tolerance. Obviously in order to carry out such corrective measures, the structural elements would have to be exposed, which would require the removal of interior finishes as required.

4.0 SUMMARY & CONCLUSIONS

From our site visit and discussions with Rev. King and Mr. Eric Taylor, it is our opinion that the church structure, as it exists, should be reinforced and strengthened to reduce the horizontal movement to an acceptable level. Obviously the decision to carry out this work will depend upon costs. Without a structural analysis to define exact requirements it becomes rather difficult to provide a proper estimate. We feel, however, that we can provide a good assessment of cost for consideration.

From our analysis we feel that three options are worthy of consideration:

1) *Install bracing and reinforce the necessary structural elements of the structure as it exists. Approximate cost - $200,000 range.*

2) *Lower the Nave roof, which will involve removal of the existing roof and install a new roof structure, complete with sheeting and shingles. This option will most likely require the installation of bracing and reinforcing to the remaining structural components. Approximate cost - $300,000 range.*

3) *Build a new church adjacent to the old church. Approximate cost - 7,000 ft^2 @ $120.00/$ft^2$ = $840,000*

The above costs are our best educated guess from the information available to us. The proper procedure to determine exact costs would be to carry out detailed design for each option and obtain firm price quotations.

The selection of either option, based on urgency of need, must take into account the priorities of the owner which will clearly depend on his resources.

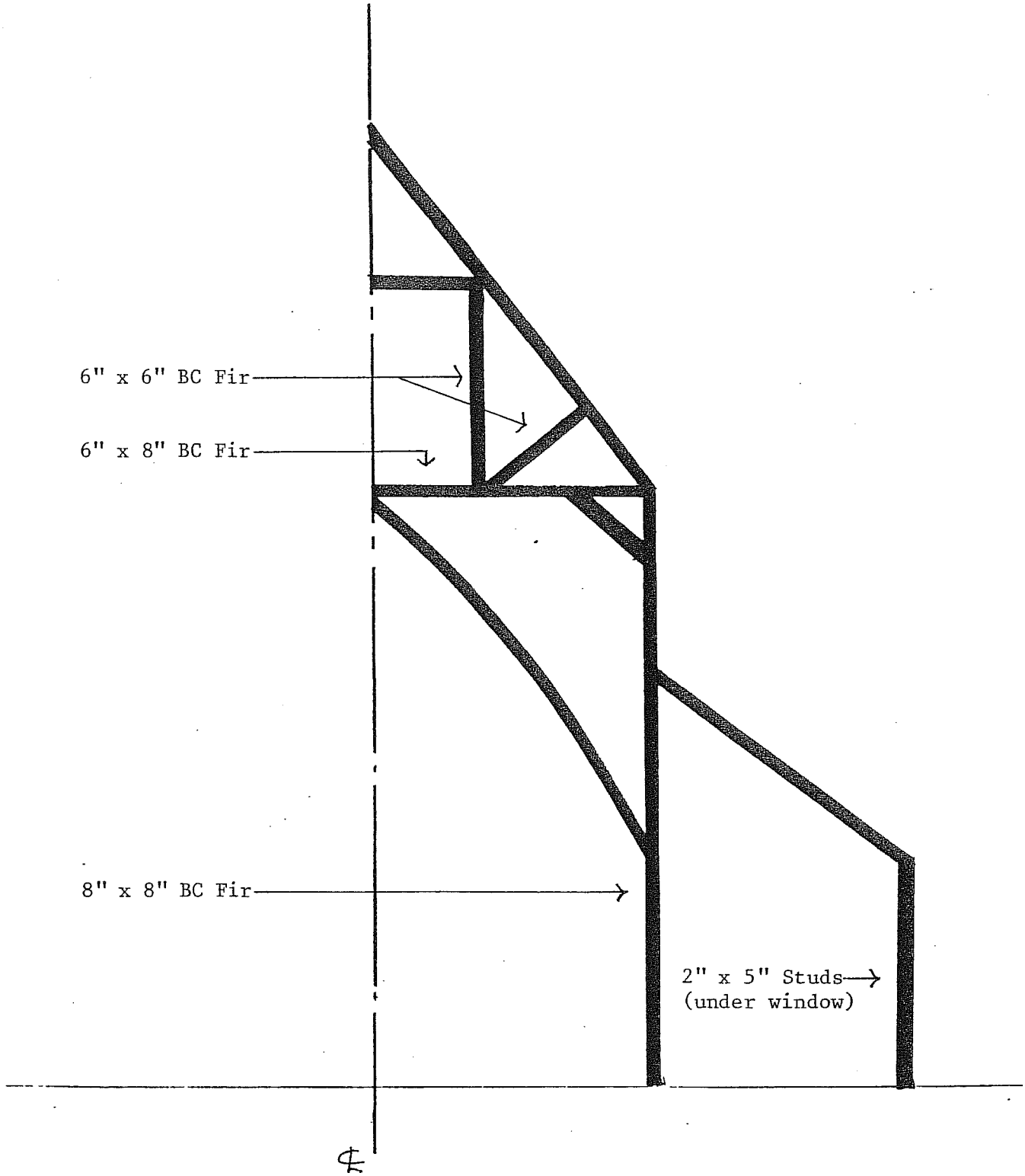
However, it should be borne in mind that the church is 62 years old and the selection of Option 1 or 2 will still require maintenance and repair to windows and stud wall framing (of unknown extent). The selection of Option 1 would also require corrective action to be taken to resolve the leaking problems which currently exist. It should also be noted that the church is not energy-efficient in that the exterior walls are not insulated.

We are of the opinion that the best choice would be to build a new church in lieu of spending some $300,000 on the old church with continuing maintenance being required.

We also recommend that the east wall be braced as soon as possible regardless of which option is selected.

APPENDIX A

FIGURE 1 - ASSUMED STRUCTURE



ASSUMED STRUCTURE AS OBSERVED FROM SITE VISIT

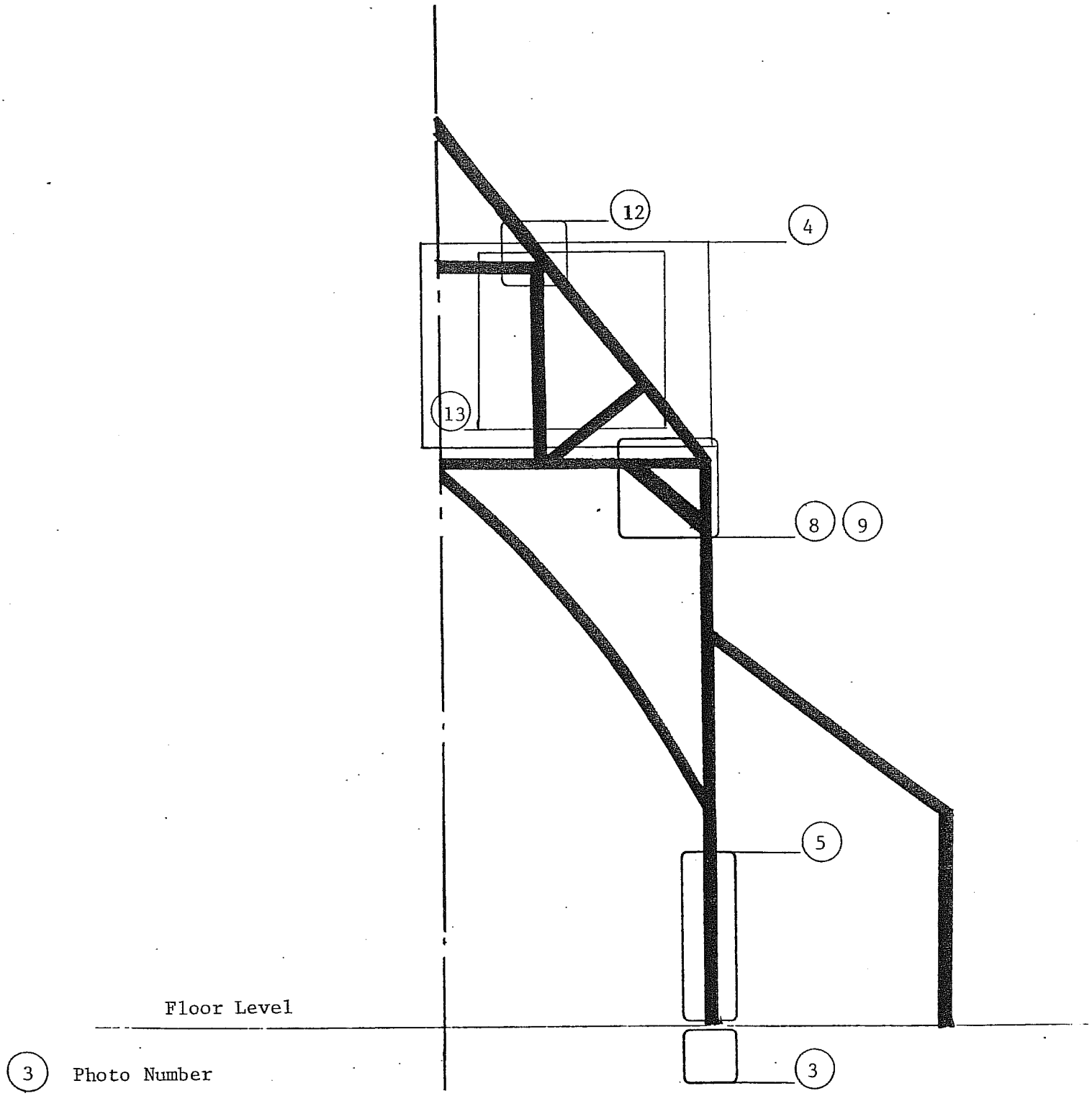
FIGURE 1

(not to scale)

APPENDIX B

PHOTO NOS. 1 - 15

FIGURE 2 - PHOTOGRAPH LOCATIONS ON STRUCTURE



PHOTOGRAPH LOCATIONS ON STRUCTURE

FIGURE 2

(not to scale)

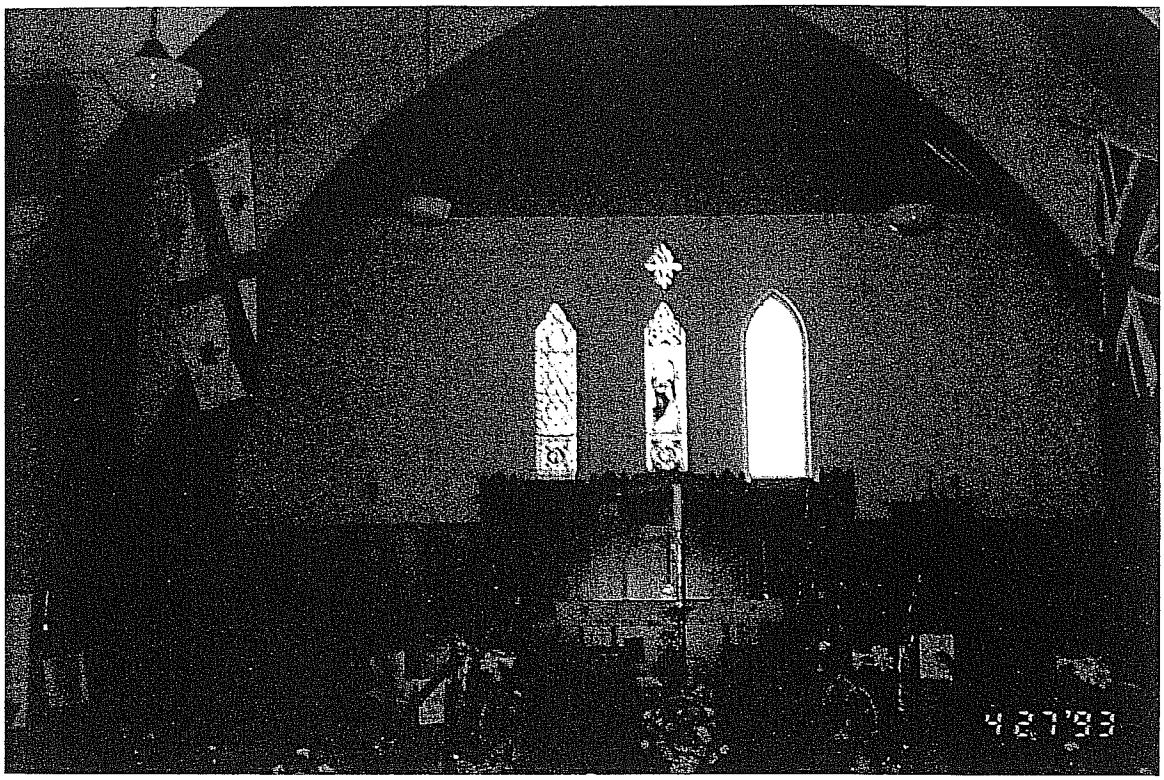


Photo No. 1 - East Wall

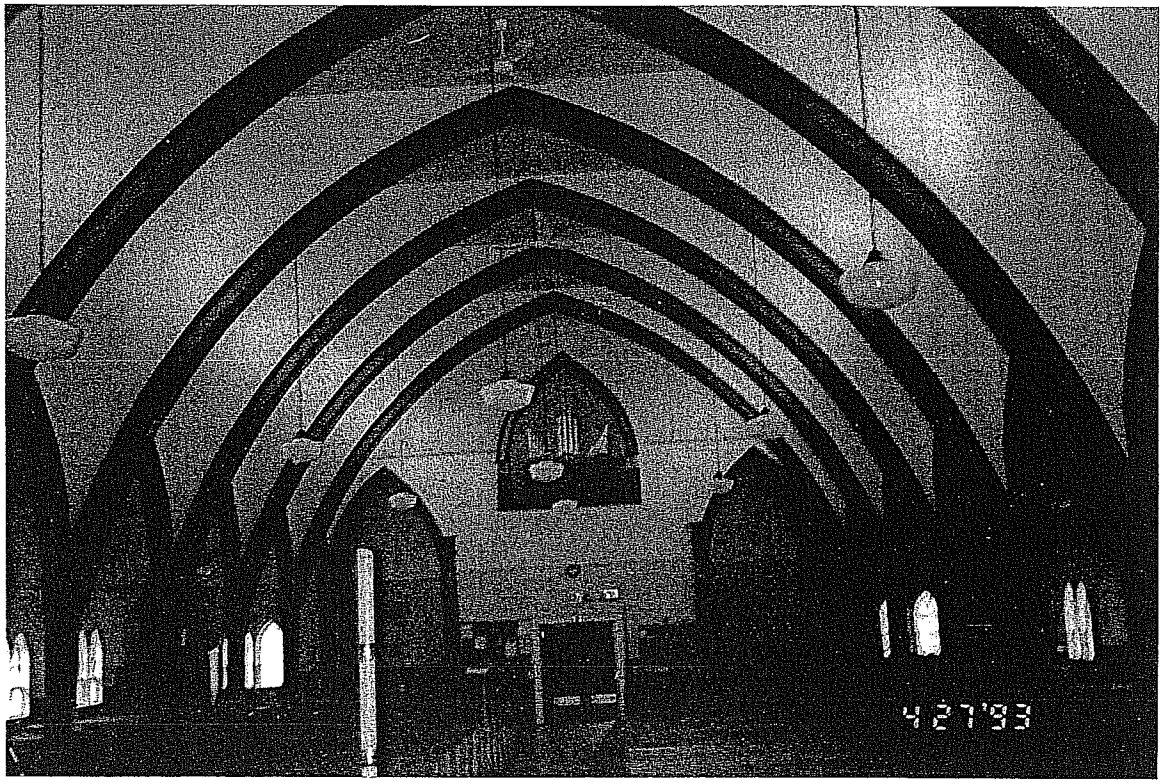


Photo No. 2 - Church interior showing supporting arches

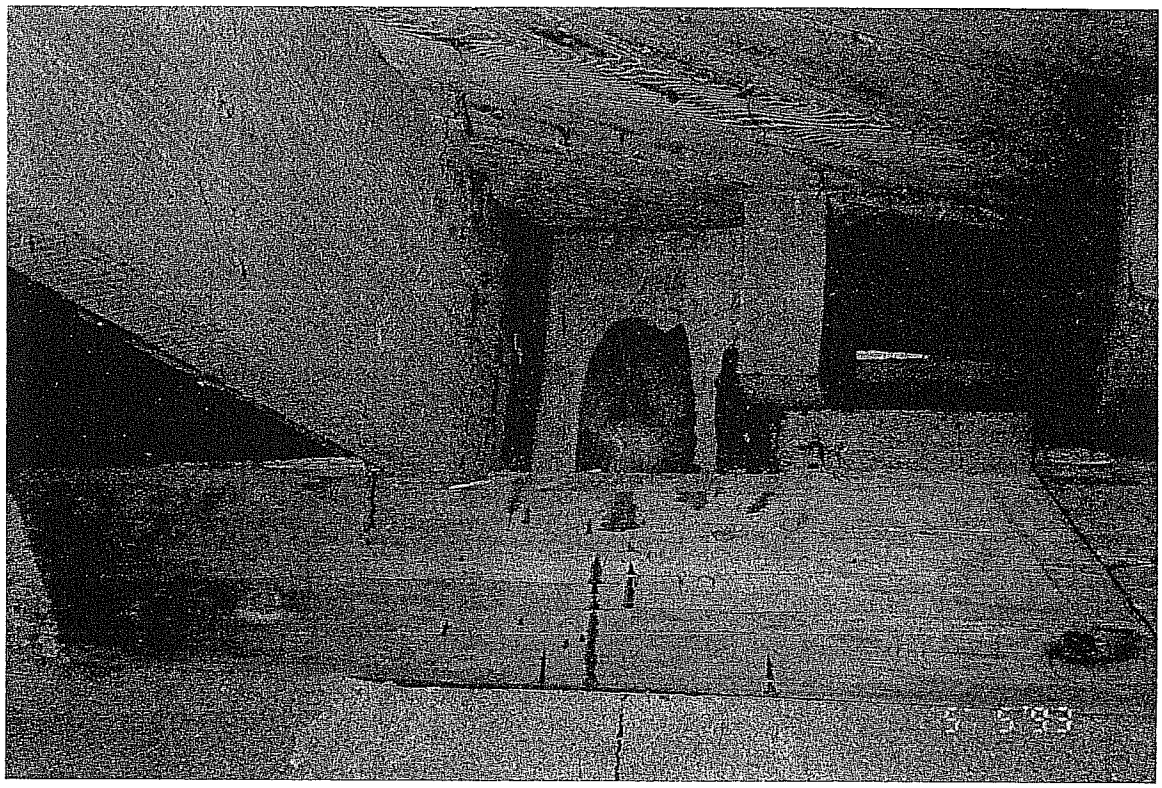


Photo No. 3 - Column base supported on concrete piers

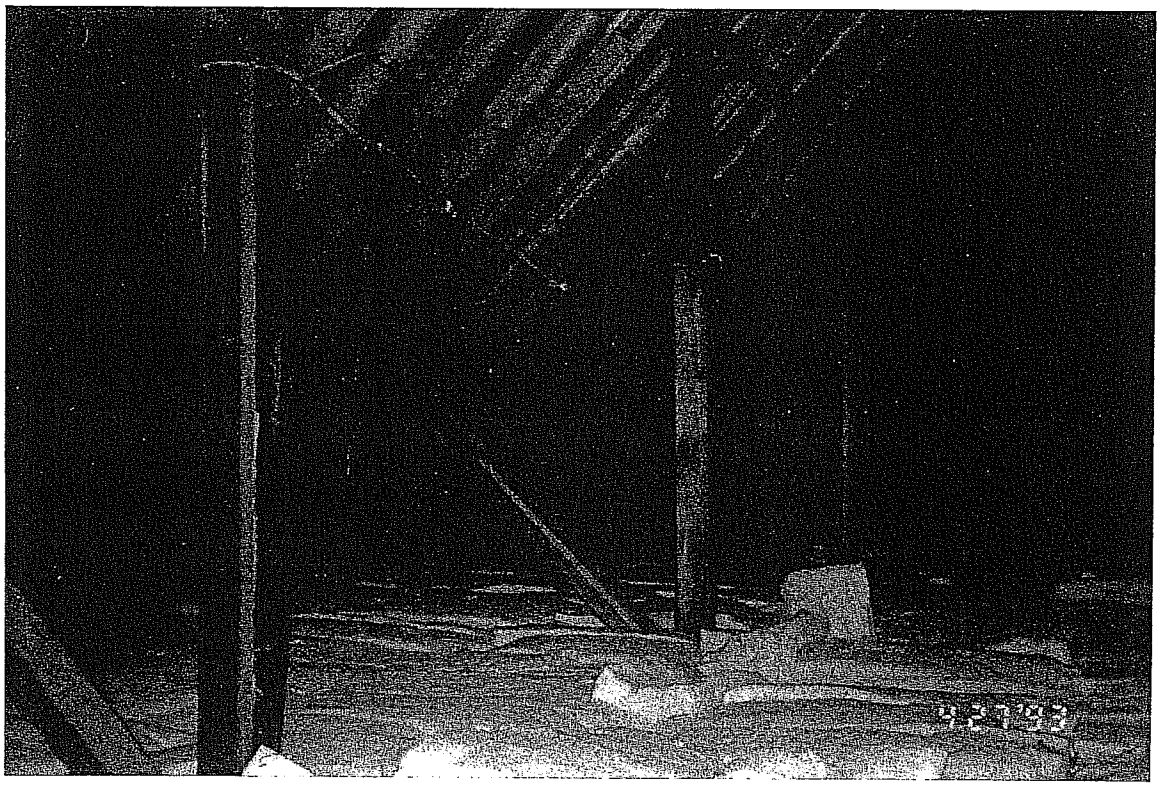


Photo No. 4 - Roof supports

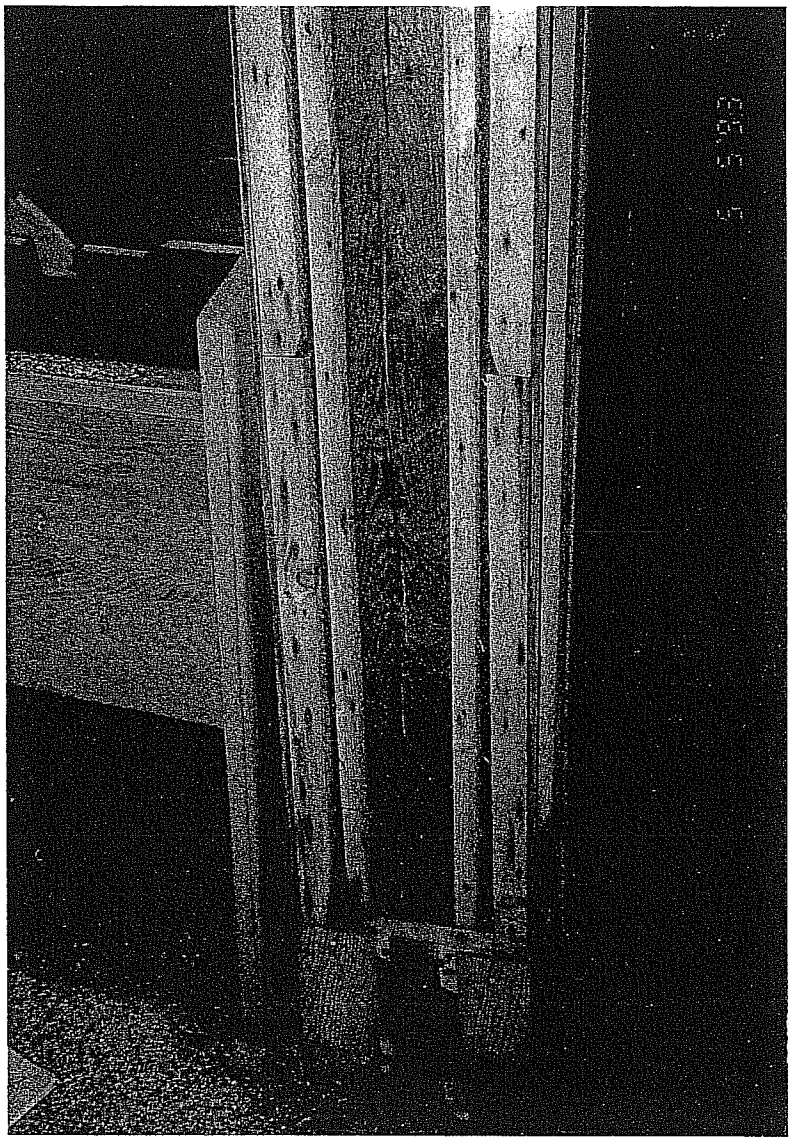


Photo No. 5 - Supporting column with interior finishes removed

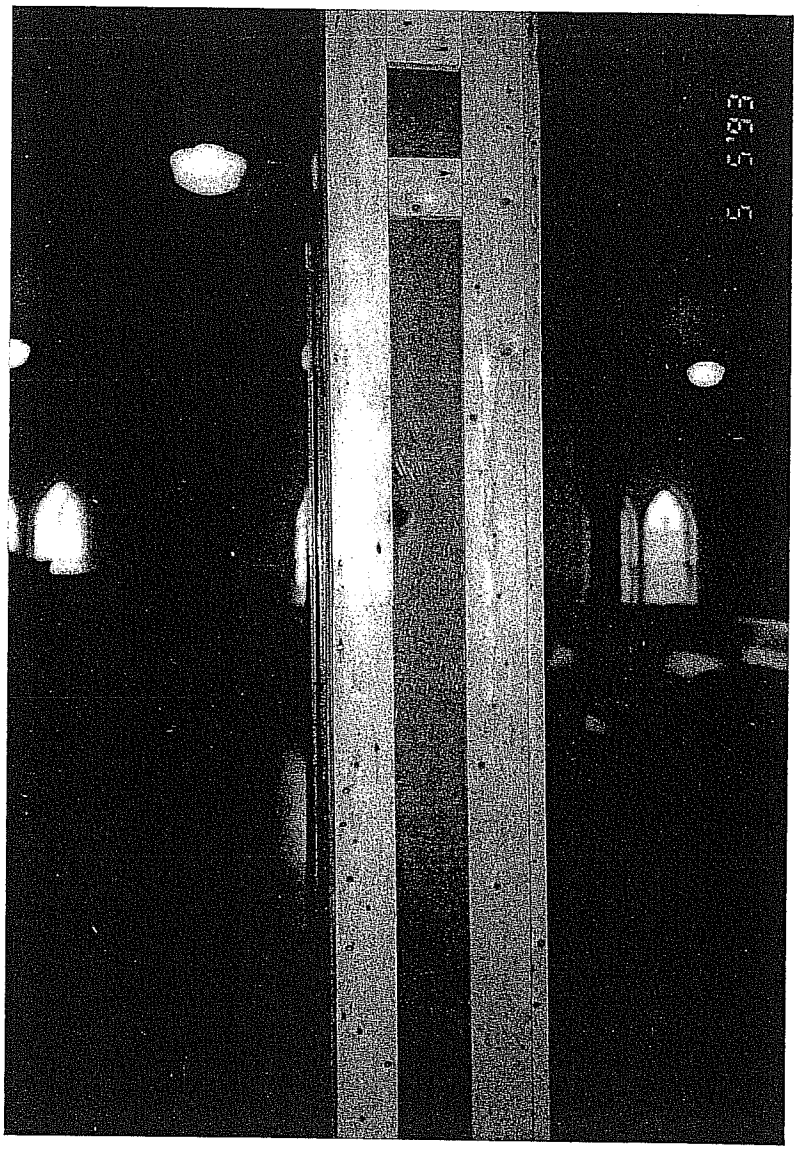


Photo No. 6 - Supporting column with interior finishes removed

Photo No. 7 - Interior arch with section of interior finish removed

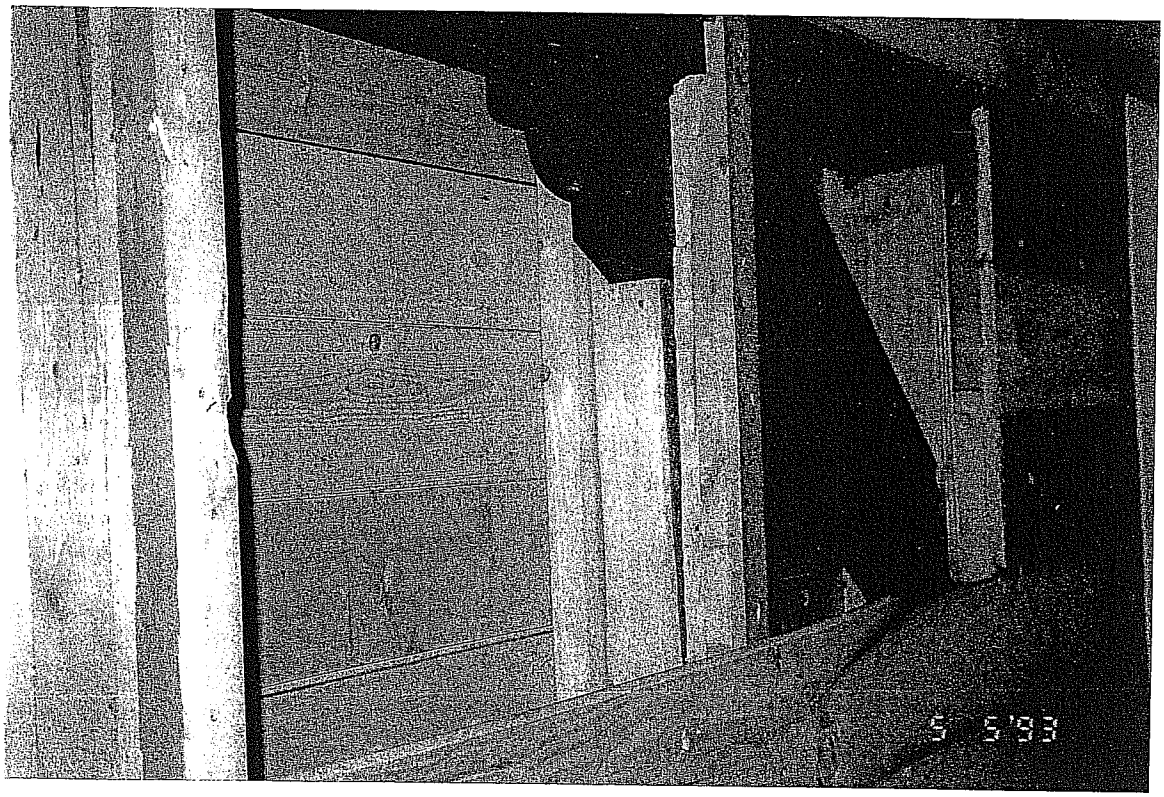


Photo No. 8 - Arch knee brace

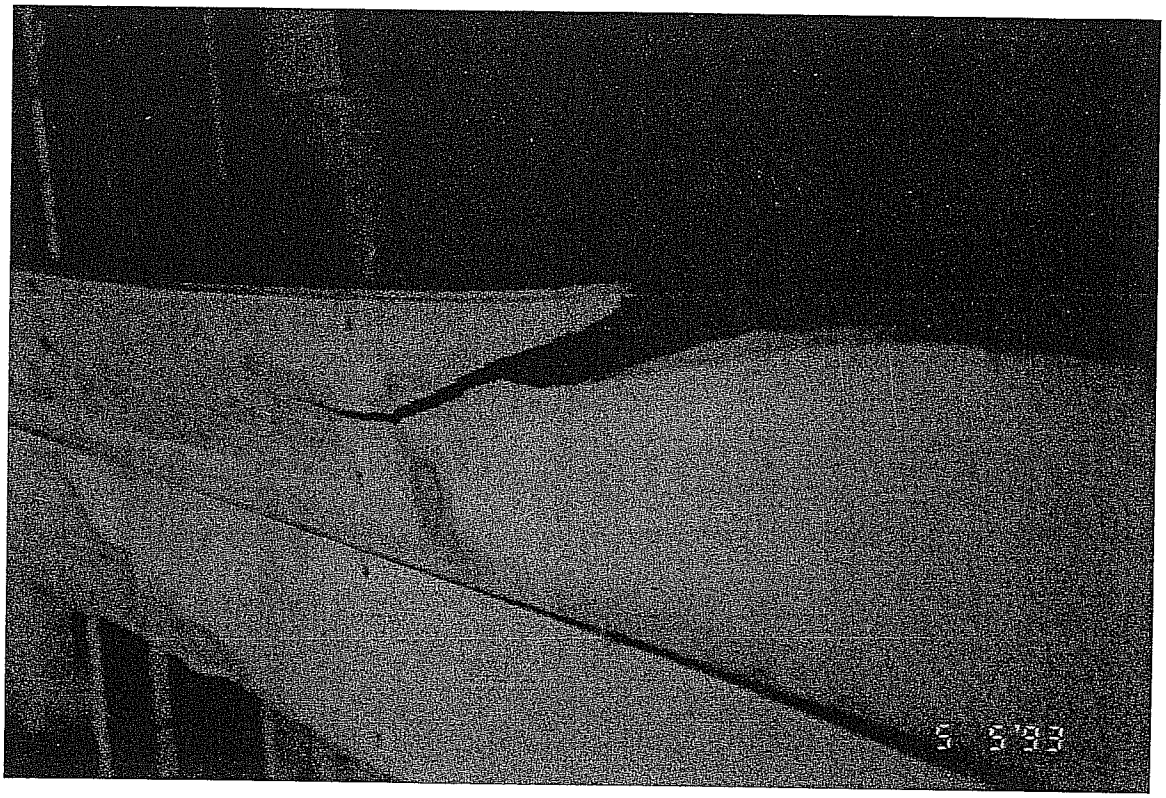


Photo No. 9 - Sheeting at knee brace - Note split in sheeting

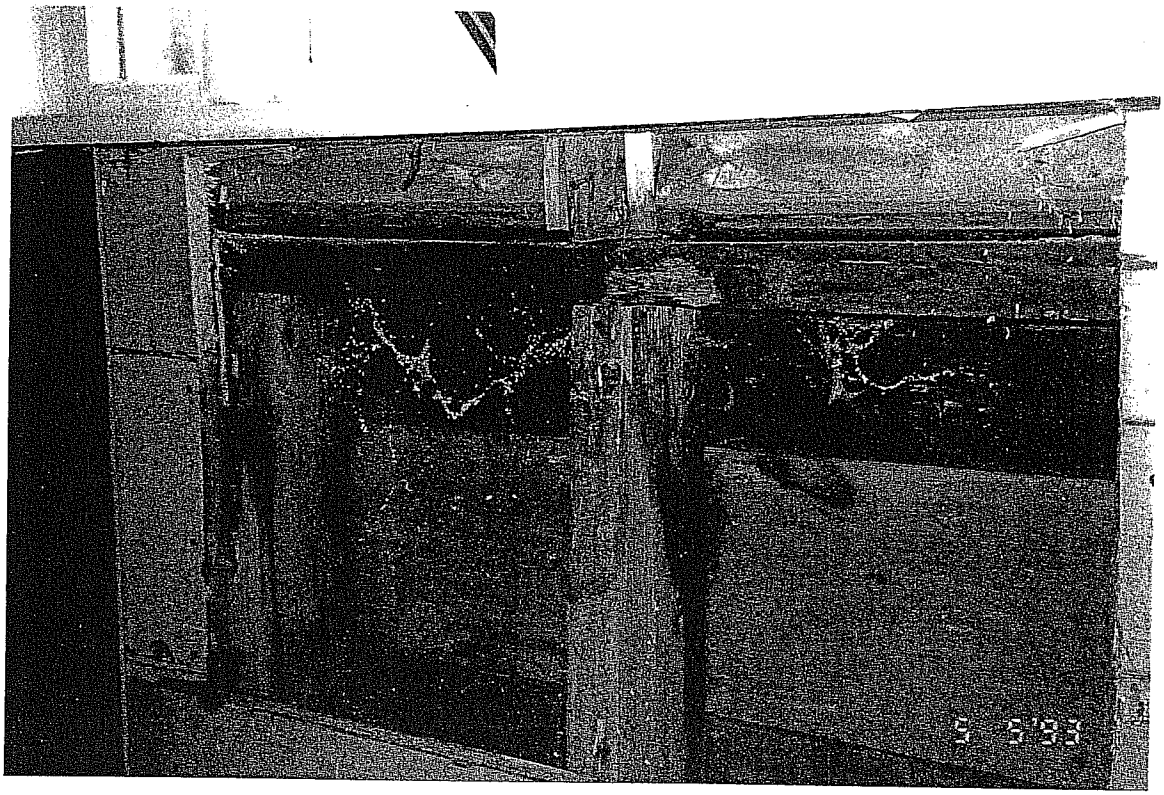


Photo No. 10 - Framing below windows, south side

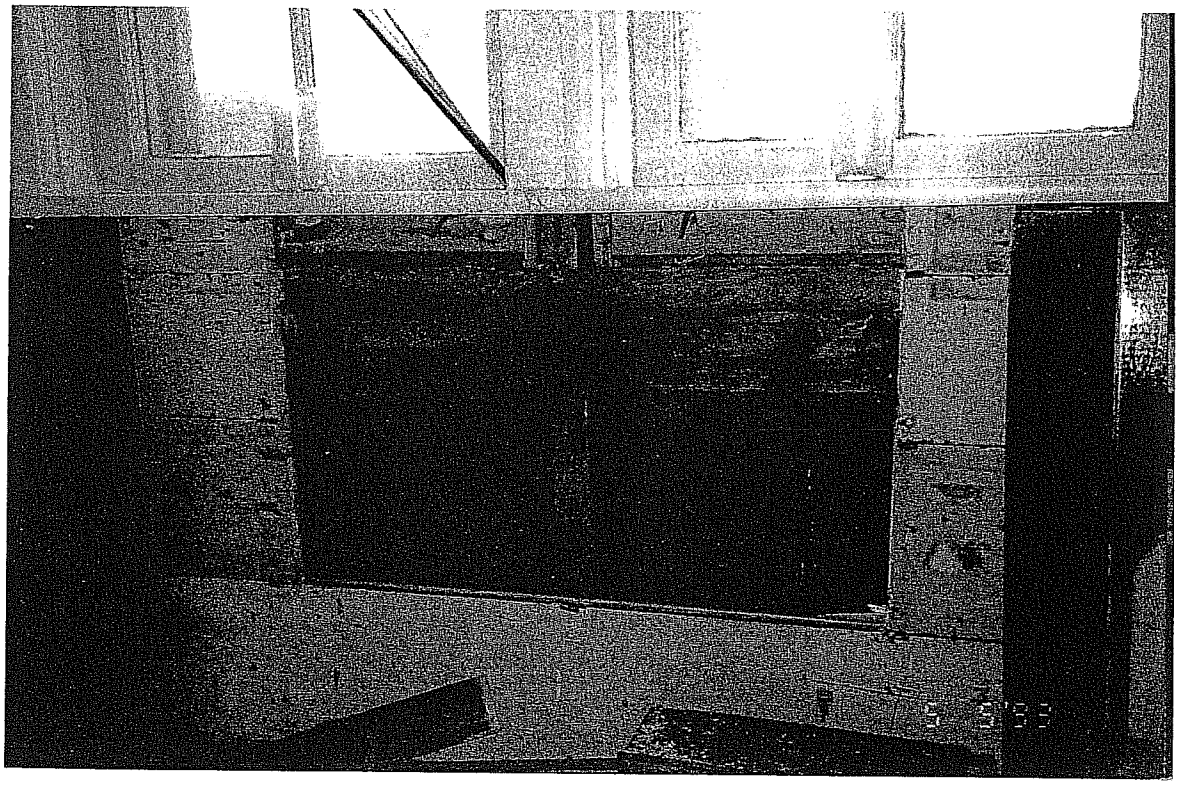


Photo No. 11 - Framing below window, south side

Photo No. 12

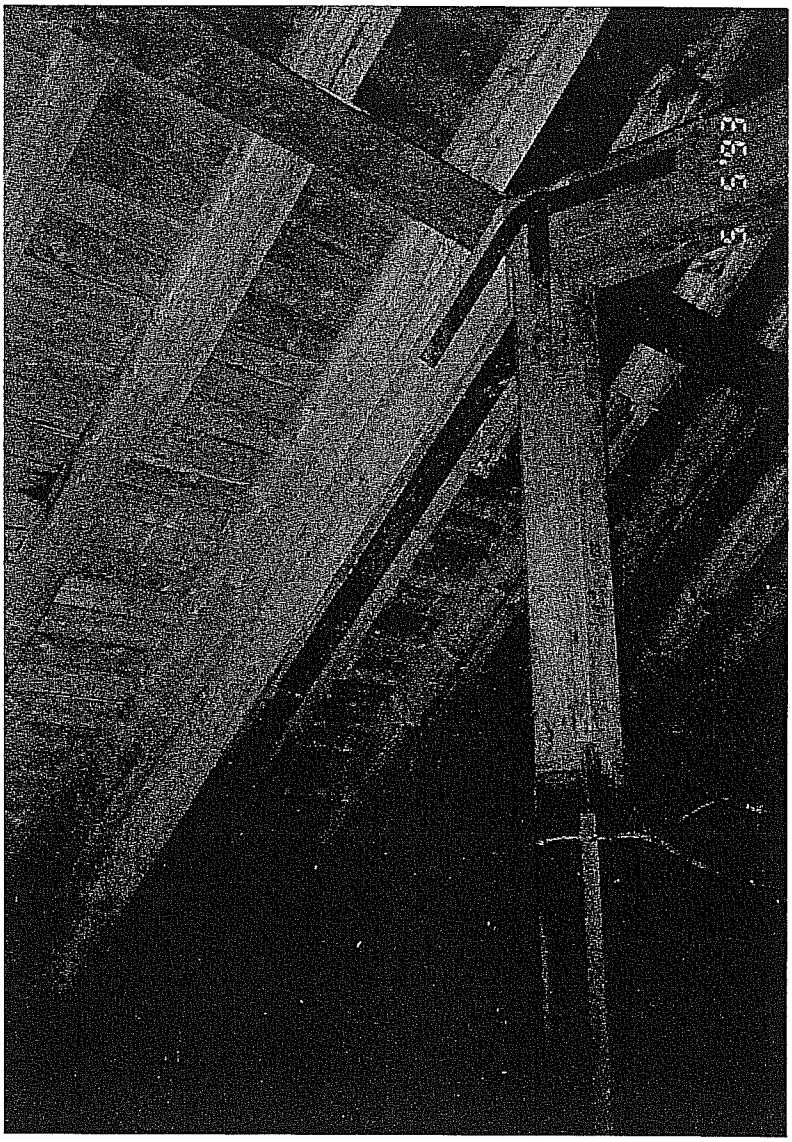


Photo No. 13

Photo No. 14 - Exterior view of east wall

Photo No. 15 - Exterior view of west & south walls