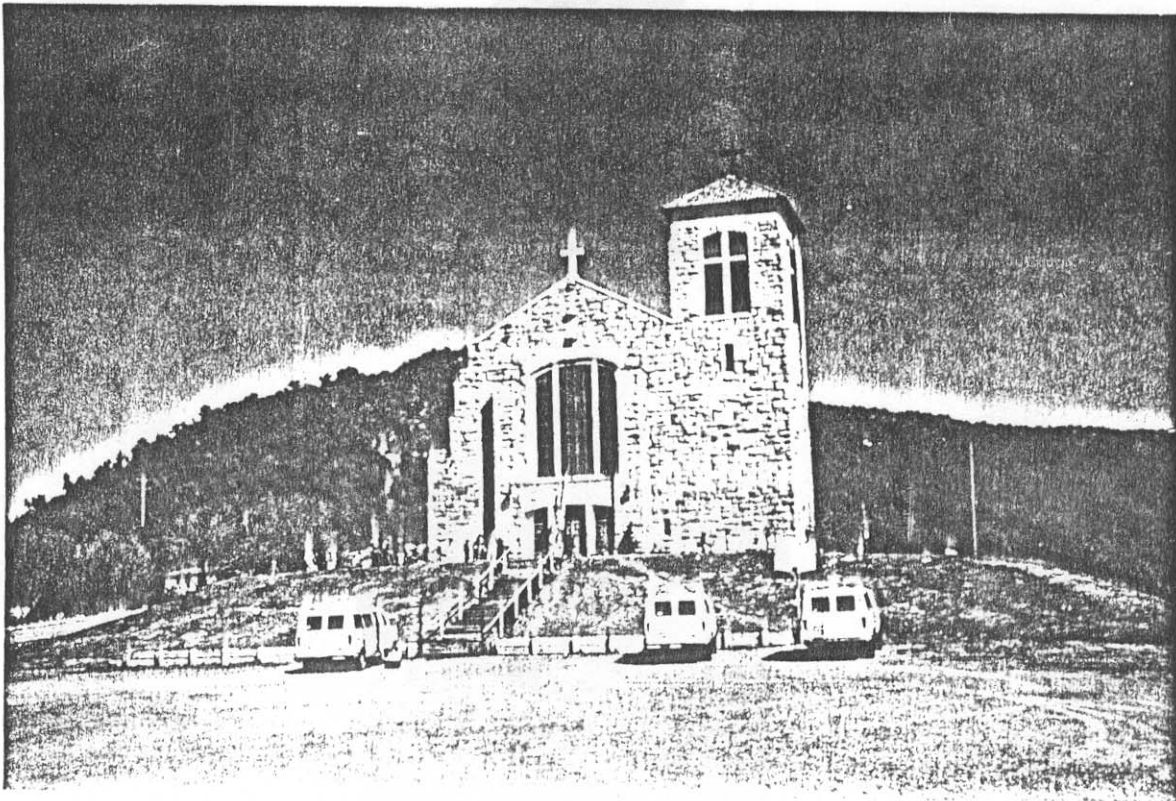


New Mexico State University
American Society of Civil Engineers

St. Joseph's Church Inspection
Mescalero, NM

Submitted to: Las Cruces Catholic Diocese
Submitted by: NMSU ASCE Student Chapter



Inspection performed: February 26, 1994
Report Submitted: March 19, 1994

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Authors

Deborah L. Apodaca
Russell Kehl
Jason Needham

Supervising Professor

Dr. Ronald B. McPherson

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HISTORICAL BACKGROUND

The idea to build St. Joseph's Catholic Church in Mescalero, NM came from the dreams of one man, Father Albert Braun. Father Albert served as a missionary to the Apache Indians beginning in 1916. After serving in World War I, Father Albert received permission to start planning the new church. He traveled to Philadelphia to see William Stanton, an architect, about designing the church. Mr. Stanton wanted to design the church as a gift to the mission. After returning from Philadelphia with the plans for the cross-shaped church, Father Albert selected the site for the new church. It was to be built on its own special knoll in the center of the valley. The construction of the church was ready to begin.

The first stones were laid in May of 1920, and in November, the cornerstone of the church was put into place. The quarrying, stonecutting and stone laying was directed by Antonio Maria Leyva, who offered his skills to Father Albert free of charge. One year after construction began, Father Albert was transferred and construction came to a halt. Six years later, in 1927, Father Albert returned and construction resumed.

The stones used in the church weighed 140 pounds per cubic foot. They were quarried, dressed, loaded onto a truck, hauled to the church and unloaded by hand with the help of Father Albert's parishioners. In 1939, the church was completed except for the windows. The tile for the floor and the roof had been brought in from a pottery plant in La Luz Canyon. On July 4, 1939, the dedication of the church took place and Father Albert's dream came true.

For more than one-half century the church has provided a religious sanctuary to the Mescalero Community. This elegant and stately structure is a true landmark. However, weathering and aging has taken its toll on the structure and some remedial work is needed to restore the church to prevent additional damage.

STUDENT VISIT

On February 26, 1994 a group of NMSU civil engineering students and two structural engineering faculty members visited the Mescalero Catholic Church to perform a visual inspection and preliminary survey of the church. Due to the age of the church, the Las Cruces Catholic Diocese would like to bring about needed renovations. Our role was simply to provide basic information to the Diocese of Las Cruces to be used for planning purposes. Although this information could be used by a professional engineering firm for developing contract documents, it is not adequate for direct use by a building contractor to rehabilitate the church. The 23 students were divided into five teams. The following list identifies the various team members and summarizes their responsibilities:

1. Outside Survey Team

Responsibilities - Lay out reference baseline around building from which plan and elevation features can be obtained.

Team Members - Carla Gomez, Craig Hagelgantz, Mike Kozeliski, Barry Lytle, Angela Montoya, and Leroy Smith.

2. Inside Survey Team

Responsibilities - Establish floor level by recording elevation readings at regular intervals.

Team Members - Kevin W. Eades, Alex Higgs, Scott Kinnear, Michael Malenfant, and Amber Stoll

3. Floor Plan Dimension Team

Responsibilities - Take measurements to develop floor plan of building interior; locate walls, columns, and other permanent features.

Team Members - Deborah L. Apodaca, Noel Baca, Dan Flack, Jason Needham, and Rachel Walsh

4. Roof System Evaluation Team

Responsibilities - Determine roof structural type; obtain physical dimensions and condition of roof members.

Team Members - Wade Bonson, Vincent Carrica, Ryan Milakovich, and Molly Young.

5. Photography Team

Responsibilities - Take photos of structure including closeups of distressed areas; document photos at the site; take measurements and make sketches of distressed areas to clarify photos.

Team Members - Steve Carroll, Aude Lescombs, Marcea Melfi

Dr. Ronald B. McPherson and Dr. John Minor, structural engineering faculty members, accompanied the team.

The students left the NMSU campus around 8 AM on Saturday, February 26 in university vans and arrived about two hours later in Mescalero. They were welcomed by Brother ~~Robert~~ *Peter* and Mr. Manuel Leyva who served as guides during their visit. The students were treated to a nourishing noontime meal that was prepared by Mrs. Leyva and members of the church staff. We wish to thank Mr. Leyva, Brother ~~Robert~~ *Peter!* and the Catholic Diocese for allowing us to do the inspection.

RESULTS

Introduction

St. Joseph's church in Mescalero, NM is a stone building which sits on top of a small hill facing west. The building is approximately 130 feet long and 60 feet wide. The main room of the church has a high pitched roof which is supported by trusses that set on wall buttresses. The sides and rear of the church are covered by a low roof. A short, low roof extends from the church walls under the three windows along the north and south sides.

The altar is centered at the rear of the building along with the sacristy. The front of the church houses the confessional room on one side and a small chapel on the other side. The bell tower is located directly above the chapel.

Floor Plan Dimension Team

Team 3 collected data on the inside dimensions of the church. The dimensions of each room were measured and the size of all internal features were recorded. This data was used to create the following floor plan.

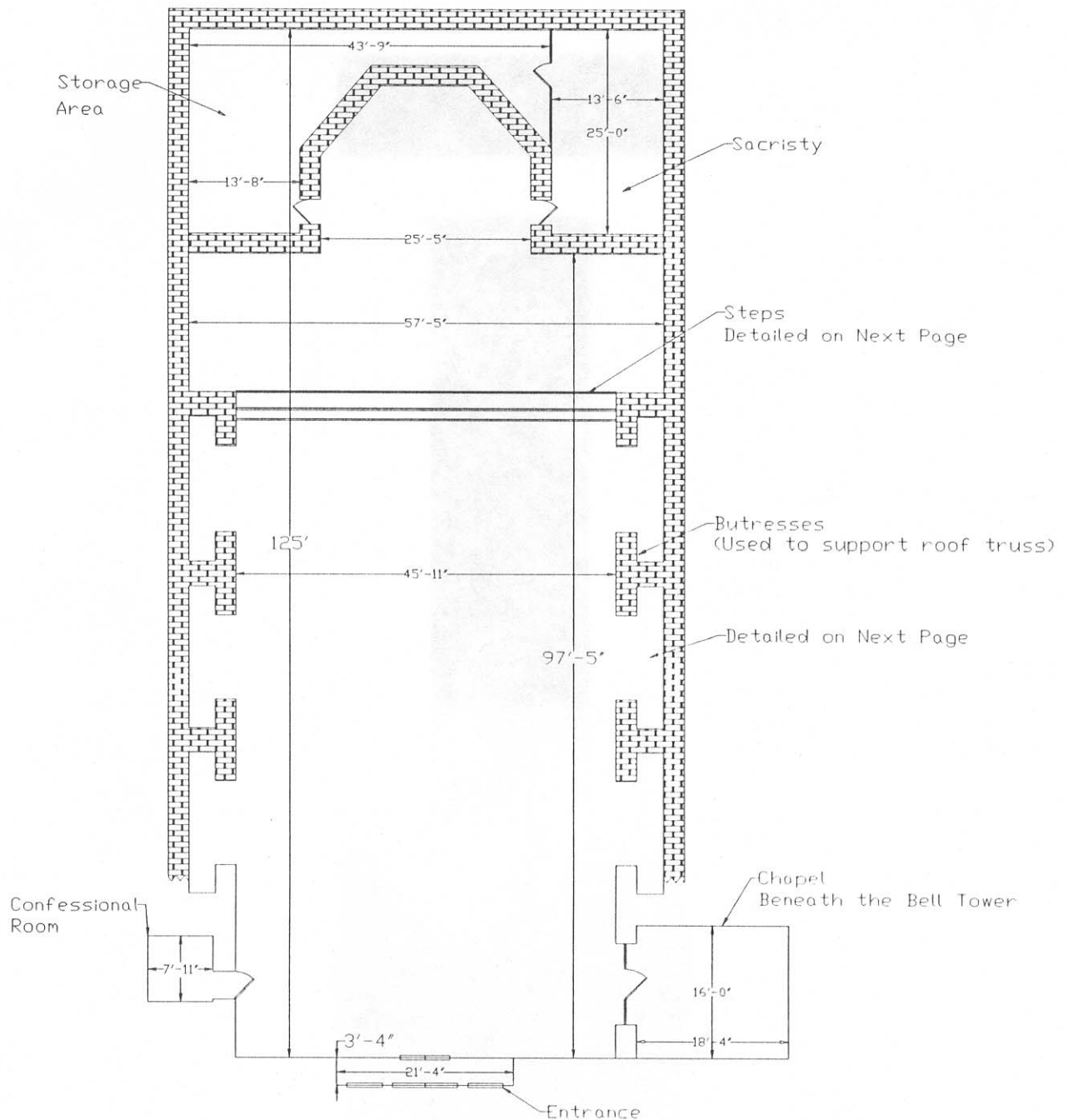


Figure 1: Floor plan

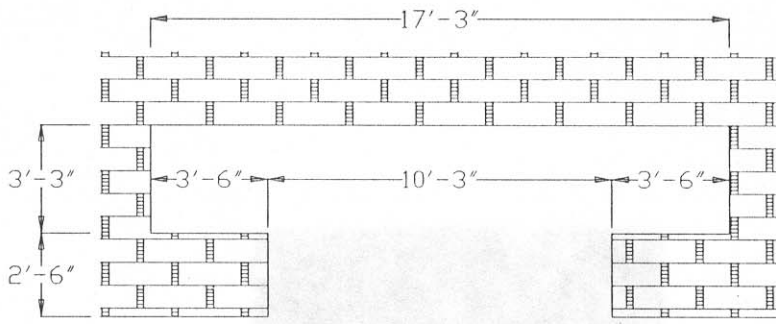


Figure 2: Sidewall recess detail

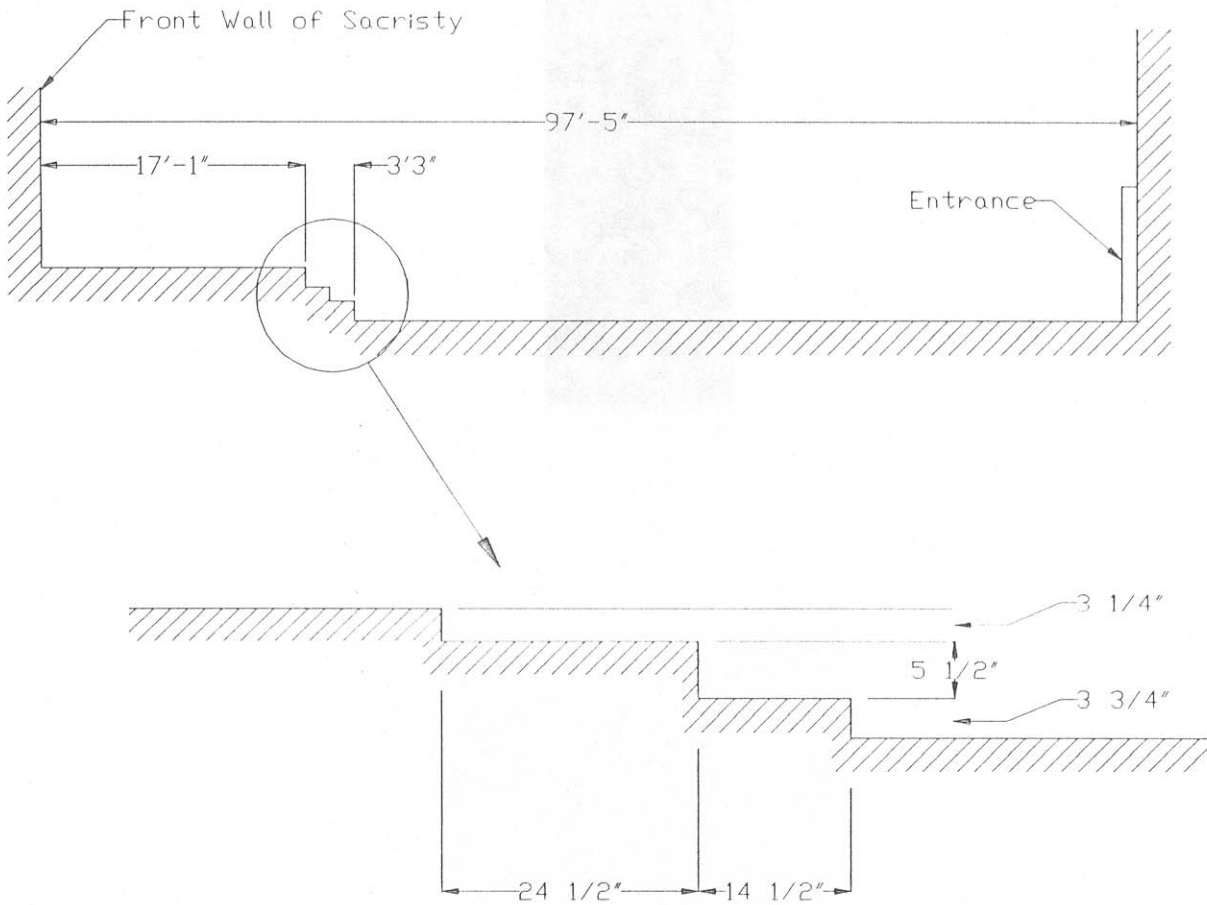


Figure 3: Step detail

Survey Teams

The data collected by teams 1 and 2 was used primarily to determine the extent of relative foundation settlement of the building.

Photographs 1 through 4 below show partial views of the south wall and the east end extension of the church. Elevation data for the eave of the low roof was collected by team 1 to determine the elevation differences along the eave line. There are three low roof sections along the south wall. At the east end, the low roof eave is continuous around the three unattached sides of the extension. The bottom surface of the eave rafter at the outside wall of the building was the reference elevation point. These rafters are visible in photo 4.

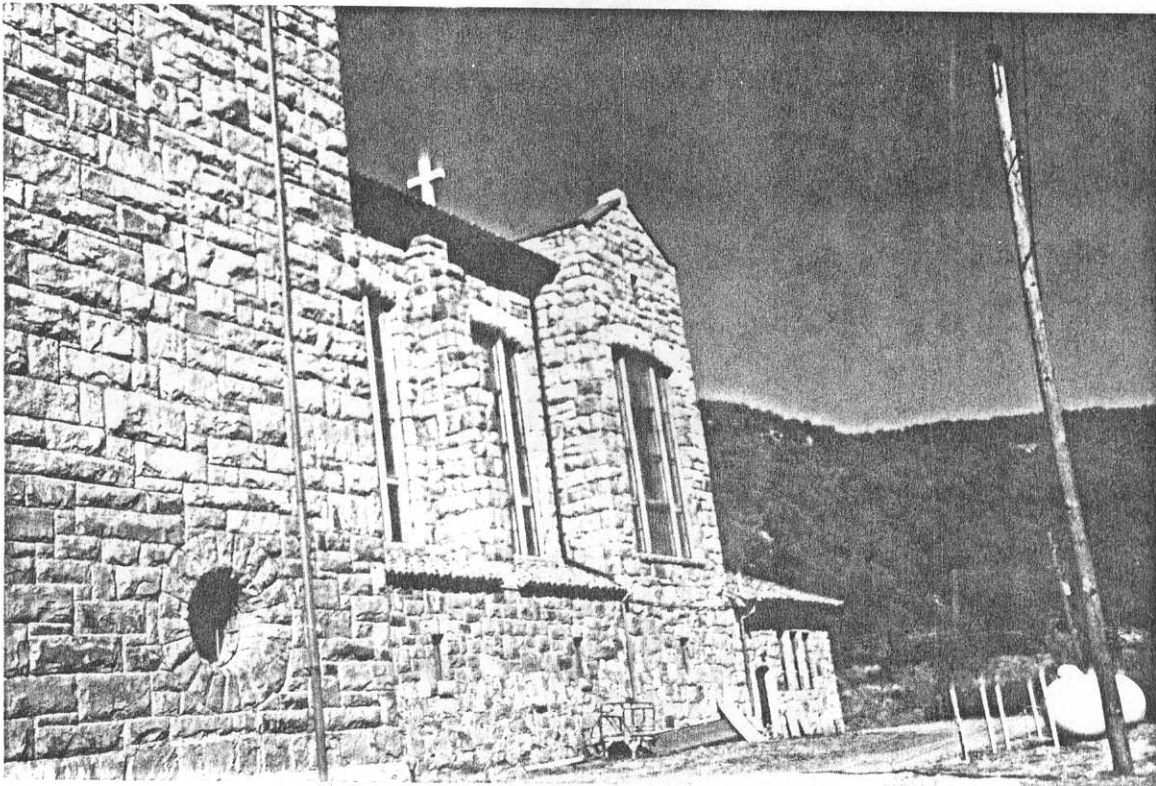


Figure 4: View of low roofs of south wall and south side of east end extension.

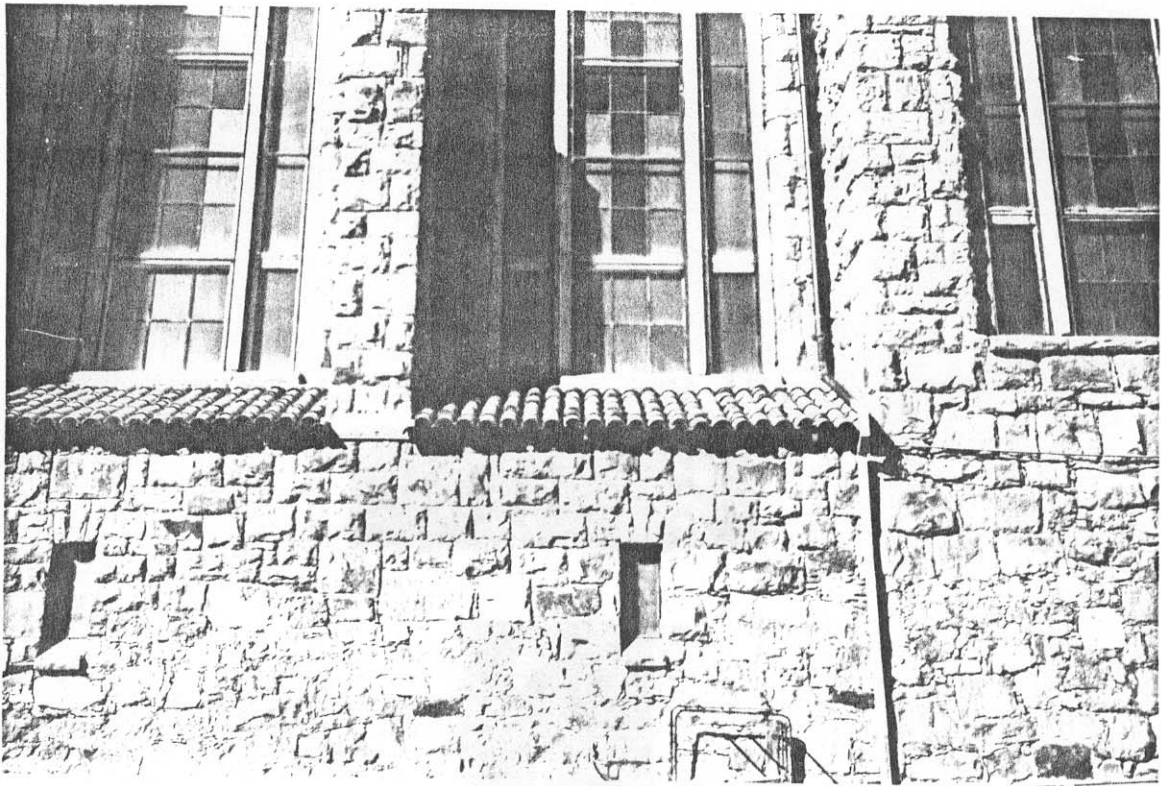


Figure 5: View of the center and east sections of the low roof along the south wall

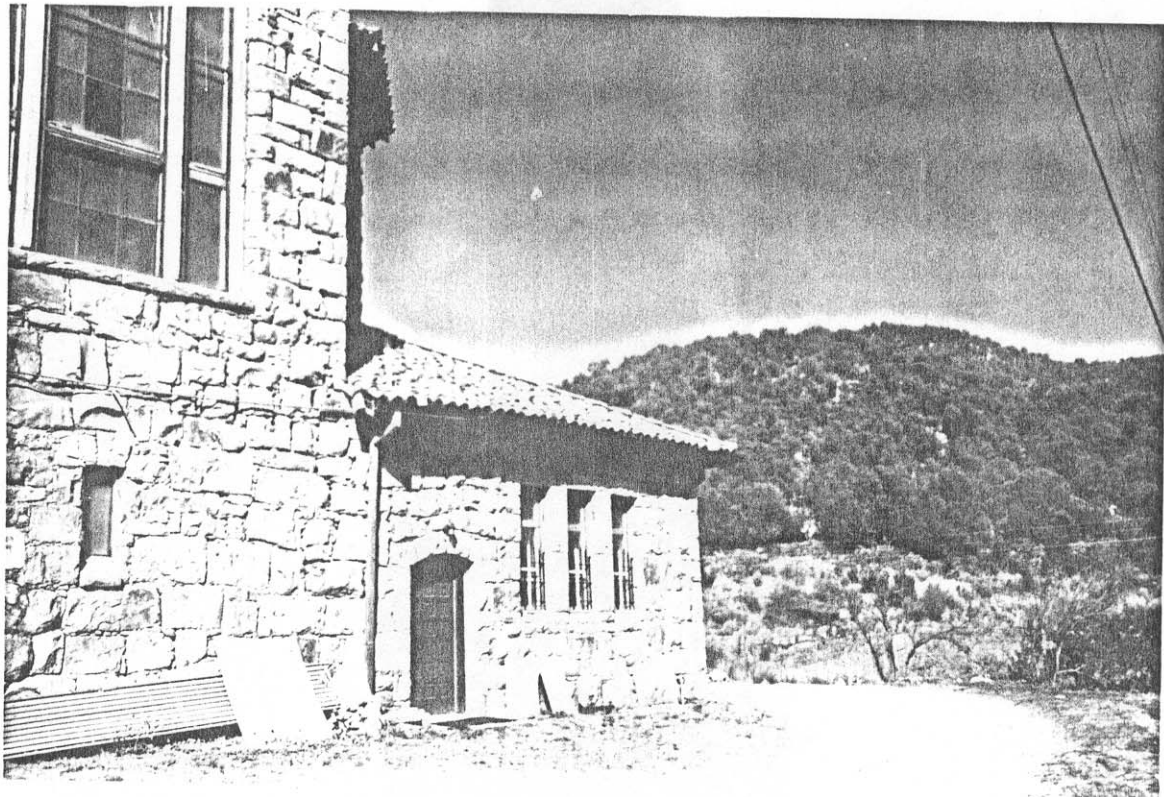


Figure 6: View of the east end extension from the south

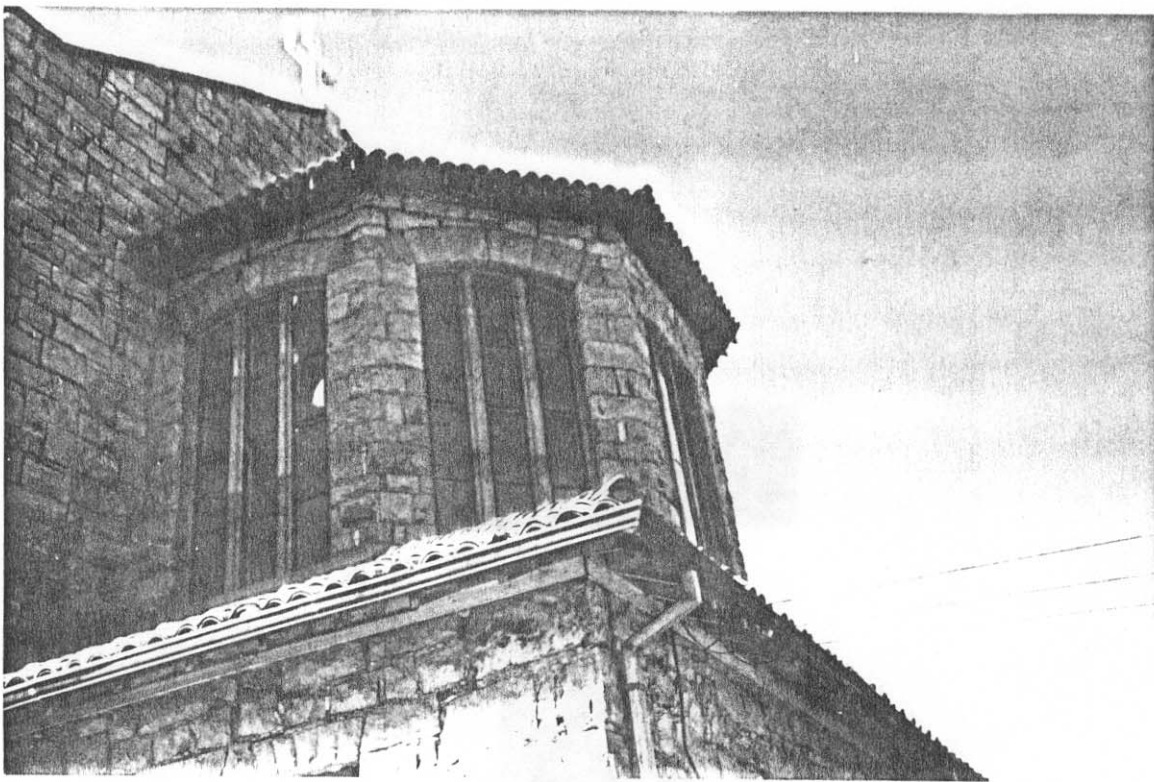


Figure 7: View of the southeast corner of the east end extension
 (Note the eave rafters from which rod readings were made)

The following sketch illustrates the manner in which the data was taken.

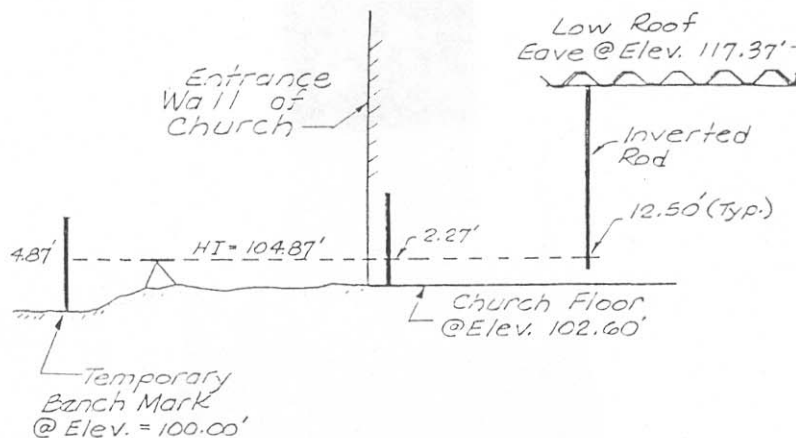


Figure 8: Typical level setup

An assumed elevation of 100.00 feet was assigned to a temporary benchmark to obtain a height of instrument(HI). The entrance floor of the church was determined to have an elevation of 102.60 feet. Readings were taken on an inverted rod set at the eave of the low roof at selected points around the south side and the east end extension of the building.

The computed eave height elevations are tabulated on the following chart.

Table 1: Outside Eave Height Elevations

Location	SOUTH WALL			EAST END ADDITION		
	West	Center	East	South	East	North
Elevation [feet]	117.02	117.13	117.18	117.24	117.61	117.53
	117.14	117.16	117.20	117.57	117.62	117.59
	117.18	117.22	117.08	117.57	117.61	117.60
Average	117.11	117.17	117.15	117.46	117.62	117.57

The low roof eaves of the three segments along the south side of the primary structure have an average elevation of 117.14 feet with only minor variations. This suggests that the building foundation has not undergone any significant relative settlement. The average roof eave elevation of the east end extension is 117.55 feet. Although this is about 5 inches higher than the roof eave of the main building wall, the elevations do not vary significantly between locations along the east end extension. This would also tend to rule out any serious foundation problems.

Team two did an inside level survey of the church. The goal of this survey was to see if any settling has occurred in the church. An assumed elevation of 100.00 feet was assigned to a temporary benchmark at the front of the church. The temporary benchmarks used in the inside and outside surveys are different. Thirty nine points were taken and the elevations were calculated for each point. The figure below illustrates where each point is located in the church.

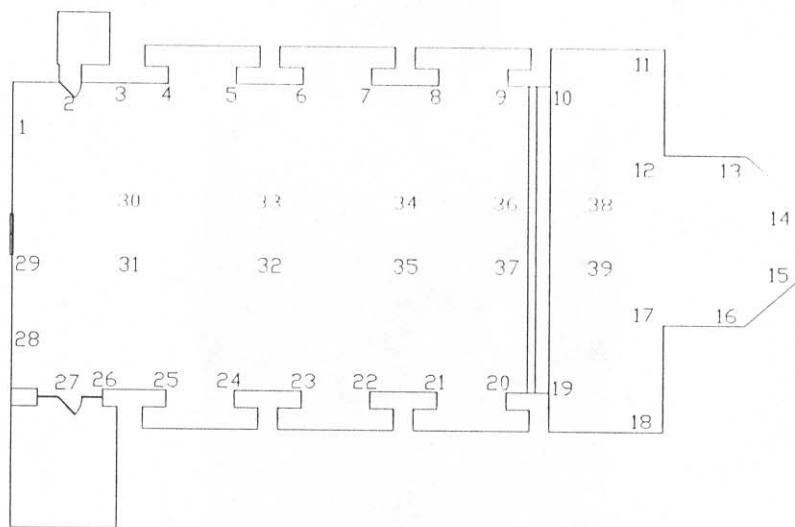


Figure 9: Inside survey data points

The following table lists the elevation at each point.

Table 2: Inside Elevations

POINT	ELEVATION (ft)	POINT	ELEVATION (ft)
1	100.05	21	100.04
2	100.09	22	100.06
3	100.08	23	100.06
4	100.07	24	100.05
5	100.08	25	100.06
6	100.07	26	100.03
7	100.06	27	100.02
8	100.06	28	100.05
9	100.06	29	99.98
10	101.22	30	100.01
11	101.13	31	100.05
12	101.18	32	100.05
13	101.11	33	100.03
14	101.08	34	100.01
15	101.11	35	100.12
16	101.05	36	100.07
17	101.08	37	100.05
18	101.00	38	101.15
19	101.11	39	101.10
20	100.05		

Because the elevations are so close, it can be concluded that no settling has occurred in the church.

Roof System Evaluation Team

Several observations were made concerning the roof system. Both the interior roof support system and the exterior roof were evaluated.

The interior roof support system, as observed from the floor of the church, appears to be in good condition. The system consists of timber trusses which span the width of the church and are supported by stone buttresses. Timber beams, which run parallel to the church side walls, connect the trusses. The following photo illustrates the interior roof support system.



Figure 10: Interior roof support system

The exterior roof is supported by timber decking which rests on the interior truss support system. The roofing tiles are fragile and many of them are broken; consequently, leakage occurs during rainfall. Photo set two (in appendix) includes several pictures of the roofing tiles.

The major problem that was observed concerning the exterior roof was the lack of a sufficient roof drainage system. During precipitation, some water fails to drain off of the roof. This is especially damaging under freezing conditions because of the expansion that takes place when water freezes. The water that does drain from the roof is not sufficiently carried away from the building. As a result of this, leaching of the exterior walls has occurred as shown in the photo below.

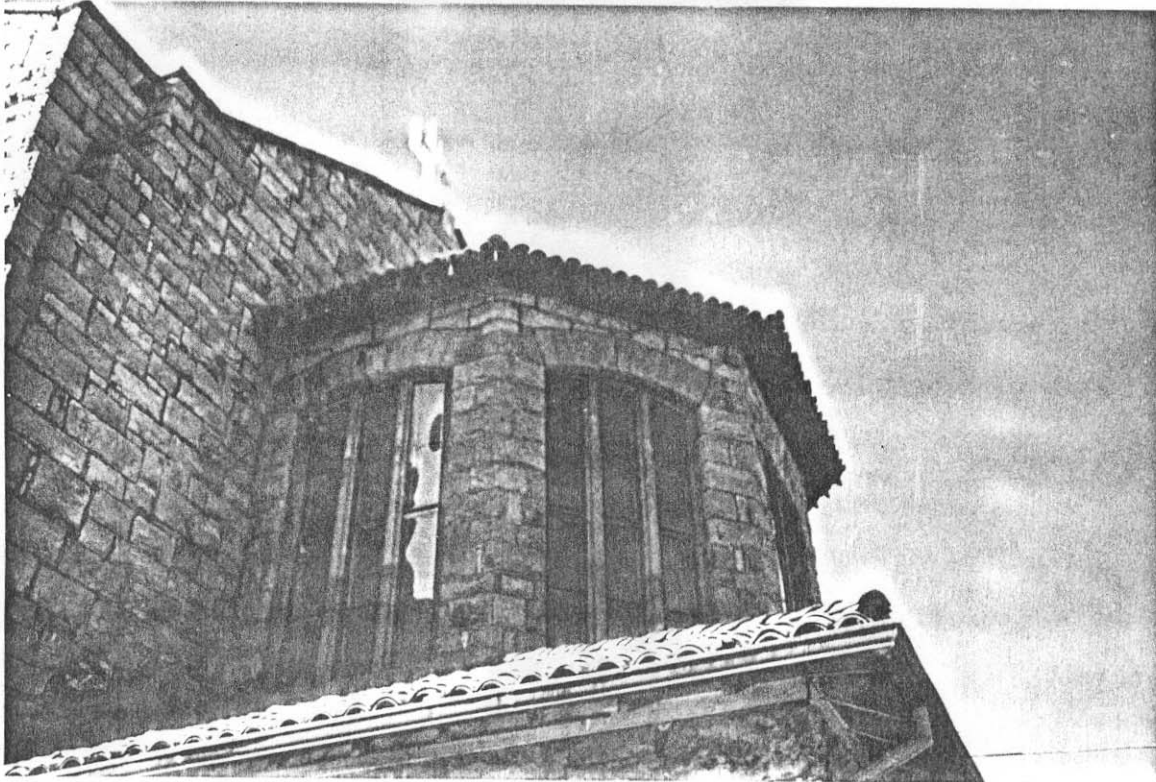


Figure 11: Leaching of the exterior walls

The addition of a gutter system to provide positive drainage away from the structure would decrease the water damage on the building. Refer to photo set six for other photos that display the roof drainage problem.

SUMMARY

Our inspection team found several areas that are in need of repair. We suggest the following:

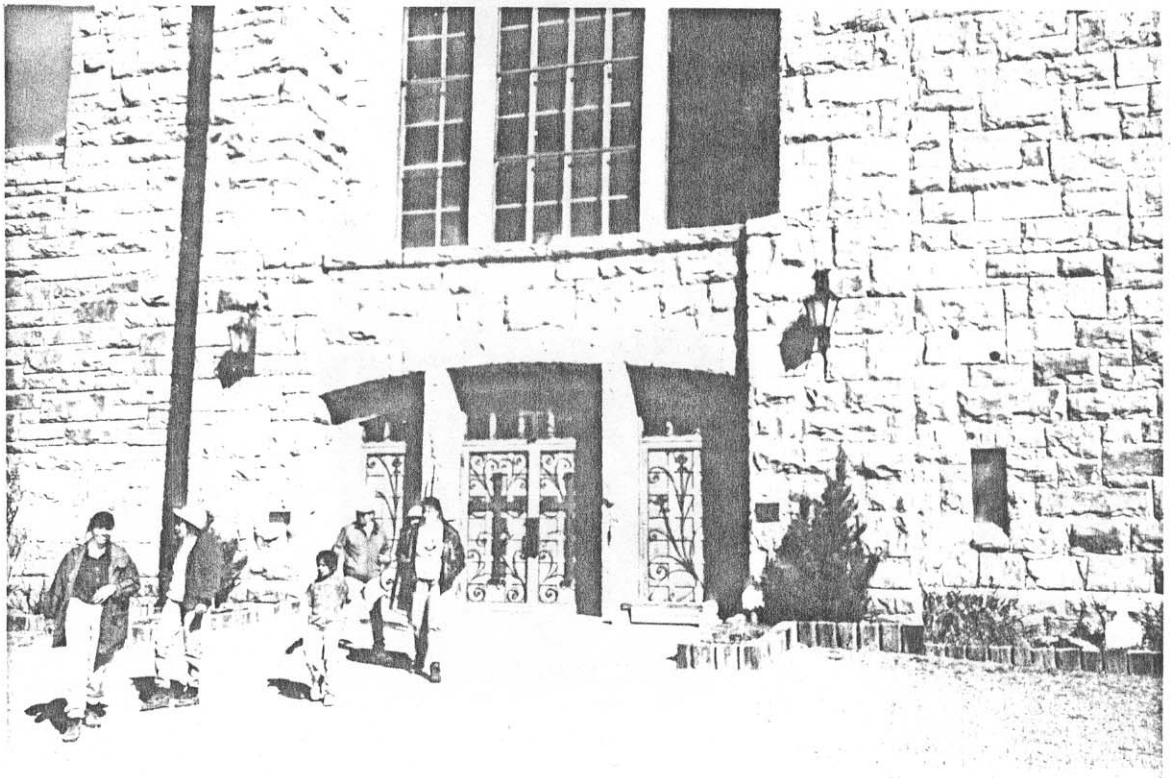
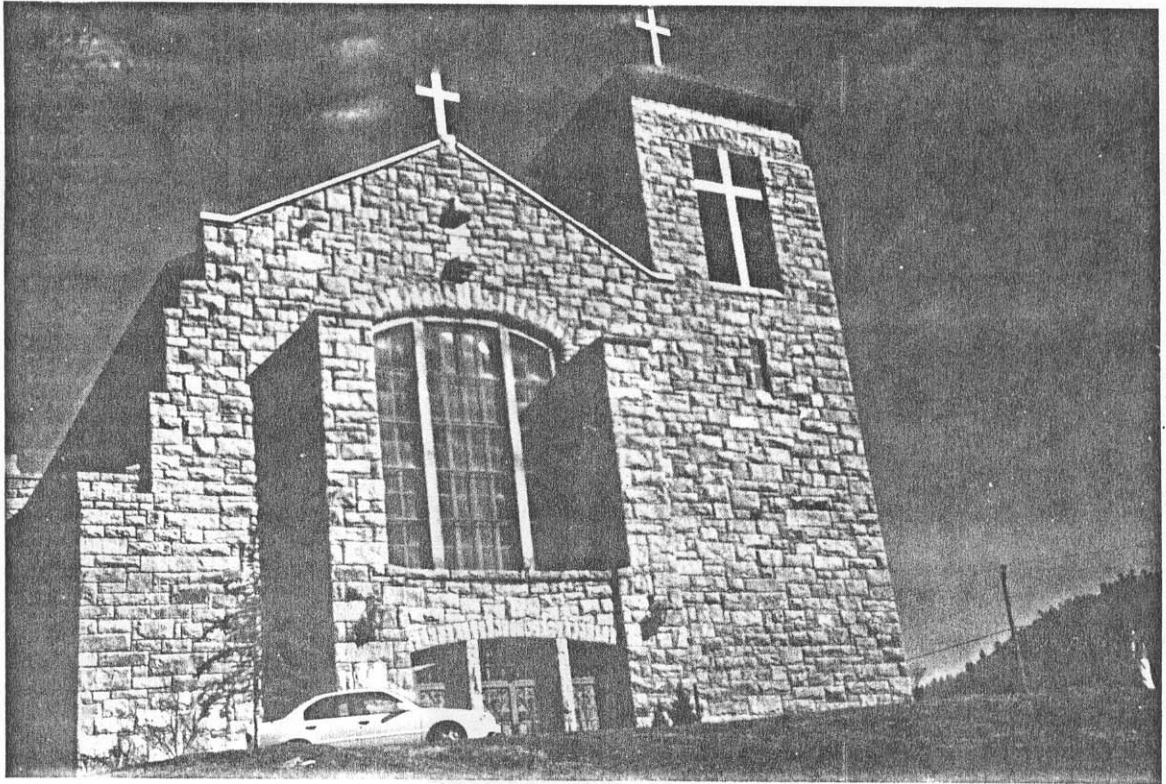
1. Some of the roofing tiles are broken and need to be replaced. This will eliminate the leaking that occurs when it rains.
2. The roof gutter drainage system needs to direct rainwater runoff away from the building to prevent water from migrating into and through the stone walls.
3. The mortar used to hold the stone walls together has deteriorated in several places. These areas need to be patched so that the walls don't start crumbling.
4. The stones used in the church walls need to be sealed. This will slow down the erosion damage due to weathering.

The foundation of the building appears to be in good condition with only minimal settling of the foundation. The roof truss system also appears in good condition despite its age. This summarizes the findings of our inspection team. The purpose of our inspection was to provide our opinion of the church's condition. Additional study by a professional engineer or licensed contractor is needed to determine exactly what renovations are necessary.

We wish to extend our thanks to Brother ^{Peter} Robert for his help on the day of the inspection. We would also like to thank Manuel Leyva and the Catholic Diocese for allowing us to do the inspection.

APPENDICES

Photo Set 1 - Front Views of the Church



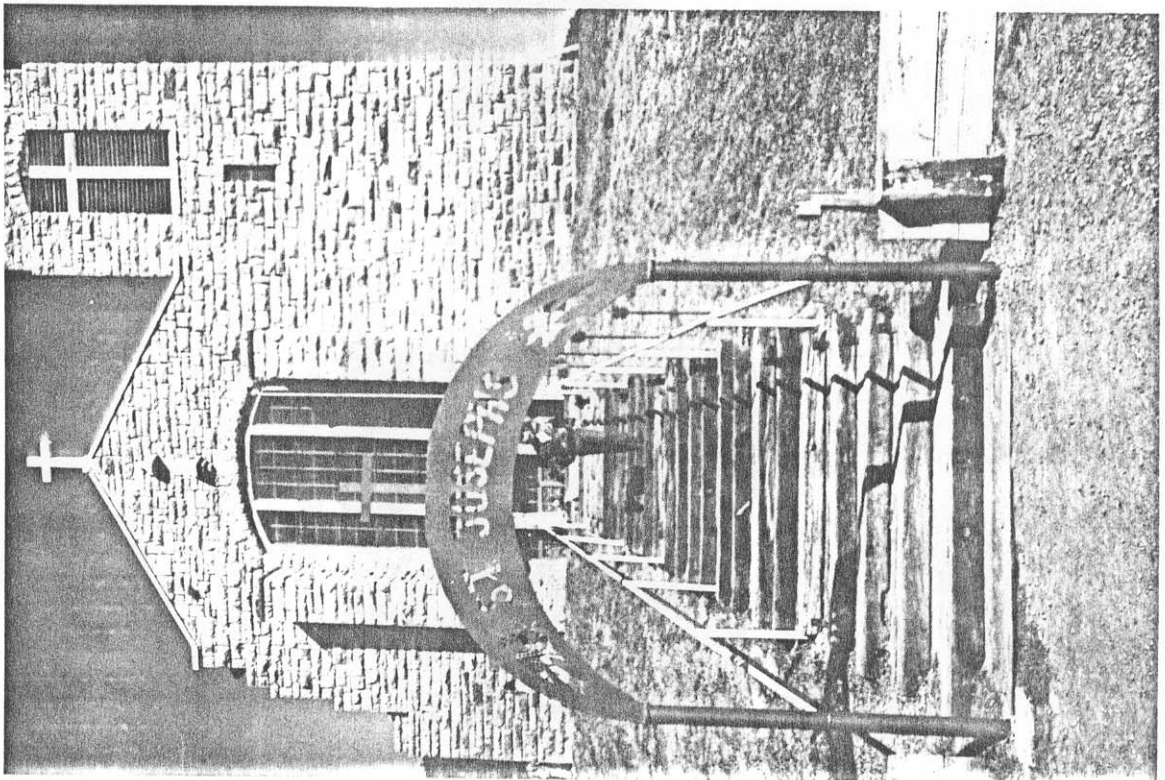
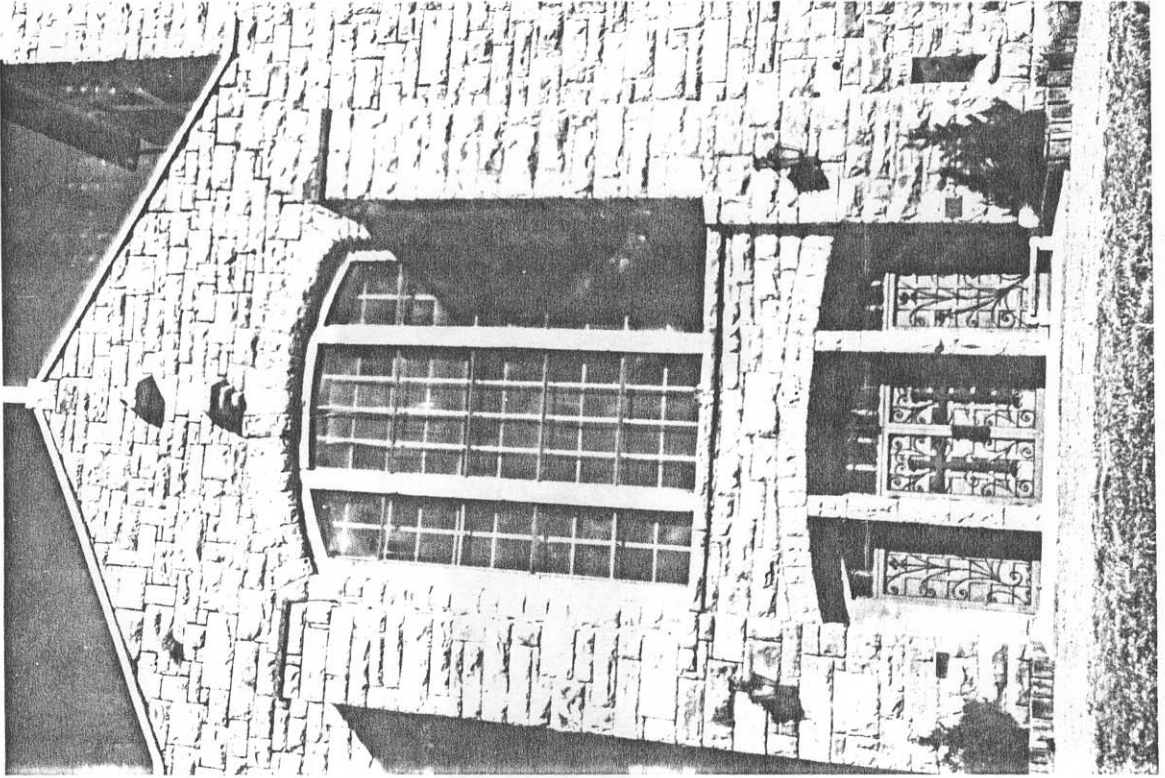


Photo Set 2 - Exterior Roof

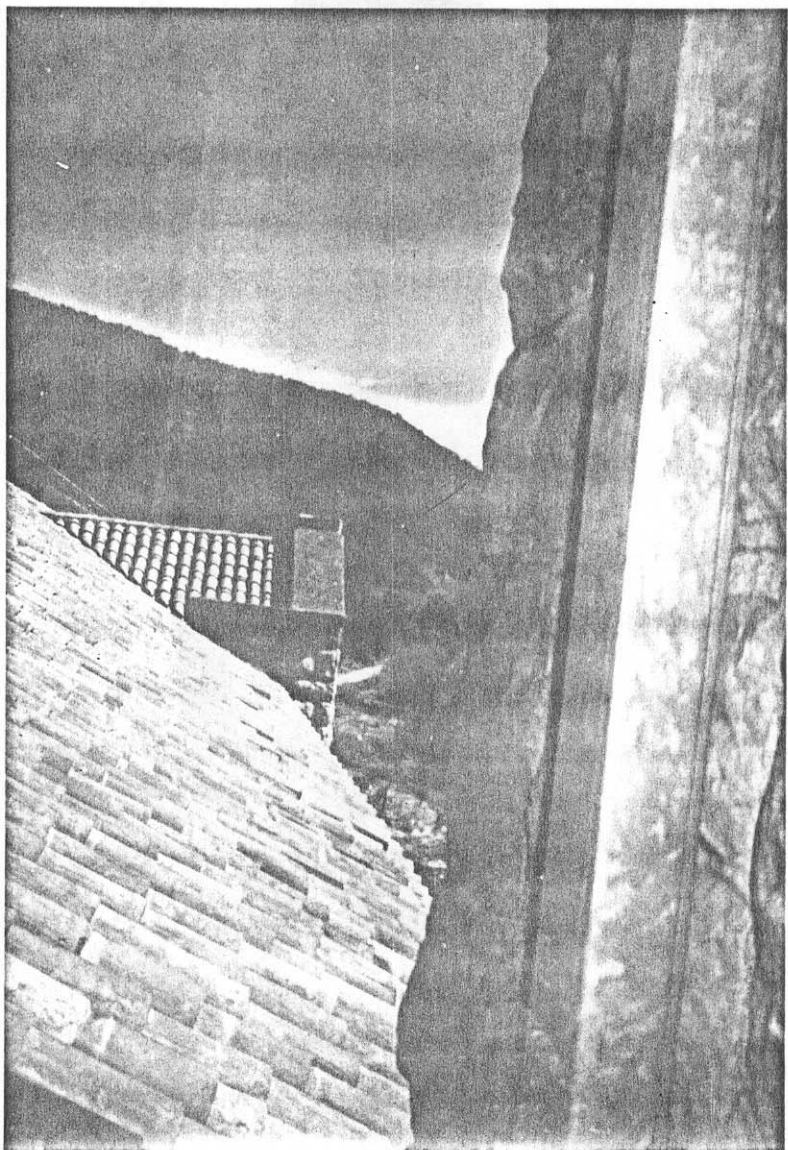
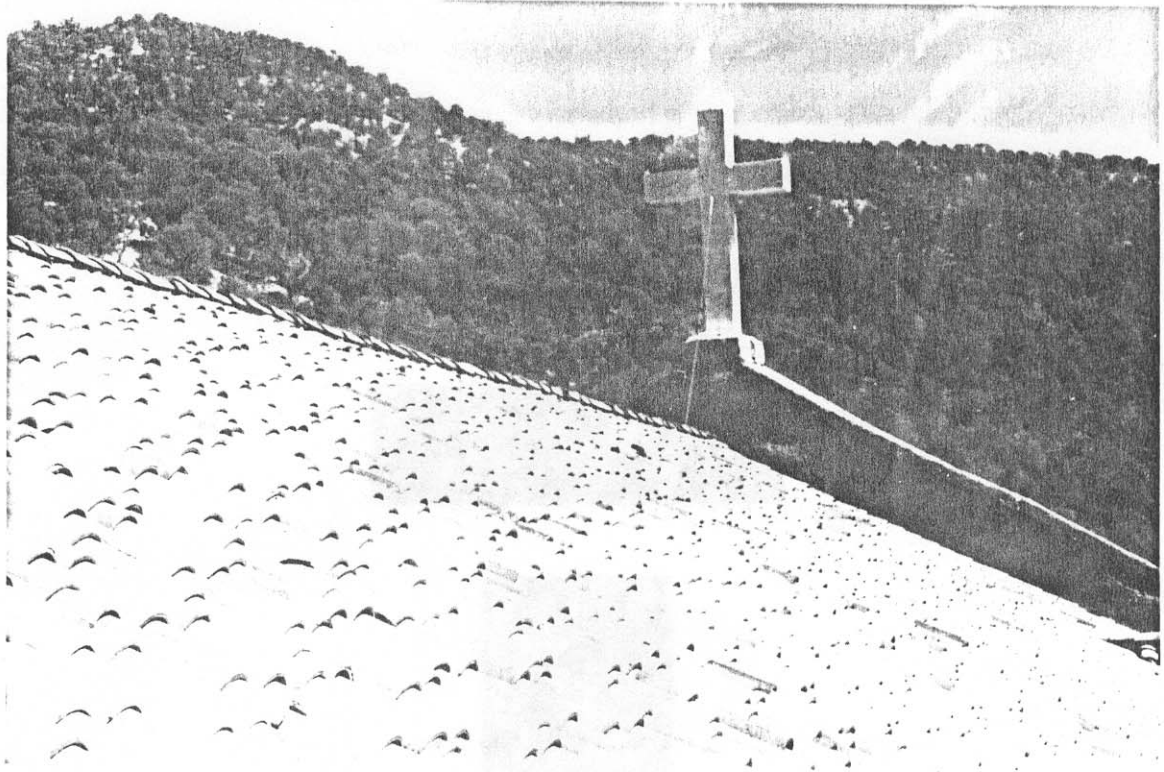
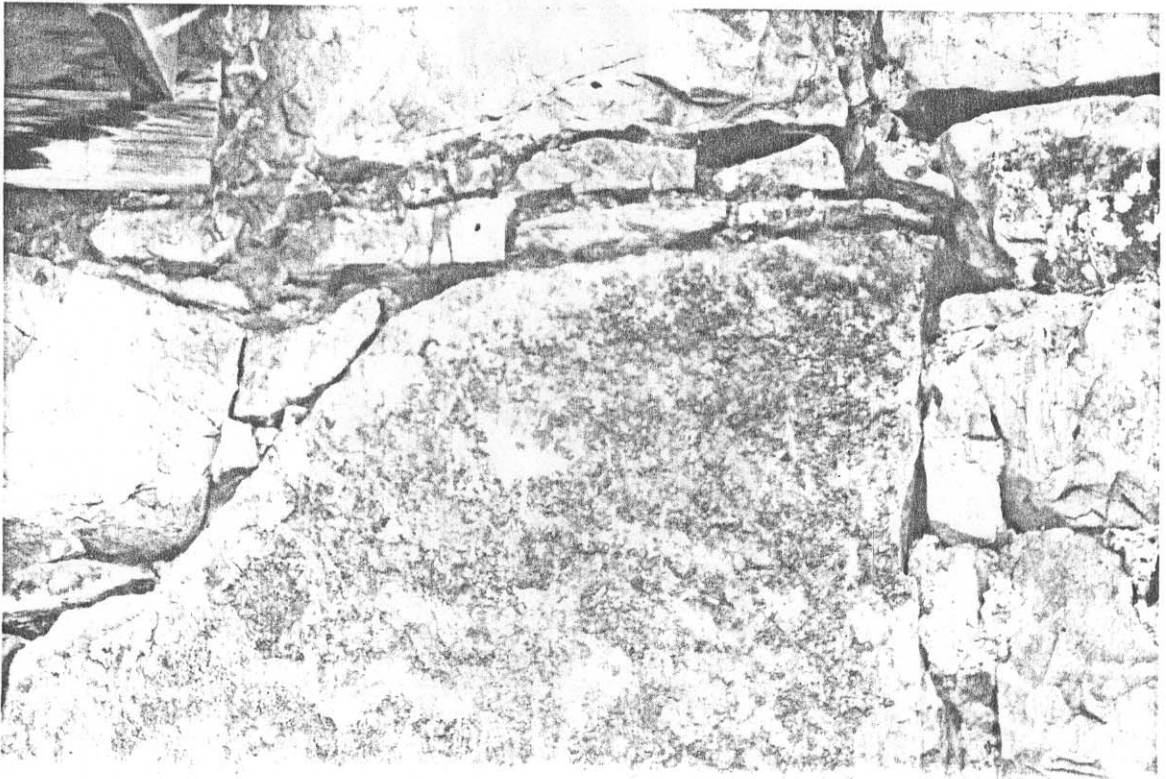
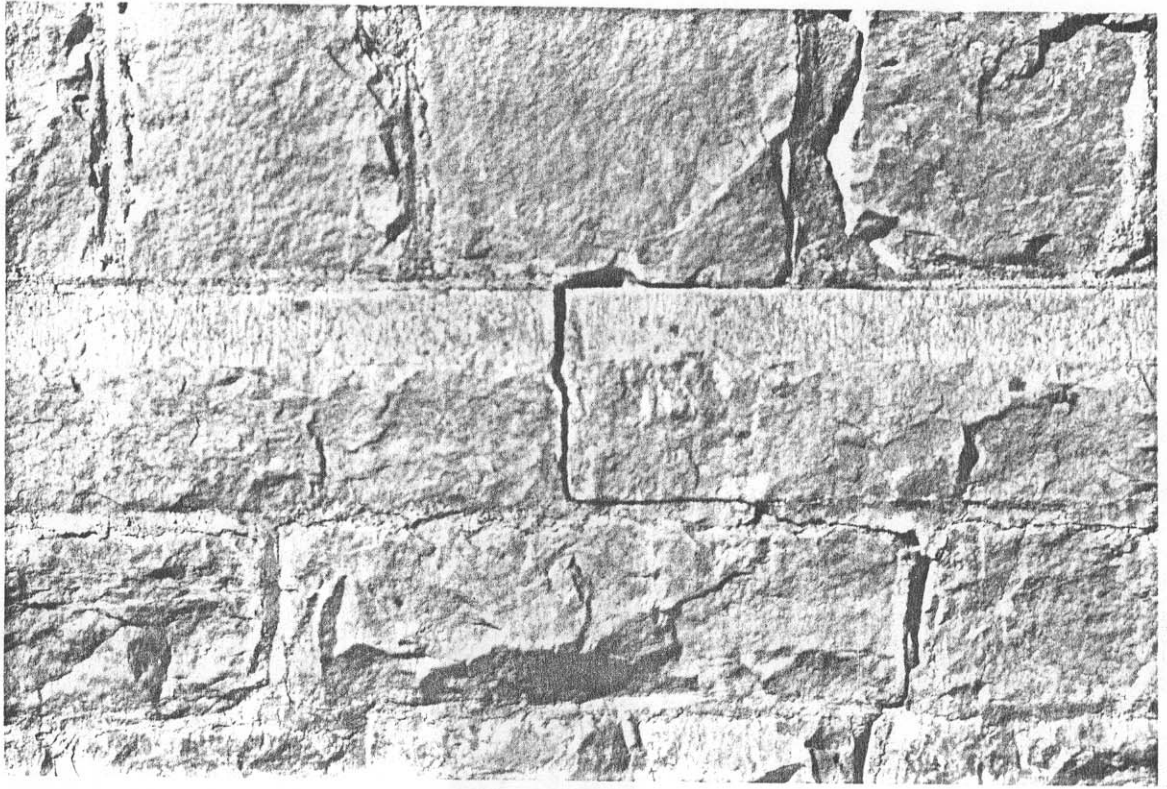


Photo Set 3 - Stone Walls and Mortar



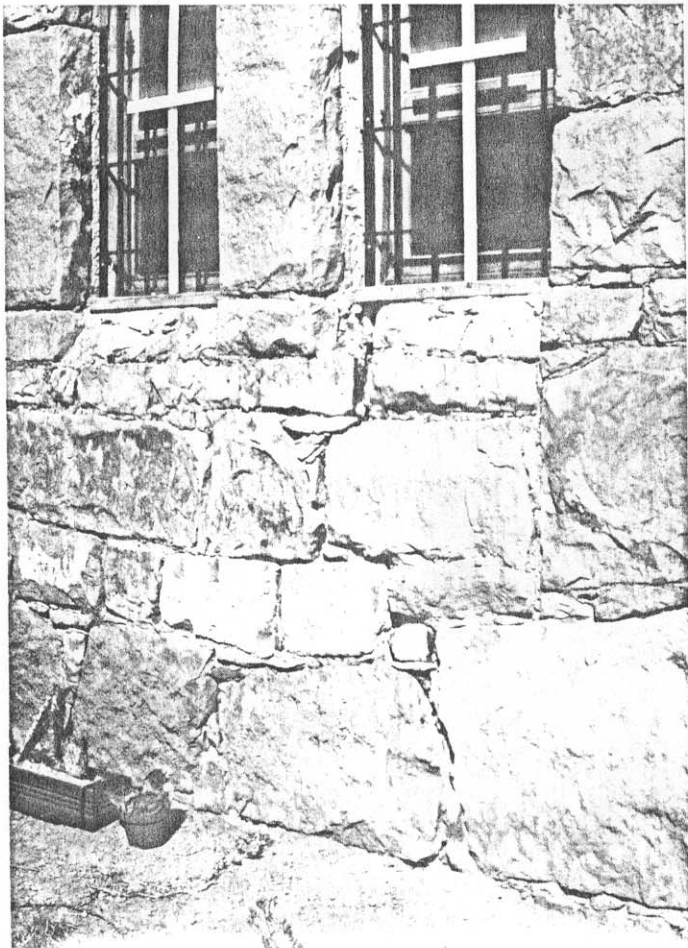
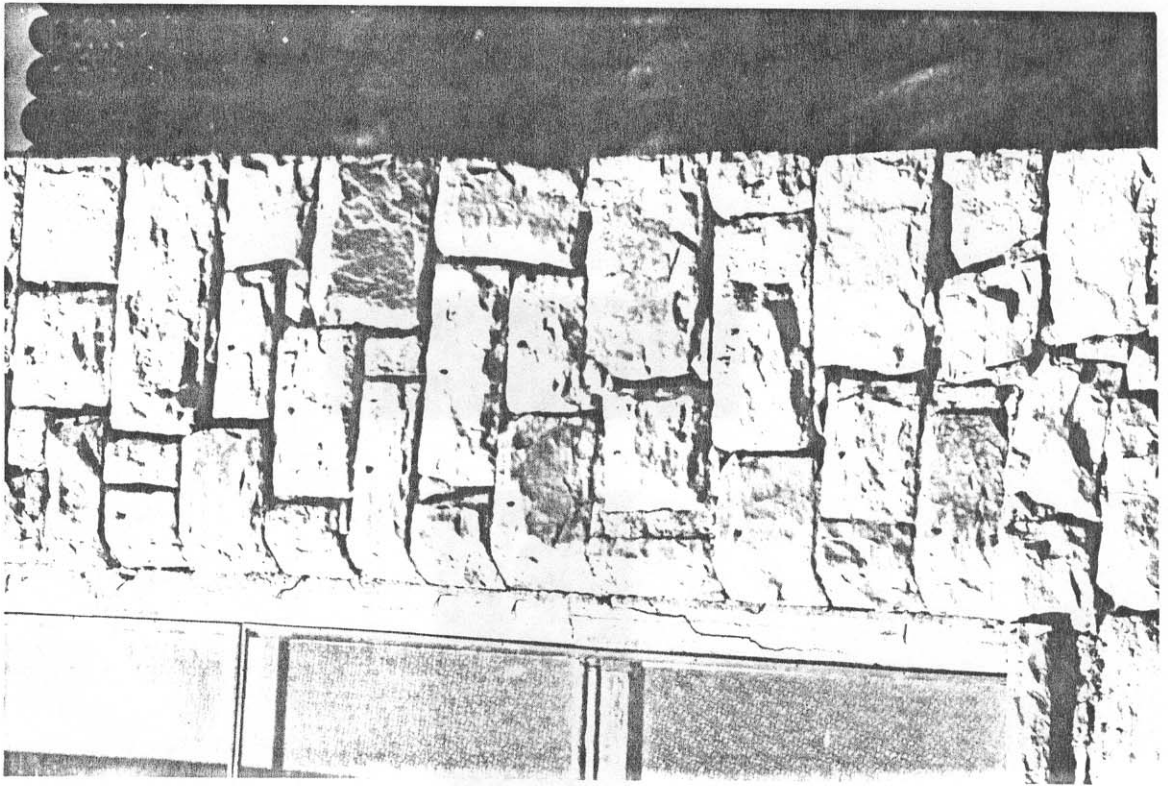
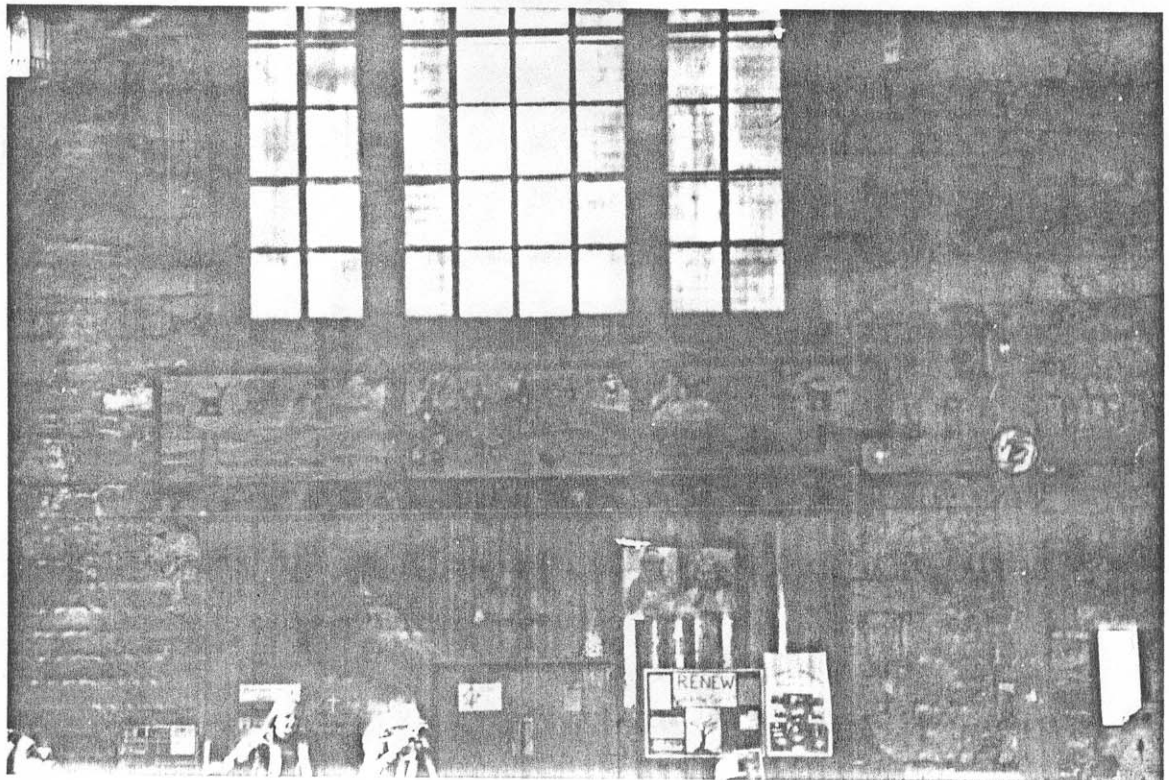


Photo Set 4 - Interior of Church



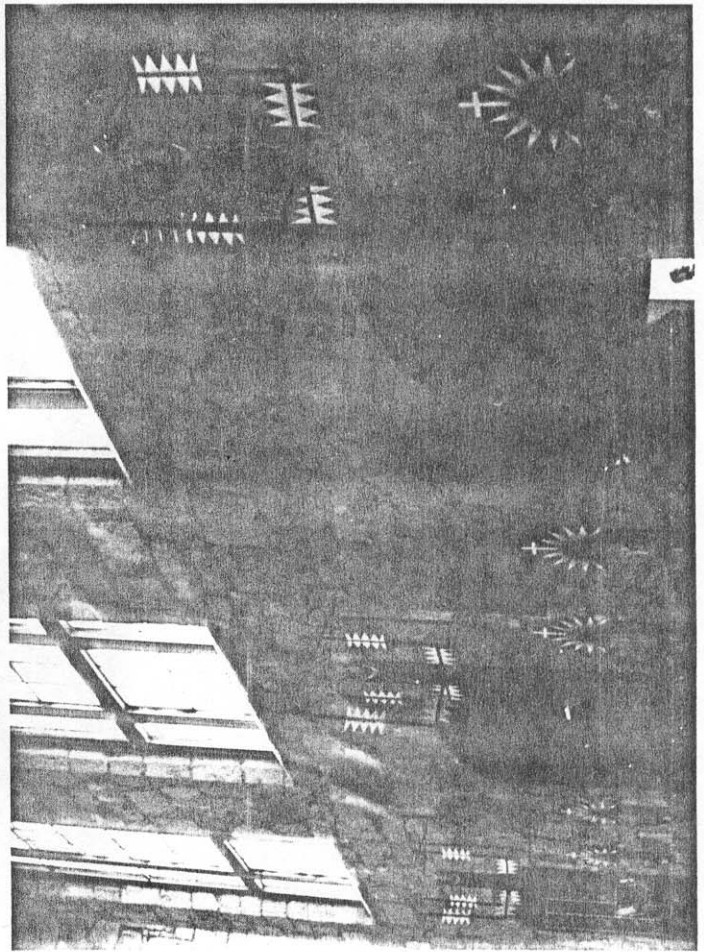
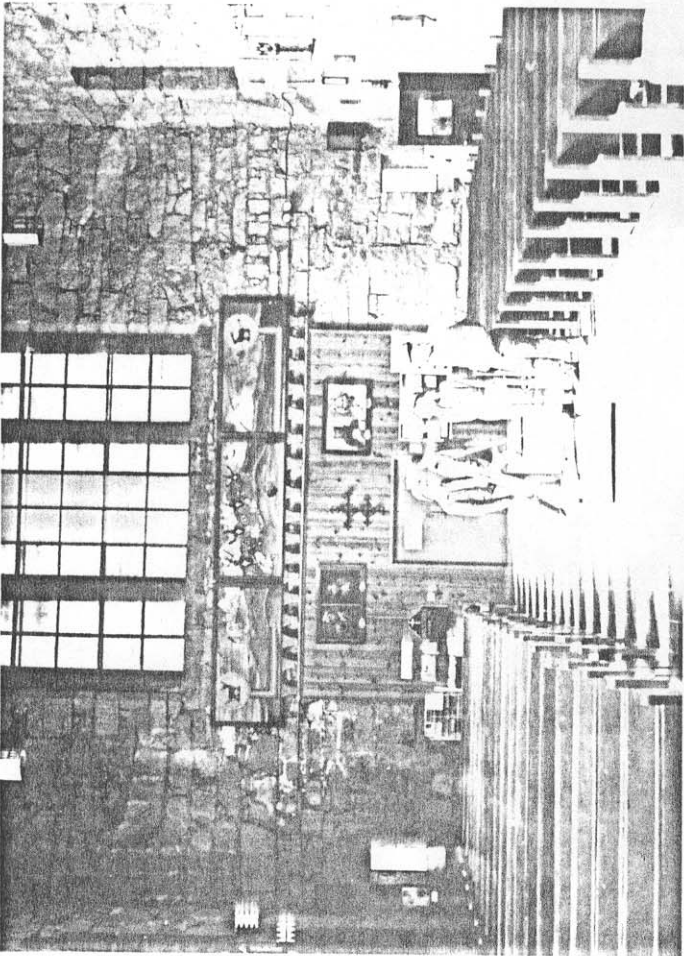
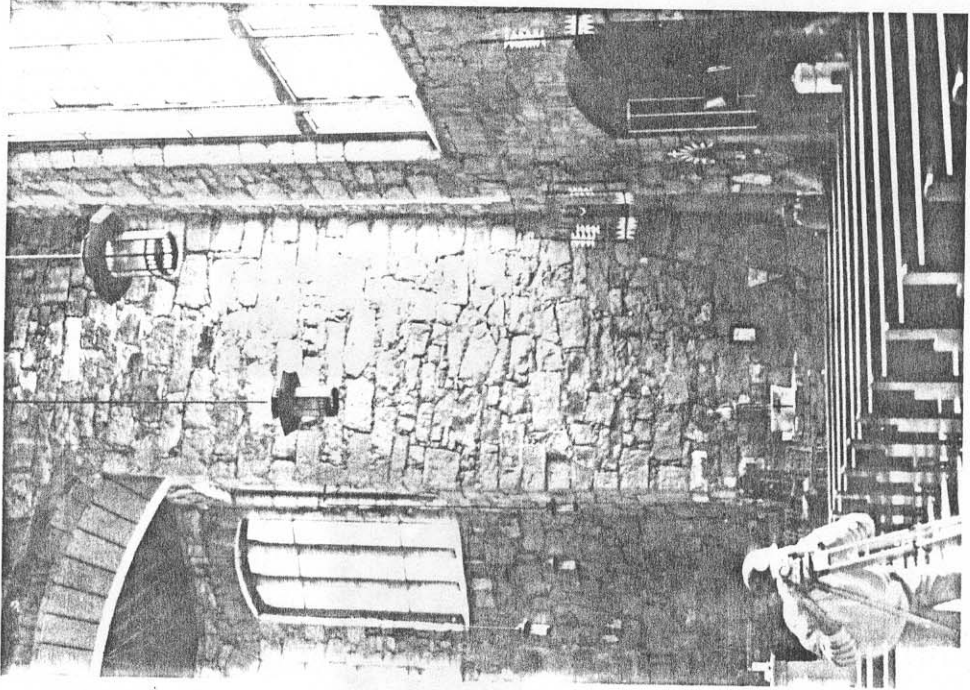
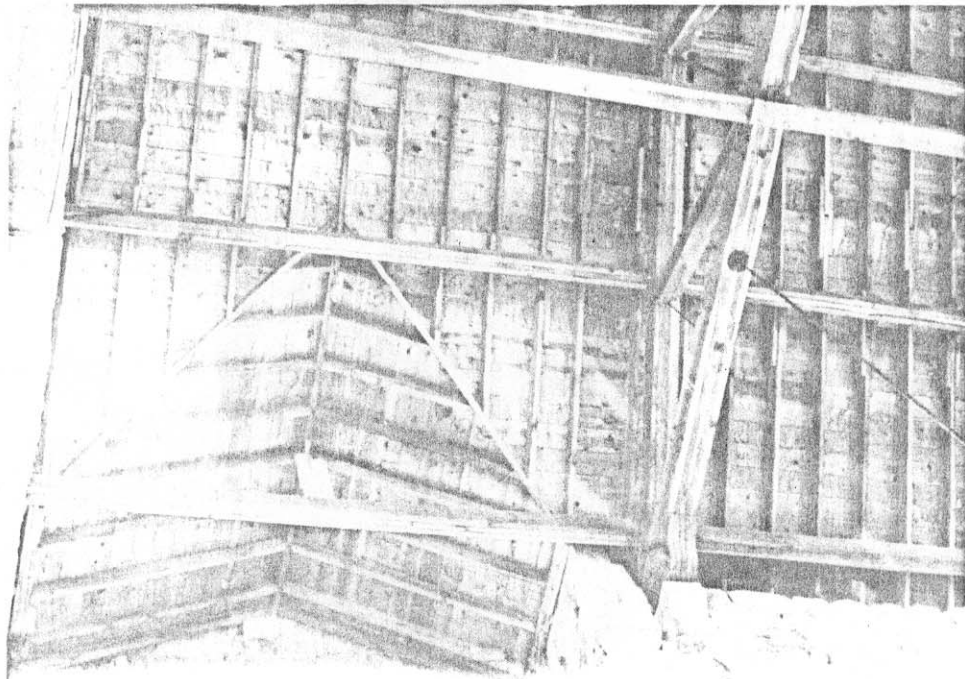
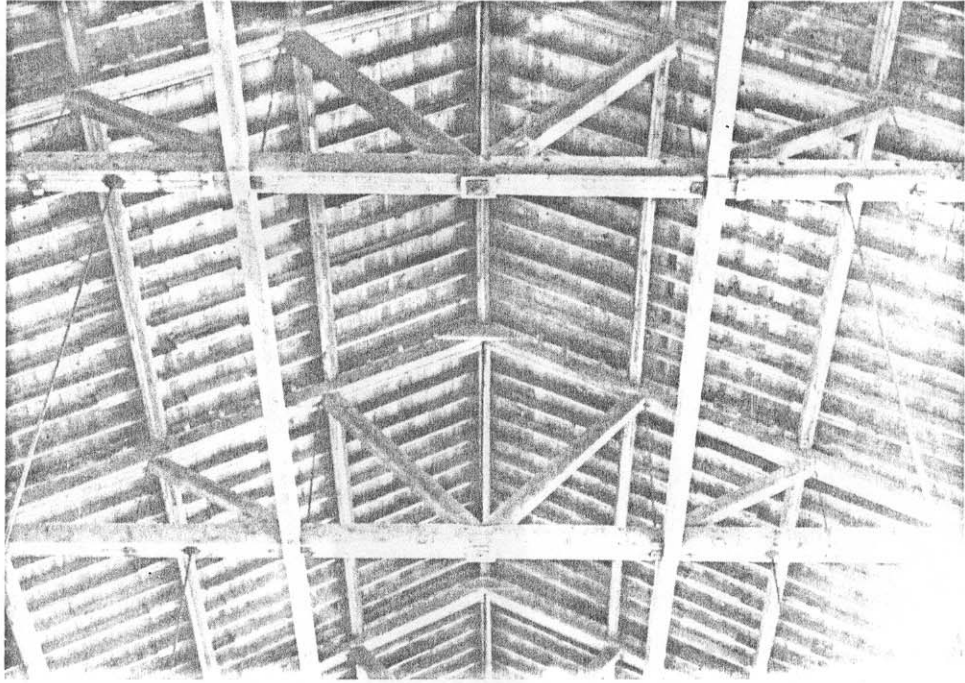


Photo Set 5 - Roof Truss System



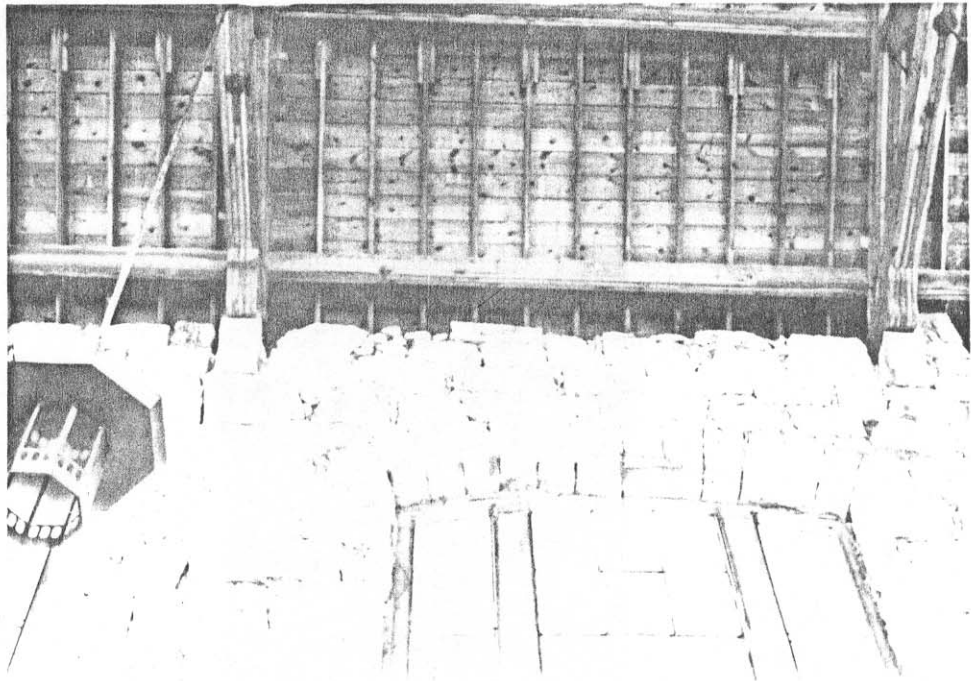
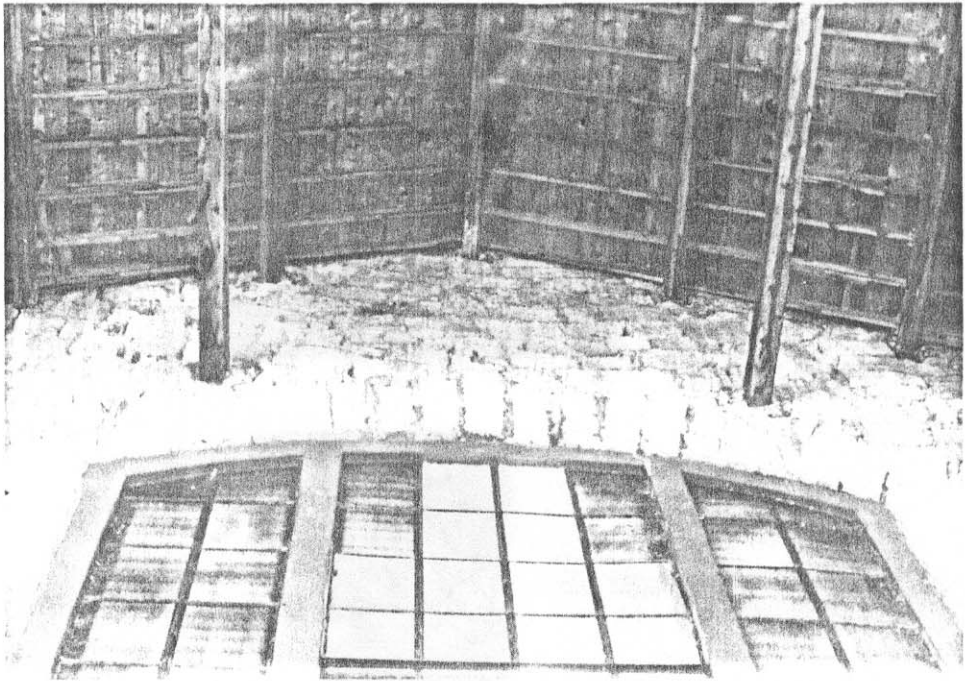
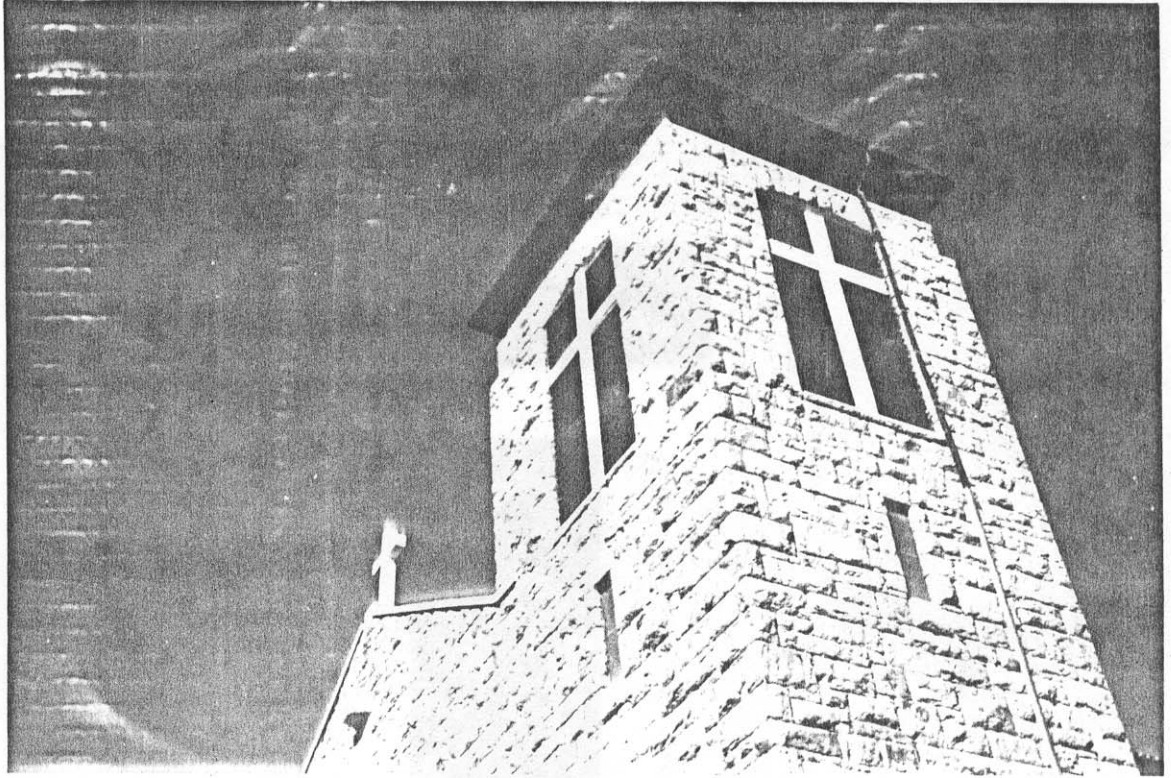


Photo Set 6 - Roof Drainage System



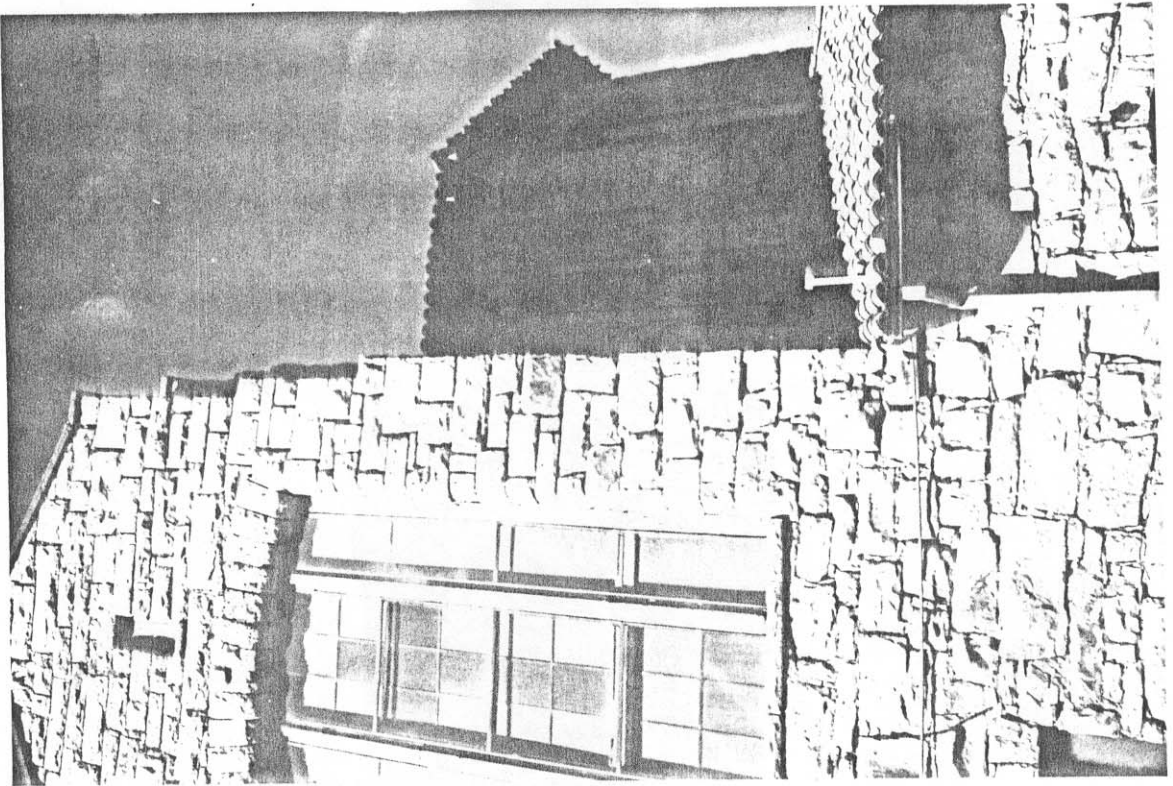
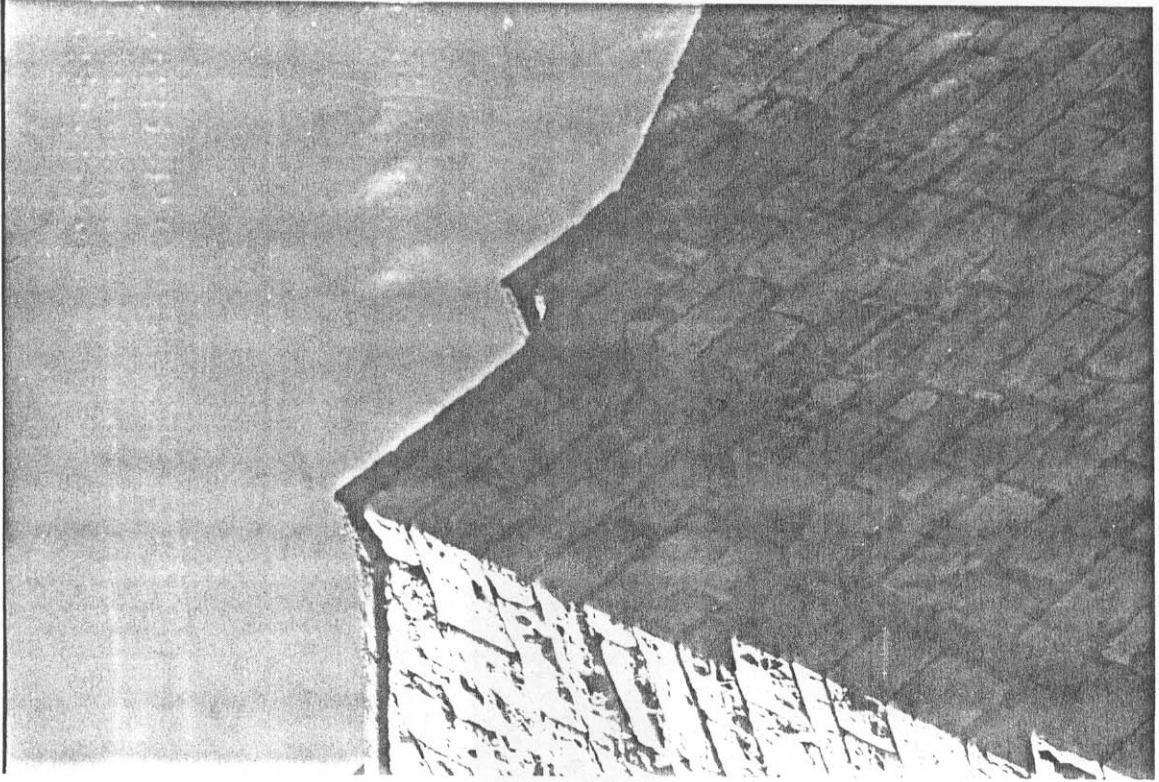


Photo Set 7 - Miscellaneous

