



St. Peter Lutheran Church ROOF (OR WALL) RETROFIT PROJECT

By Luther C. Mock, RRC

St. Peter Lutheran Church is located just five miles south of the rural farm in which I grew up and where I live today. I have many memories of driving by it during my youth and admiring the unique A-frame design. It rises above the corn and soybean fields and can be seen for miles from the northeast Indiana flatlands.

The 23:12 slope structure of the building is built from 8-inch-thick, 8-foot wide precast concrete slabs. They are anchored at the base of a precast concrete floor slab and nested at the ridge with complicated-shaped, precast concrete keyways. The gross floor area is approximately 5,000 sq. ft., and the roof surface is roughly 11,000 sq. ft. The concrete design was inspired by the availability of specially designed components that could be made at a nearby precast plant.

The original architect designed a 6-inch continuous window inset that profiles the A-frame shape by staggering the concreted slabs at 14 inches. The inset window detail (skylight)

consists of a 1 x 1-3/4-inch aluminum glazing stop and a translucent 1/4-inch acrylic sheet. Southern sun exposure creates an impressive, rich blue light in the church sanctuary.

In the summer of 2000, the congregation contacted me to design a new roof system. They reported they had endured roof leaks on the facility since its construction in 1970. The original roof covering was sprayed polyurethane foam (SPF) with an acrylic coating. A few years later, the original SPF was covered with 8-foot-wide fiberglass panels designed and formed specifically for the unique profile of the roof. This system also provided minimal success from water infiltration – primarily at the glazing detail. The 14-inch depression of every other concrete panel, coupled with the depth of both the SPF and the fiberglass covering, created a natural waterway against the skylight.

Early in the project, there was a lot of discussion about keeping or abandoning the 6-inch light detail. We were confi-



dent a watertight detail could be designed for the skylight. But it would certainly be less costly if these were removed and covered over. Abandoning the skylights would not only cost less, it would eliminate air infiltration and heat loss.

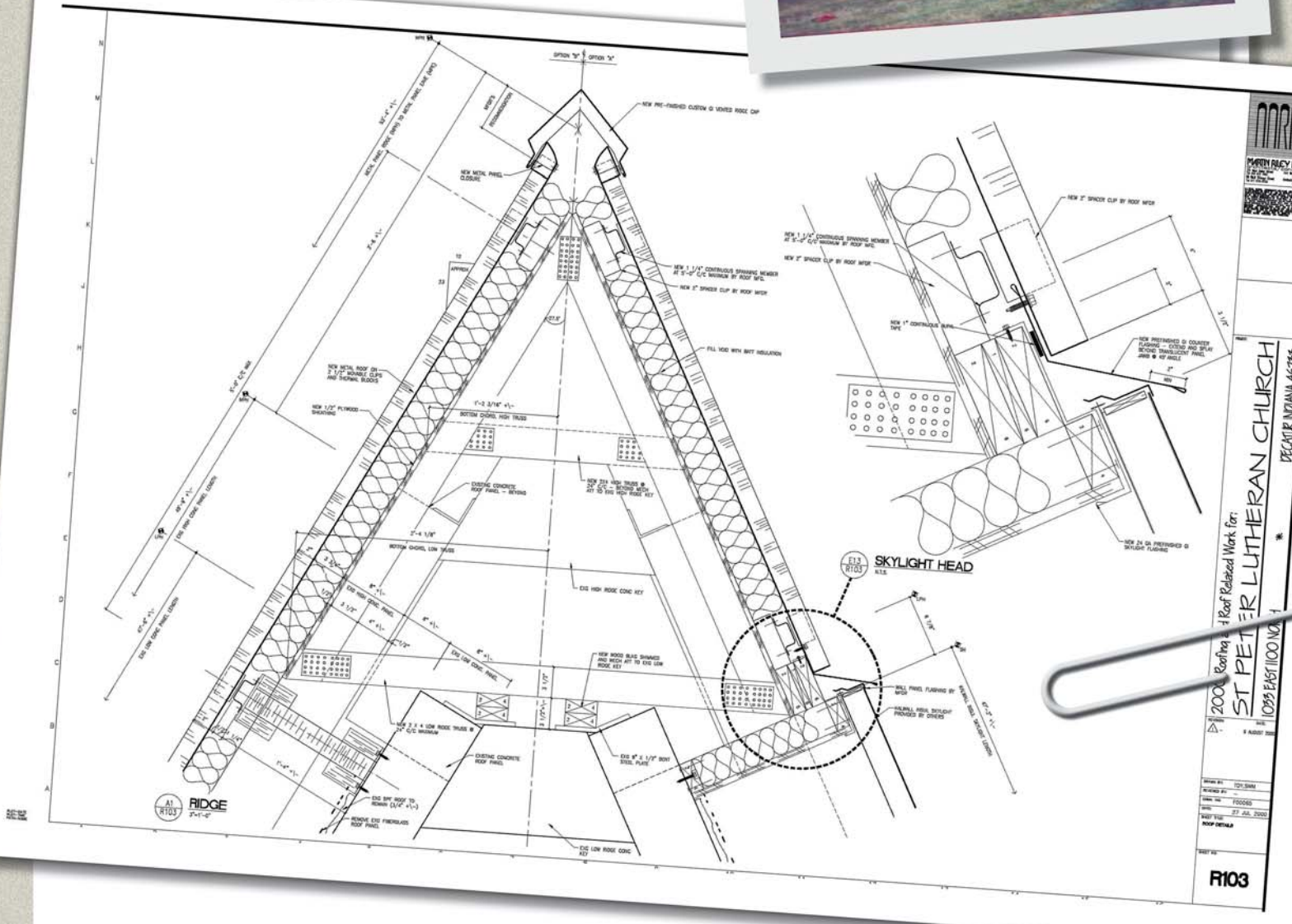
The primary design criteria for the roof-covering choice were low-maintenance, aesthetics, and long-term performance. The church project committee was willing to invest in a higher initial cost to realize these preferences. In order to identify the true cost of saving the skylights, we designed the reroofing project as Option A (keep the skylights) and Option B (abandon the skylights). When all the options were considered, a standing-seam metal roof covering was chosen. The low bidder for Option A was \$228,800 and Option B was \$168,800. Keeping the skylights would be a \$60,000 (36%) premium. The congregation felt strongly about keeping the skylights and their powerful effect the blue light has on the interior space; therefore, Option A was chosen.

It was felt that the staggered concrete roof slabs of the original design created a pleasing exterior effect. However, it also created hundreds of linear feet of flashings that increased cost and water infiltration vulnerability. The project team chose to

eliminate the staggered panel effect for the value of less flashings and cost savings. But the choice to change the roof into a flat plane created new challenges to maintaining the interior, natural light effect of the skylights.

The retrofit design includes 1-1/4-inch structural steel members that run perpendicular to the slope at 5 feet, center-to-center. They span over the 14-inch depressed concrete pan-

Removal of 8-foot-wide fiberglass panels and exposure of original sprayed polyurethane foam roof.



NORTH ARIZONA
 10055 EAST 11000 N.
 SCOTTSDALE, ARIZONA 85255
 PHONE: 480-948-1100
 FAX: 480-948-1101
 WWW: WWW.NAARCHITECTS.COM

2004 Roofing & Roof Related Work for:
ST. PETER LUTHERAN CHURCH
 10055 EAST 11000 N.
 SCOTTSDALE, ARIZONA 85255

DRAWN BY: TCM/SMH
 CHECKED BY: FGD/GOO
 DATE: 27 JUL 2004
 SHEET NO: R103
 PROJECT NO:

R103

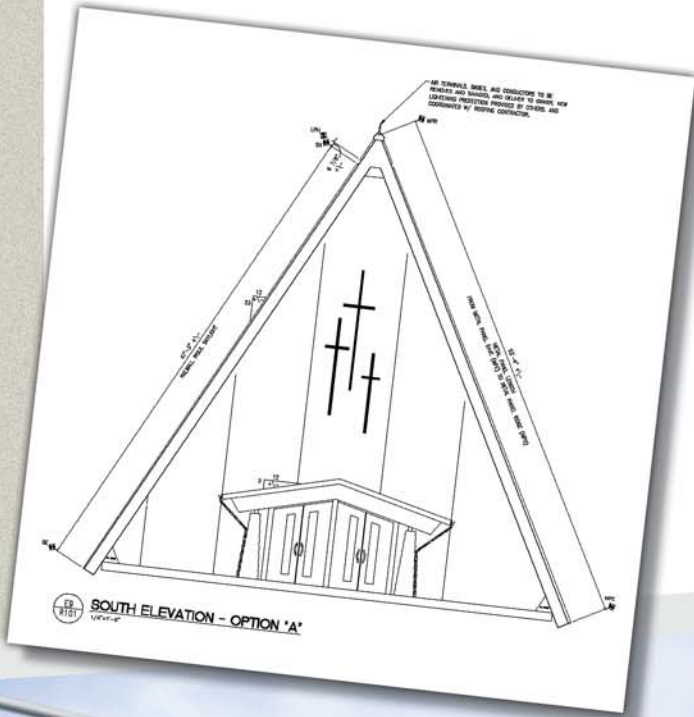
els and are supported by 2-1/2-inch post supports. A 1'-1" inside dimension light trough was created with wood blocking adjacent to the 6-inch-deep light inset. The walls of the trough

were extended above the surface of the new metal roof covering to act as a curb for a new skylight assembly. The inside surfaces of the light trough were painted white to maximize light reflectivity.

The skylight covering had to be virtually maintenance free and have high impact resistance like the metal panel. In addition, the skylight covering had to offer some insulating qualities and be fabricated to fit the project dimensions. A translucent, fiberglass-reinforced sandwich panel with high insulating qualities was chosen. The product has the unique ability to fill a space with uniform, usable, natural daylight – even on cloudy, dark days. The face of the sandwich panel has millions of prismatic glass fibers that refract sunshine.

The prior roof systems included minimal insulation – approximately 1-1/2-inches of SPF. The installation of the spanning members offered the opportunity to upgrade the thermal resistance of the assembly. Blanket fiberglass insulation fills the cavities of both levels of the concrete panel.

The previous ridge was approximately 36 inches across on a horizontal plane, which is too wide for the new manufactur-



View of translucent, fiberglass-reinforced sandwich panel for interior light penetration.

er's standard ridge detail. A small wood truss structure with plywood sheathing was designed that effectively raised the height of the building by six feet. The space in the cavity is uninsulated and vented with a triangular louver at each end.

The roof system qualified for a 20-year, no dollar-limit warranty for both product and workmanship. The congregation chose to purchase the warranty but there have been no leaks in the four years since the system has been installed. Not only has the congregation enjoyed a leak-free building, but also a 40-50% reduction in heating bills. The metal roof system manufacturer, skylight product manufacturer, general contractor, and specialty contractors were extremely sensitive to the unique demands of this project and delivered high quality results. ■



Design Team:

Luther Mock, Designer
Sean Motter, Project Manager
EDIFIS Building Exterior Solutions
Fort Wayne, Indiana

General Contractor:

Michael Brown, Project Manager
Hagerman Construction Corporation
Fort Wayne, Indiana

Specialty Contractor (Metal Panels):

Chris King, President
Exterior 2000, Inc.
Bluffton, Indiana

Specialty Contractor (Skylights):

Stan Hegerfeld, President
Premier Glass, Inc.
Hoagland, Indiana

Metal Roof Panel Manufacturer:

Butler Manufacturing Company
VSR™ Roof System

Skylight Manufacturer:

Kalwall Corporation

ABOUT THE AUTHOR

Luther Mock is the founder of Foursquare Solutions, Inc., Monroeville, Indiana, and serves as its corporate president. Prior to his current position, he was an owner of Martin, Riley & Mock, Inc. since its inception in 1986 and managing partner of EDIFIS Building Exterior Solutions. He has been involved in roofing and moisture technology since 1978. Since 1986, he has specialized in building envelope design, asset management, and failure analysis. Luther has been involved in more than 800 building envelope related projects. Mock is currently president of the Roof Consultants Institute and is also a member of the American Institute of Architects (AIA), Construction Specifications Institute (CSI), American Society of Testing and Materials (ASTM), and the Midwest Roofing Contractors Association (MRCA). He earned his RRC in 1990.



**LUTHER C. MOCK,
RRC**