Construction Details

This section features construction details from some of the more typical examples of the passive systems we have described. This information should give designers, builders, and homeowners a much better knowledge of how each system is designed and built, with a focus on those details needing special attention. Since full sets of construction drawings are not included here, you may wish to seek professional assistance before actually building your own system.

The details shown here are from four designs developed in two federally-sponsored demonstration projects to promote solar design, research, and construction. They include a solar window, solar chimney, and a solar room from Project SUEDE, and a solar wall from the Brookhaven House.

Project SUEDE, "Solar Utilization, Economic Development, and Employment," was part of a nationwide effort to train solar installers and to build solar applications into existing houses. Sponsored by the U.S. Community Services Administration, Department of Energy, and Department of Labor, SUEDE was carried out in New England by a four-member consortium: the Center for Ecological Technology in Pittsfield, Massachusetts; the Cooperative Extension Service of the University of Massachusetts in Amherst; Southern New Hampshire Services in Manchester, New Hampshire; and Total Environmental Action Foundation in Harrisville, New Hampshire. Together, these groups trained 30 installers who built one of three types of low-cost solar systems onto nearly 100 New England homes. A major goal in Project SUEDE was to demonstrate that solar designs can be simple, can be built at reasonable costs from readily-available building materials, and can be attractive and work well.

Examples of the New England SUEDE systems illustrated here also appear in the color section. The added solar windows, the thermo-siphoning air panel retrofit were each constructed by the Center for Ecological Technology. The attached greenhouse was constructed by Southern New Hampshire Services. Design for New England SUEDE were developed by Total Environmental Action, Inc., (TEA), of Harrisville, New Hampshire.

The Brookhaven House is the result of a research and design effort carried out by TEA, Inc., under contract to Brookhaven National Laboratory, and built at the Lab site on Long Island as a demonstration house to be monitored for its performance. The work was sponsored by the Building Division of the Office of Buildings and Community Systems, Office of the Assistant Secretary of Conservation and Solar Applications, U.S. Department of Energy.

The goal of the Brookhaven project was to develop an attractive, energy-conserving, single-family home of conventional design, using thermal storage materials in combination with heavy insulation and passive solar systems to significantly cut heating costs without reducing comfort. The construction details shown here are from the triple-glazed storage wall located next to a large sunspace and serving as the structural south wall of the dining room. This storage wall also contains a set of windows for direct gain, natural lighting, and a view from inside.

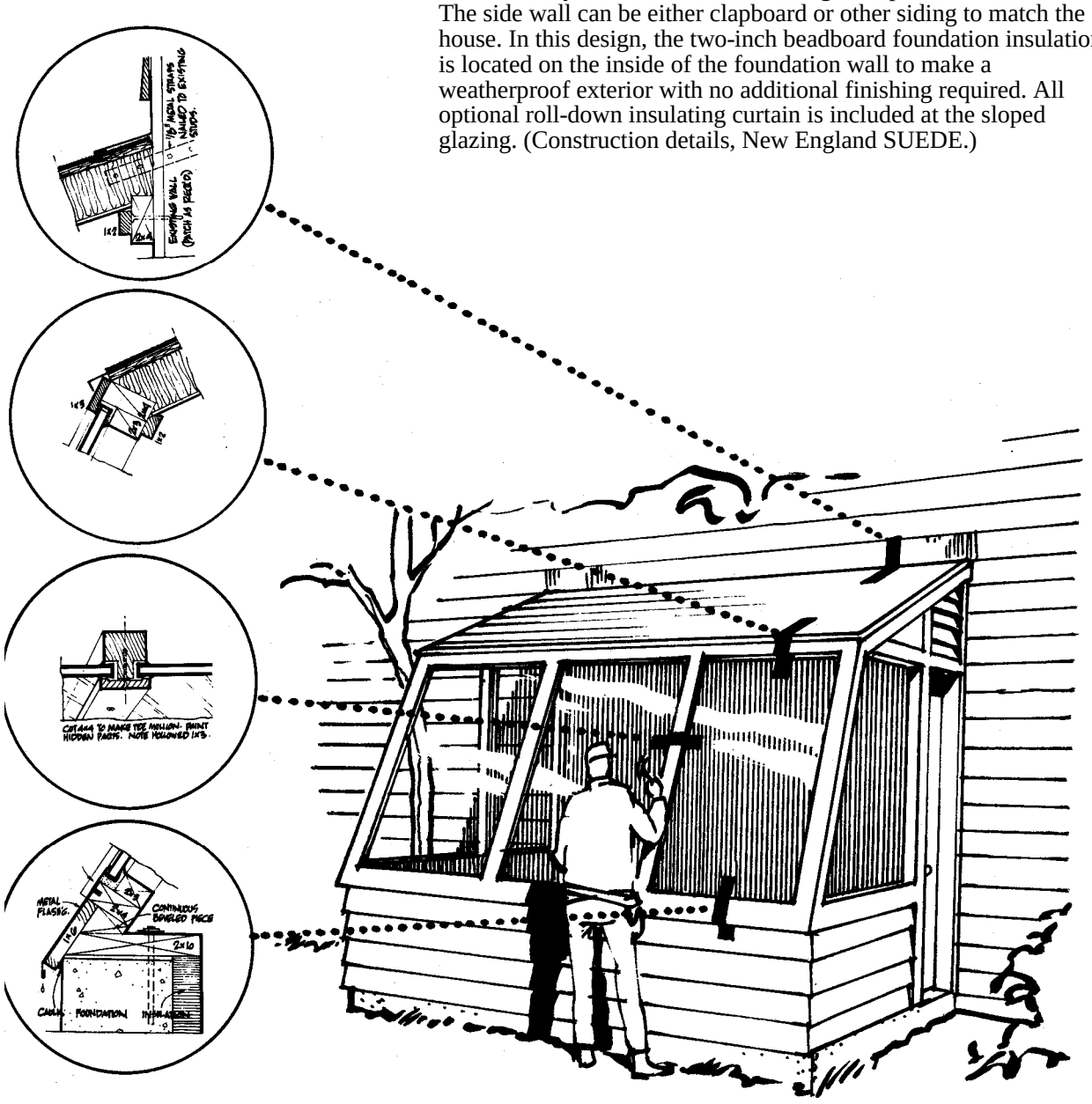
A photograph of the Brookhaven House appears in the color section.

The drawings here were prepared by and adapted by the authors from Total Environmental Action, Inc. designs for the Brookhaven and SUEDE projects. As neither the authors, publisher, TEA nor any of its employees, nor any of the original SUEDE and Brookhaven project participants, have any control over the final use of these revised drawings, all warrantees, expressed or implied, for the usefulness of these drawings and all liabilities which may result from the use of these drawings are voided by their use in construction.

It is good practice to have all dimensions, quantities, and specifications reviewed by a competent local architect, engineer, and/or building official prior to construction to assure compliance with individual requirements, and local codes and conditions.

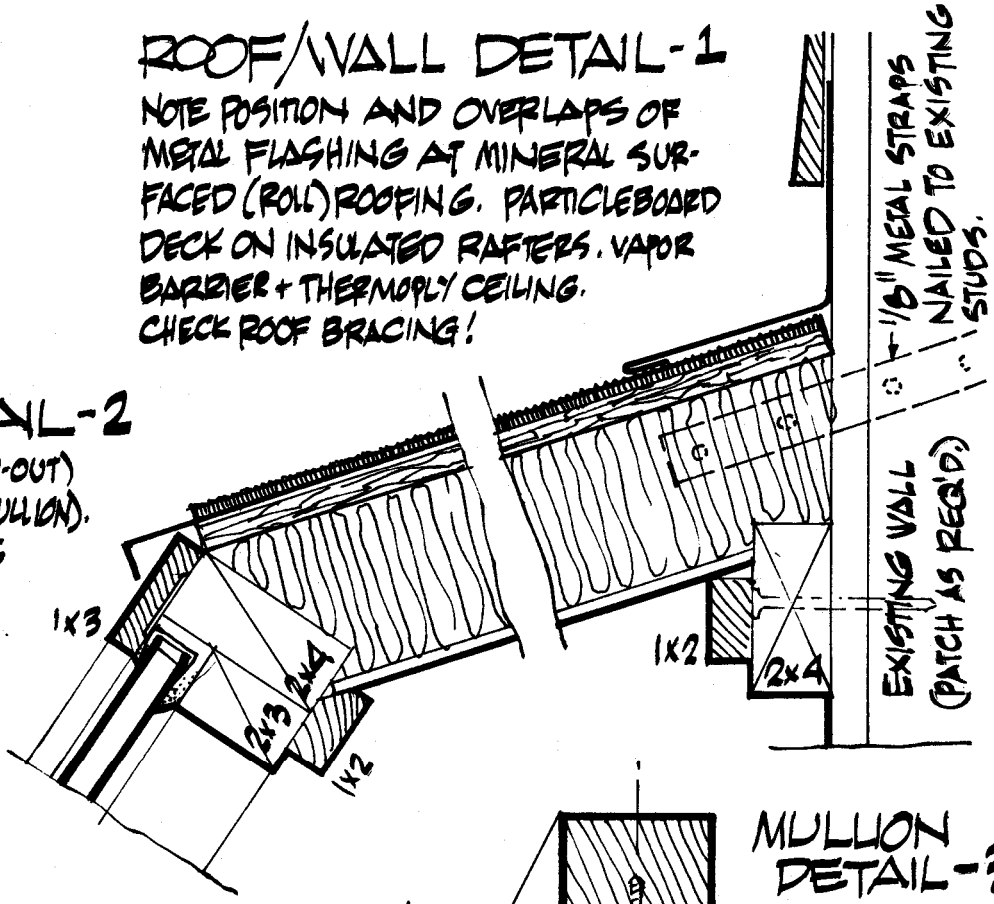
Solar Rooms

This solar greenhouse uses stock size insulated glass patio door unit s the solar aperture. These units are field-mounted in the wood-framed structure which rests on an added foundation wall of poured concrete or block and which is attached to the existing house wall by 2x4 braces and a 2x4ledger strip bolted to the wall. The side wall can be either clapboard or other siding to match the house. In this design, the two-inch beadboard foundation insulation is located on the inside of the foundation wall to make a weatherproof exterior with no additional finishing required. All optional roll-down insulating curtain is included at the sloped glazing. (Construction details, New England SUEDE.)



ROOF/WALL DETAIL-1

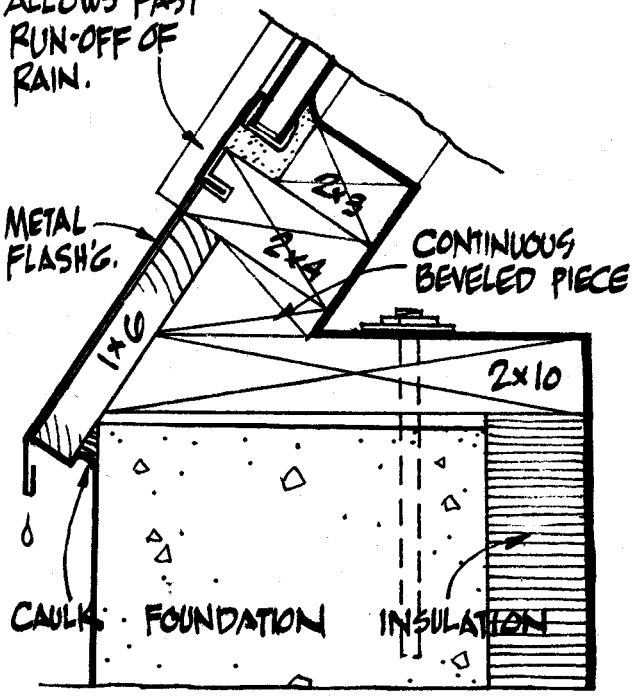
NOTE POSITION AND OVERLAPS OF METAL FLASHING AT MINERAL SURFACED (ROLL) ROOFING. PARTICLEBOARD DECK ON INSULATED RAFTERS. VAPOR BARRIER + THERMOPLY CEILING. CHECK ROOF BRACING!



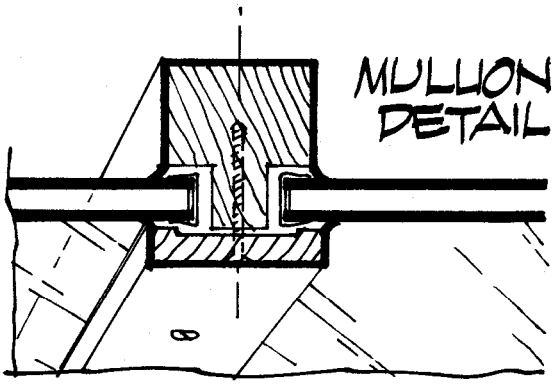
EAVES DETAIL-2

NOTE RABBETED (HOLLOWED-OUT) BACK OF 1x3 (SAME AT MULLION). SET STD DOUBLE GLAZING IN PROPER-SIZED RECESS, USE APPROPRIATE AND COMPATIBLE GLAZING TAPE & CAULKING.

NOTE ABSENCE OF COVER-TRIM AT SILL BELOW. THIS ALLOWS FAST RUN-OFF OF RAIN.



MULLION DETAIL-3



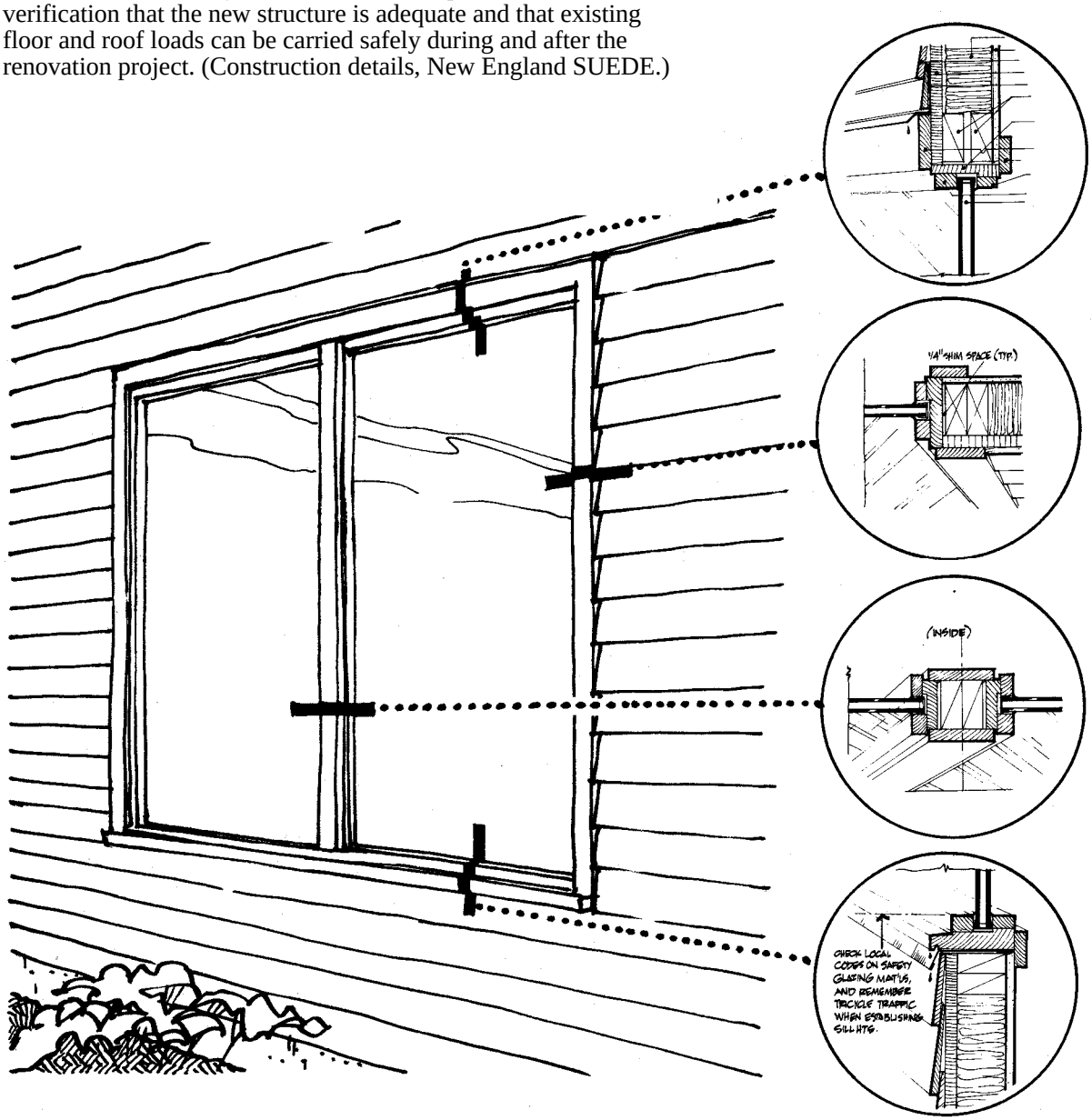
CUT 4x4 TO MAKE TEE MULLION. PAINT HIDDEN PARTS. NOTE HOLLOWED 1x3.

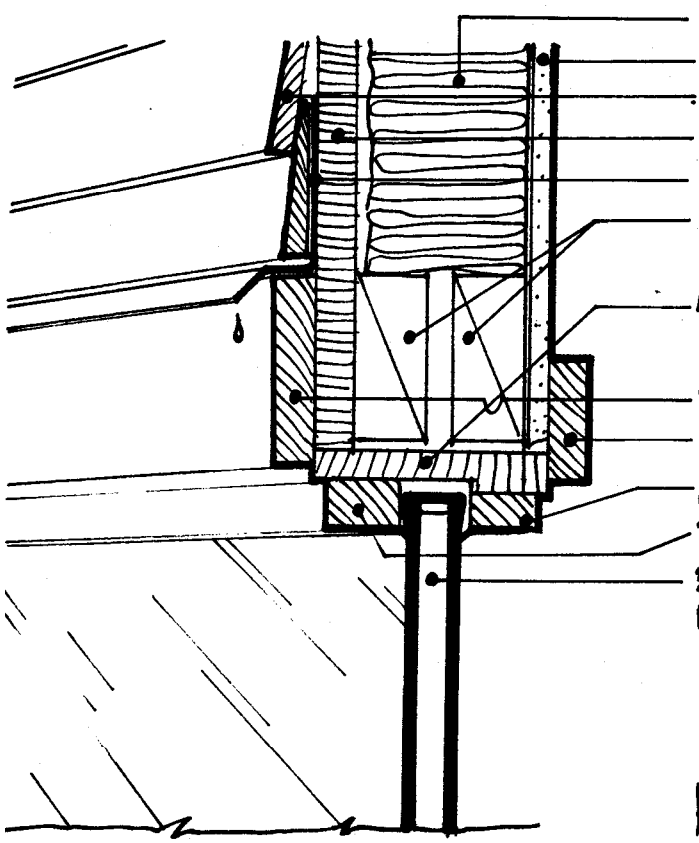
SILL DETAIL-4

TURN FLASHING INTO SLOT, SMEAR GLAZING CAULKING DOWN TO SLOT LINE. SUPPORT BOTH PANES OF DOUBLE GLASS ON APPROPRIATE SUPPORT BLOCKS.

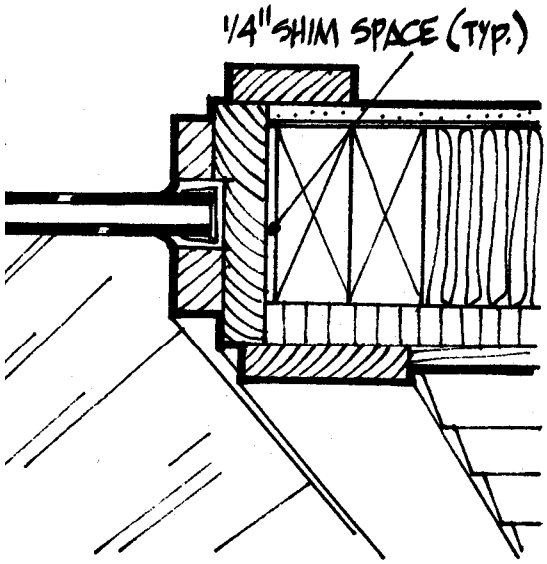
Solar Windows

These details were developed for a low-cost addition of direct gain south glazing in standard 2x4 stud wall construction. A section of the south wall is removed and new framing added as shown to prepare for the addition of standard-sized insulated glass units. These fixed units are installed using standard glazing techniques including setting blocks, glazing tape and weep holes for condensation. The rough framing is finished with trim pieces and glazing stops. Note that cutting into the framing of a stud wall house can be a major structural alteration to the house, and should only be undertaken after professional verification that the new structure is adequate and that existing floor and roof loads can be carried safely during and after the renovation project. (Construction details, New England SUEDE.)





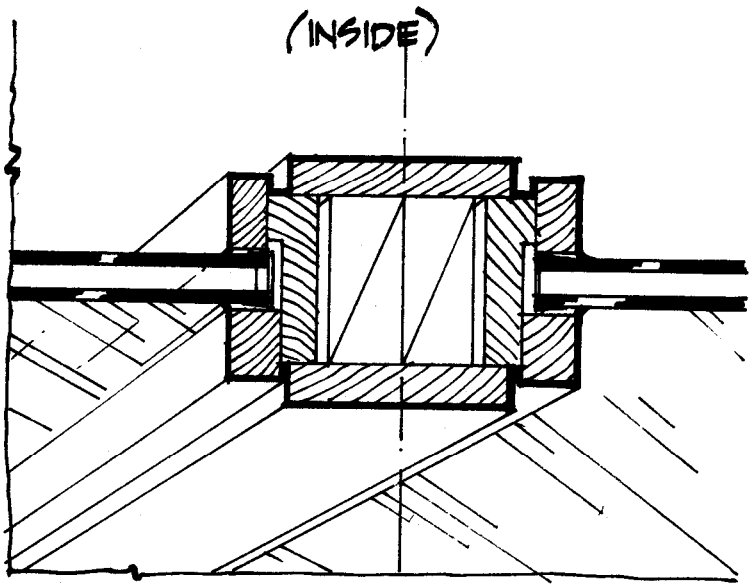
HEAD (TOP) DETAIL - 1



MEMBERS SHOWN AT LEFT ARE THE SAME AS THOSE NOTED ON THE DETAIL ABOVE. NOTE ABSENCE OF FLASHING. CAULK BETWEEN SIDING AND 1X4.

JAMB (SIDE) DETAIL - 2

AGAIN, THE DETAIL IS SIMILAR TO THE HEAD DETAIL BUT NOTICE THAT THE 5/4" WINDOW FRAME IS 3-1/2" TO MATCH THE 2x4's; AND THE COVER TRIM, INSIDE AND OUT, IS 4-1/2" WIDE

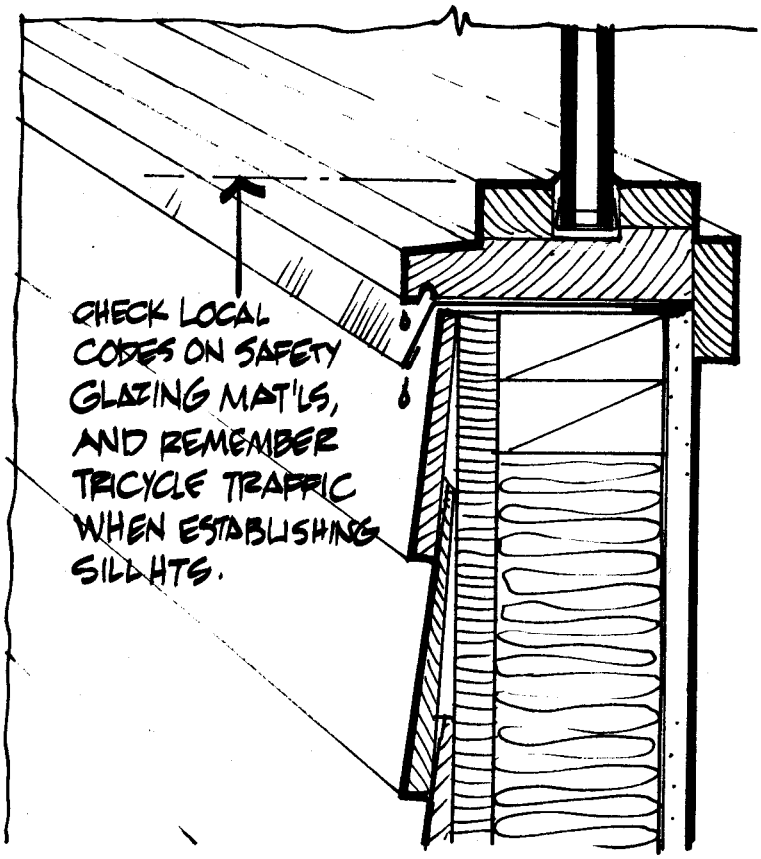


MULLION (POST) - 3

SILL DETAIL - 4

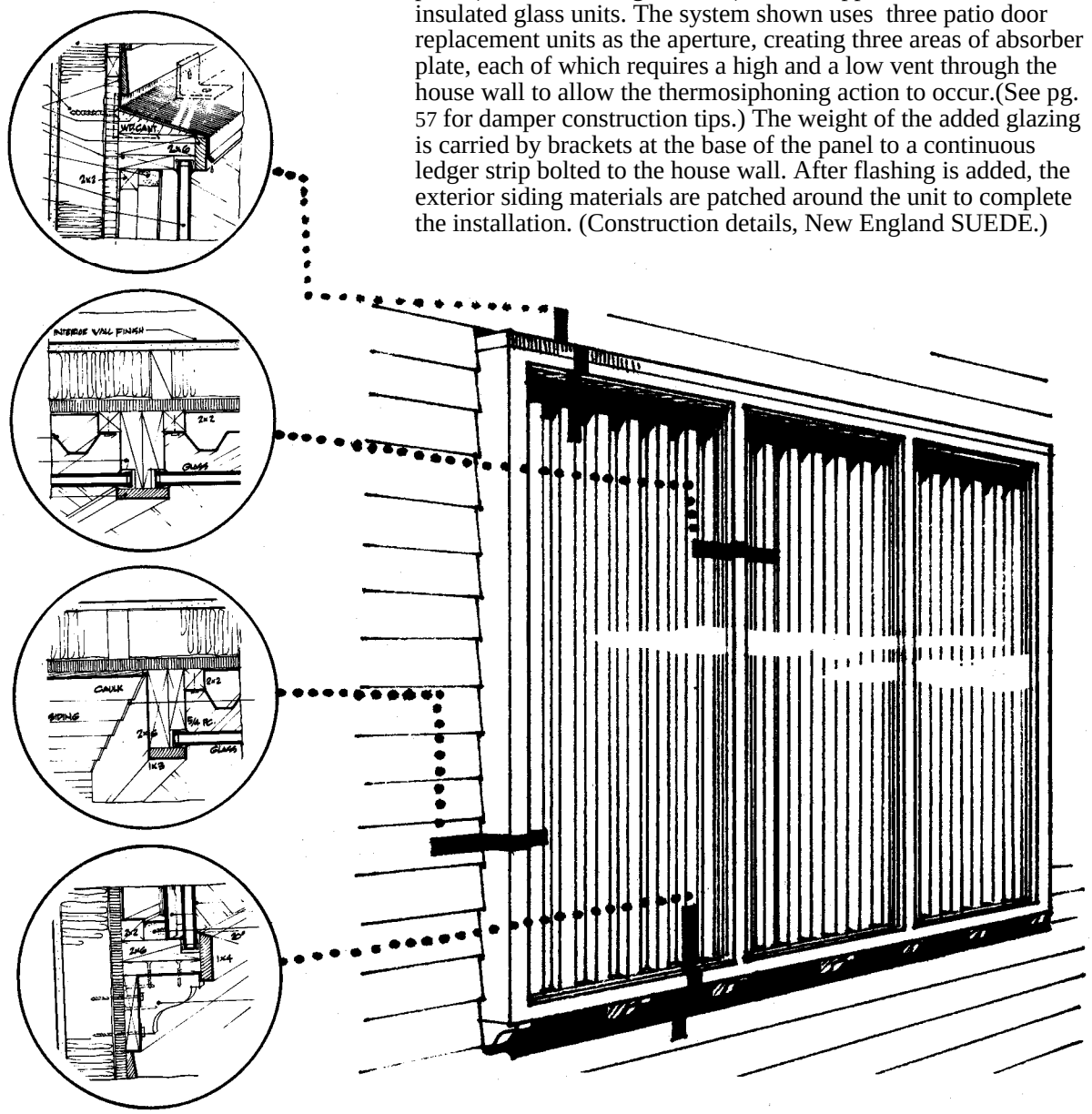
NOTE THAT THE WINDOW FRAME AT THE SILL IS MADE OF 2X MATERIAL WITH TWO RABBETED STEPS ON TOP AND ONE DRIP SLOT ON THE BOTTOM.

CAULK THE UNDERSILL FLASHING NEAR THE INDOOR SIDE.

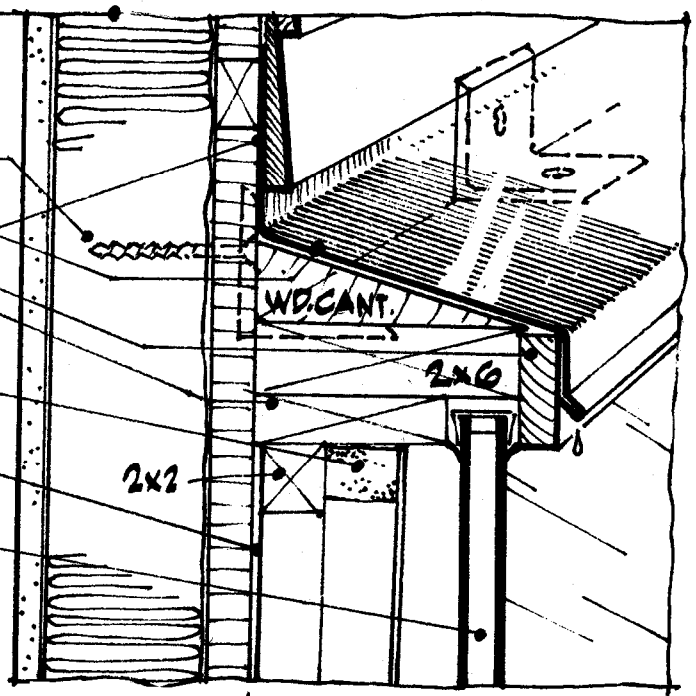


Solar Chimneys

This retrofit passive space heating device, called a thermosiphoning air panel (TAP), uses the existing house wall as the major structural element. The exterior finish is removed, new Thermoply® structural sheathing added over the existing wall, and wood framing added to support the ribbed aluminum absorber plate (industrial siding material) and to support the field-installed insulated glass units. The system shown uses three patio door replacement units as the aperture, creating three areas of absorber plate, each of which requires a high and a low vent through the house wall to allow the thermosiphoning action to occur.(See pg. 57 for damper construction tips.) The weight of the added glazing is carried by brackets at the base of the panel to a continuous ledger strip bolted to the house wall. After flashing is added, the exterior siding materials are patched around the unit to complete the installation. (Construction details, New England SUEDE.)



EXISTING STUD WALL (ADD INSULATION AS NEEDED)
3"x 3"x 1"x 1/8" METAL ANGLES RECESSED, WITH 2" FLATHEAD WOOD SCREWS AT EACH STUD.
METAL FLASHING SEPARATED BY PAPER OR PLASTIC FROM DISSIMILAR METALS.
1x3
5/4" PIECE
NEOPRENE CLOSURE STRIP, INSIDE TYPE, BEHIND CORRUGATED ALUMINUM ROOFING. BLACK FINISH.
1/8" NON STRUCTURAL THERMOPLY SHEATHING.
ST'D. INSULATING GLASS SET AS NOTED ON EARLIER DETAILS.

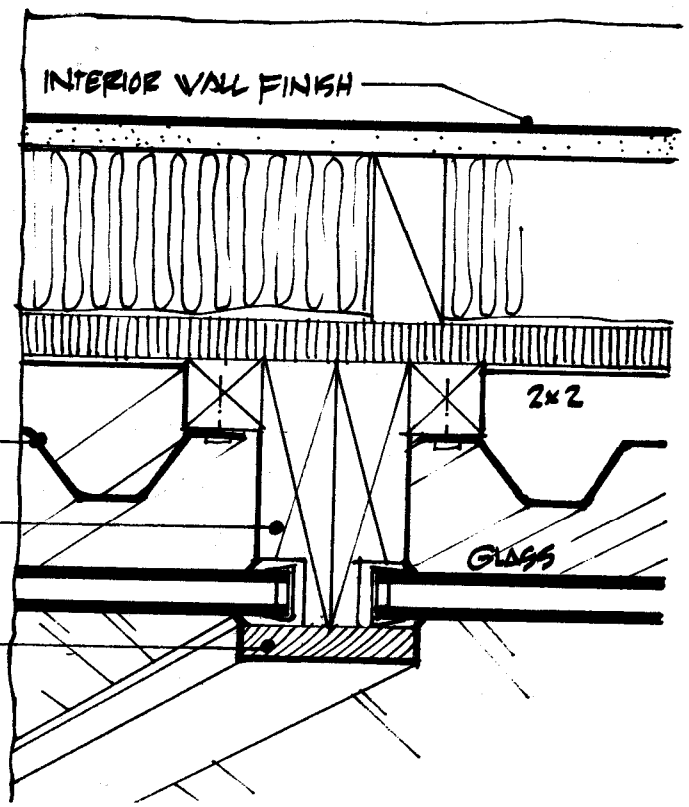


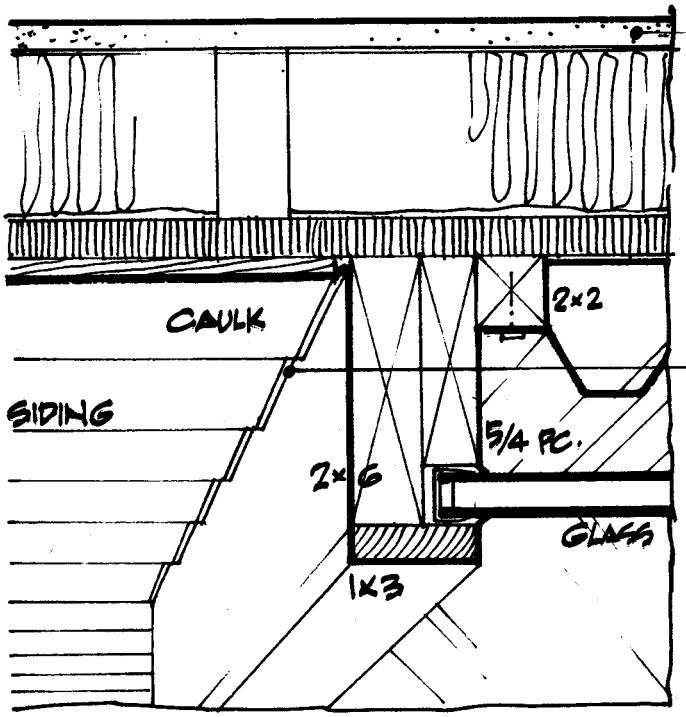
HEAD SECTION-1

MULLION-2

NOTE THAT REQUIREMENTS ON OTHER DETAILS RE: BACK-PRIMING, SETTING OF GLASS, ETC APPLY TO THESE DETAILS AS WELL.

CORRUGATED ROOFING SHEETS
(2) 2x6's RABBETED AS SHOWN
1x4 COVER FASTENED EVERY 12 INCHES 1 1/2 #8 SCREWS
DO USE PINE MATERIALS IN COLLECTOR FRAMING OR TRIM.





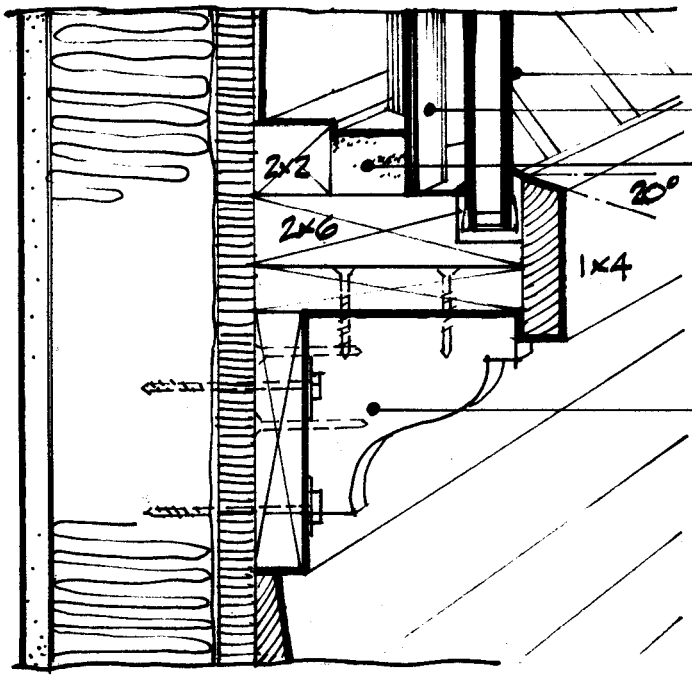
INTERIOR WALL FINISH.

SELECT 2×6 MEMBERS CAREFULLY!

LEAVE ¼" GAP AT SIDING FOR CAULKING; USE MAT'L COMPATIBLE WITH FINISH ON WOOD.

NOTE THAT VERTICAL PIECES ARE NOT FASTENED TO EXISTING WALL; HORIZONTAL MEMBERS ARE.

JAMB DETAIL - 3



SILL DETAIL - 4

GLASS.

CORRUG. METAL AND CLOSURE STRIP.

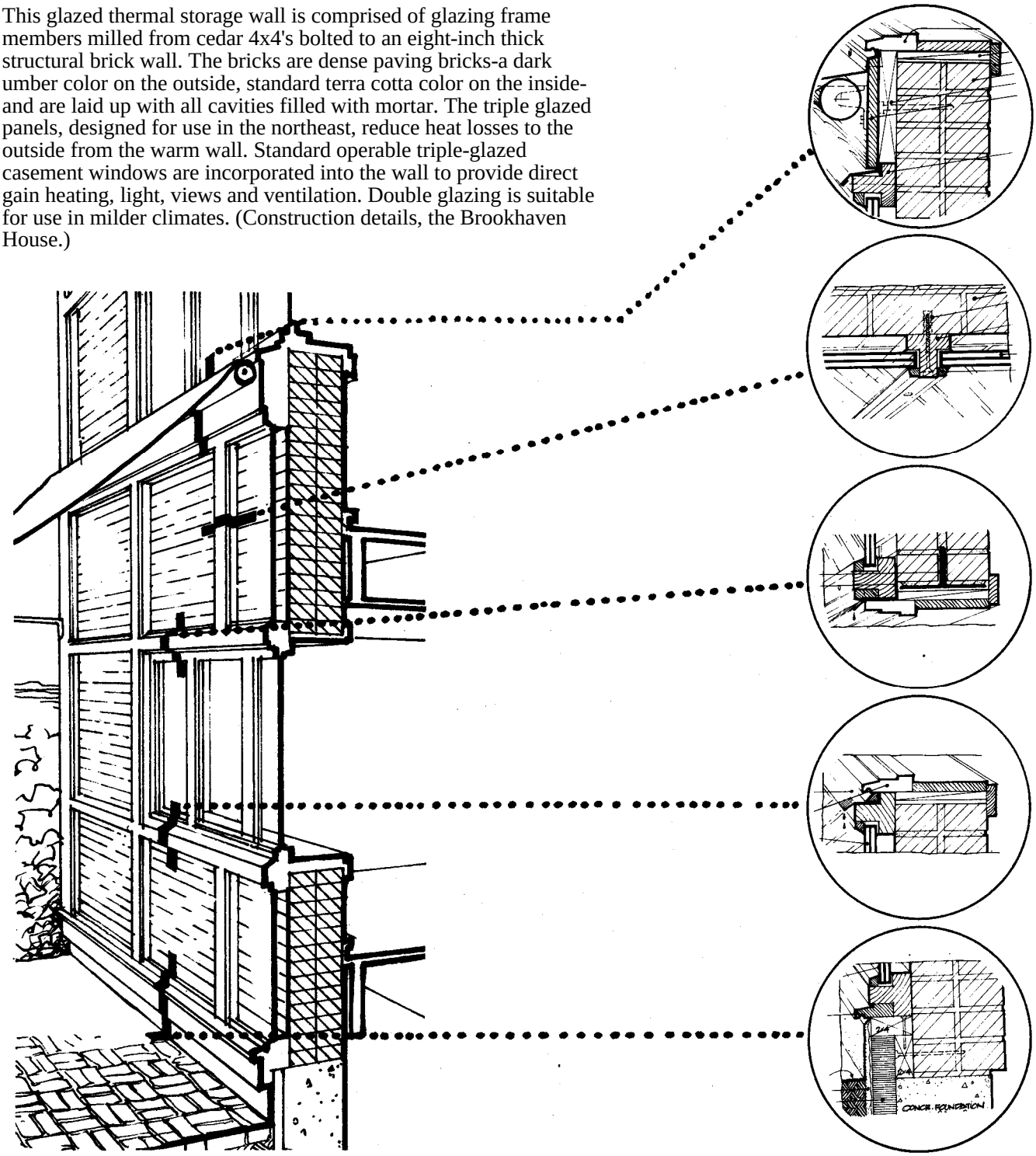
NEOPRENE CLOSURE STRIP

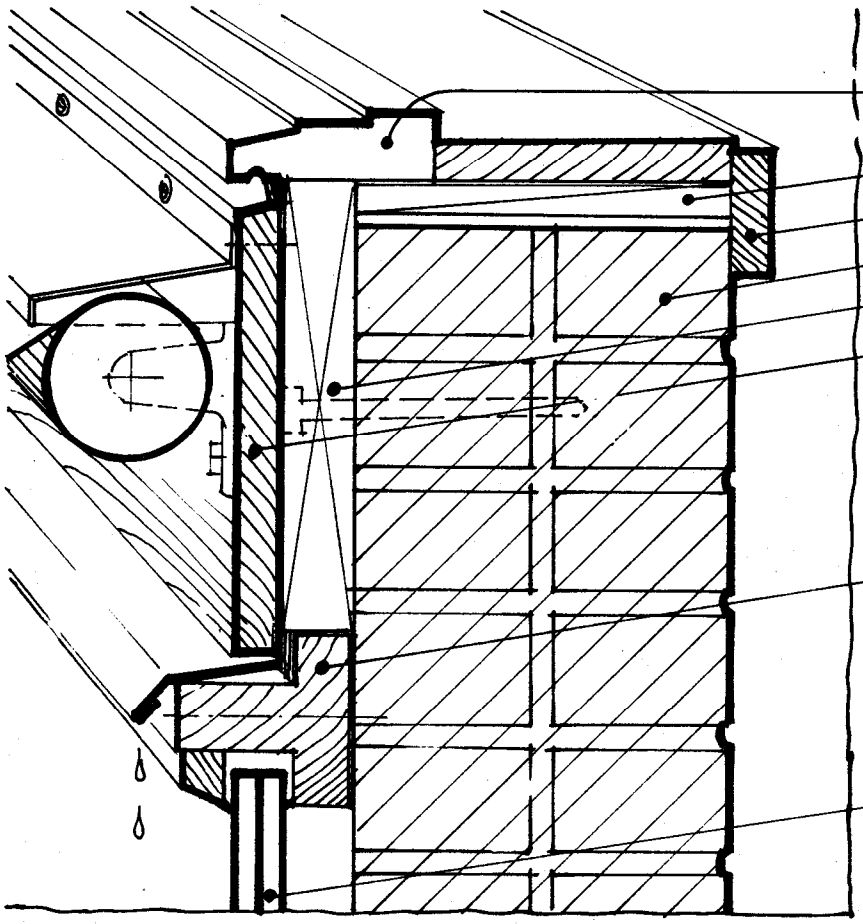
SUPPORT BRACE: 2 CONTINUOUS 1×6 OR 5/4"×6" BOARDS WITH 2" BRACKETS EVERY FOOT. LONG FLATHEAD SCREWS FASTEN BRACE TO BRACKETS.

CONNECT BRACE TO WALL WITH (2) 3" LAG SCREWS @ EA. STUD

SolarWalls

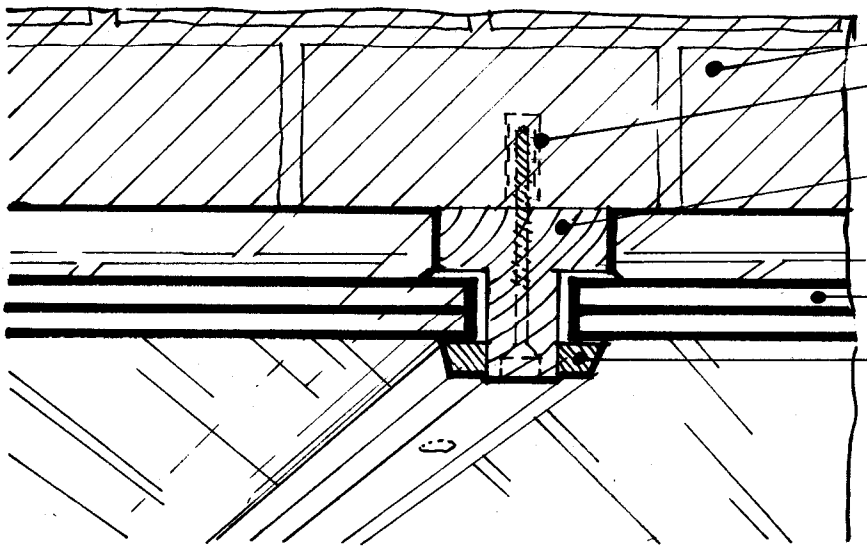
This glazed thermal storage wall is comprised of glazing frame members milled from cedar 4x4's bolted to an eight-inch thick structural brick wall. The bricks are dense paving bricks-a dark umber color on the outside, standard terra cotta color on the inside-and are laid up with all cavities filled with mortar. The triple glazed panels, designed for use in the northeast, reduce heat losses to the outside from the warm wall. Standard operable triple-glazed casement windows are incorporated into the wall to provide direct gain heating, light, views and ventilation. Double glazing is suitable for use in milder climates. (Construction details, the Brookhaven House.)





HEAD DETAIL - 1

SILL OF STD WOOD WINDOW.
CAULK SLOT BELOW.
BLOCKING & SHIMS.
1x3.
8" BRICK WALL.
2x10.
1x10 TRIM.
AWNING & COVER.
FLASH BEHIND 1x10 AND OVER "WINDOW" HEAD OF SOLAR GLASS.
4x4 RABBETED TO TEE SHAPE.
EPOXY-PAINT ALL WOOD SURFACES IN OR EXPOSED TO SOLAR AIR SPACE.
TRIPLE GLAZING.
BACK-PRIME ALL WOOD AS PER OTHER DETAILS



BRICK WALL
5" GALV. SCREWS INTO 2" LEAD SHIELDS
4x4 FRAME CUT TO APPROPRIATE TEE SHAPE. (NOT PINE!)
TRIPLE GLAZING ... + GLAZING TAPE, SETTING BLOCKS
WOOD STOPS, NAILED.
WOOD PLUGS COVER RECESSED SCREWS.

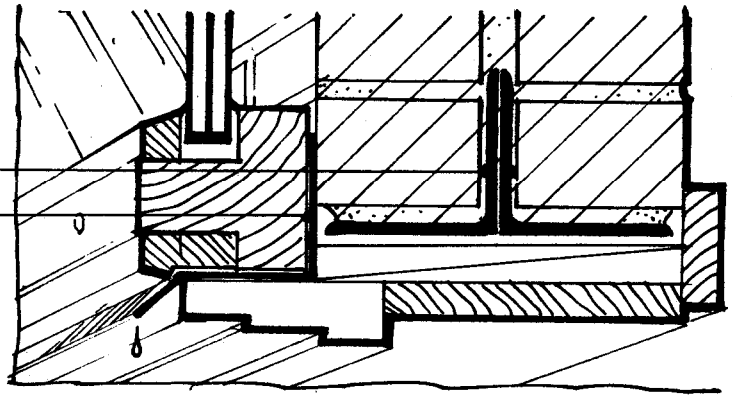
MULLION - 2

WINDOW HEAD - 3

BACK-TO-BACK STEEL ANGLES MUST BE SIZED TO CARRY TOTAL MASONRY WALL LOAD.

FLASHING EXTENDS UP BEHIND TEE.

GET GOOD ADVICE ON FASTENING WOOD TO STEEL AND BRICK.

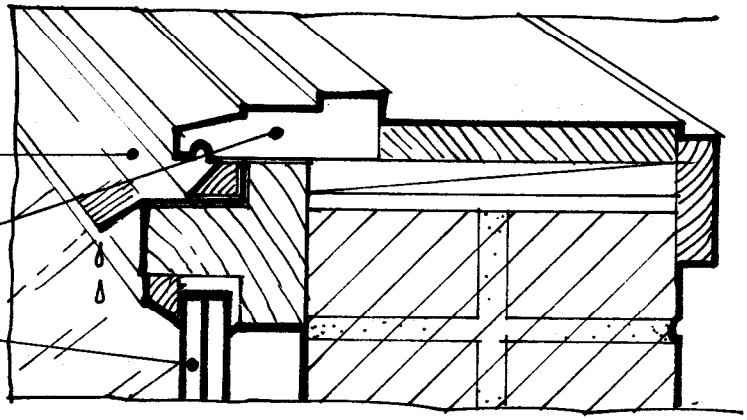


WINDOW SILL - 4

METAL FLASHING IN ⌐ SHAPE PROTECTS 4x4 TEE.

STANDARD WDW. SILL IS SIMILAR TO DETAIL ON OPPOSITE PAGE.

TRIPLE GLAZING.



SILL AT GRADE - 5

TRIPLE GLAZING IN 4x4 TEE AS BEFORE.

SILL PIECE WITH DRIP

EXTERIOR GRADE.

1/2" CEMENT PLASTER ON CHICKEN WIRE PROTECTG 2" POLYSTYRENE BOARD INSULATION.