The wall-panel framing system developed by the Small Homes Council in 1954 used a double 2" x 6" continuous header, or lintel, placed at the top of the panels and extended around the entire house. The header required the use of lag screws and nails to fasten it to the tops of the panels. In 1959, in a cooperative investigation sponsored by the Lumber Dealers Research Council, the Small Homes Council - Building Research Council developed a nailed-glued wall-panel header for the wall-panel framing system. This header is described in Instruction Sheet #21, NAIL-GLUED HEADER FOR WALL-PANEL FRAMING SYSTEM, and its design is explained in Research Report #381, EVALUATION OF PRE-ASSEMBLED WALL-PANEL FRAMING SYSTEM. For this design (the design on Instruction Sheet #21), the plywood web must be at least 9" thick, and at least 12" deep. Nail-glued headers present several advantages over the original design using the double 2" x 6" continuous lintels, namely: 1. Lag screws are eliminated 2. Less material is required 3. Lumber shrinkage problems are less 4. Top plate installation is simpler

The nail-glued header is necessary in door and window panels only. A header is not required for solid wall panels with three or more studs.

**SHALLOW HEADERS**

When a 7'-6" height is desired for ceilings or exterior walls, there is insufficient depth to accommodate the 12" header, and a shallower header is required. This instruction sheet presents a design for these conditions. Two designs are presented for these shallow headers. The first design makes use of a 3/4" plywood web, and the second uses 5/8" plywood.

### MATERIALS NEEDED FOR HEADERS

**Lumber:** Use Western hemlock, Douglas fir, or Southern yellow pine, of a grade which is equivalent to at least a 1200 psi gruee. Moisture content should not exceed 19%.

**Top flange:** Use 2" x 4" x 48" or 2" x 6" x 48".

**Bottom flange:** Use 2" x 4" x 48" or 2" x 6" x 48".

**Stiffeners:** Use 2" x 4" x 36".

**Plywood:** Use C-C grade, interior-type Douglas fir plywood.

For exposed conditions, use C-C grade or better exterior-type plywood. The plywood must meet commercial standard CS60-66 as certified by an approved testing laboratory.

**Adhesives:** Classic meeting Federal specifications MMA-A-125, Type I or II (Type II contains a mold inhibitor), is recommended in pressed and low humidity areas. Maintain the header, plywood, glue, and surrounding atmosphere at a minimum temperature of 50°F. during fabrication and curing. Allow 16 hours curing time when temperatures are between 50°F. and 70°F.; when header is to be used in exposed conditions, use a "waterproof" adhesive meeting Federal specifications MIL-A-397B. Most "waterproof" adhesives require a minimum fabrication and curing temperature of 70°F. during fabrication and curing. Allow 16 hours curing time when temperatures are between 50°F. and 70°F.; when header is to be used in exposed conditions, use a "waterproof" adhesive meeting Federal specifications MIL-A-397B. Most "waterproof" adhesives require a minimum fabrication and curing temperature of 70°F. during fabrication and curing.

**Fasteners:** For nail-gluing 5/8" plywood; use 6d nails or 1 1/2" staples. For nail-gluing 3/4" plywood; use 6d common nails only. Fastener spacing should not exceed 4" o.c.

### FABRICATION OF HEADERS

The headers can be fabricated as individual units, or as an integral part of window or door panels. In either case, maintain the recommended fabrication and curing temperatures. After fabrication and stacking, do not handle the headers during the curing period as discussed under "adhesives." For nail-glueing techniques, follow the instructions found in Instruction Sheet #1, NAIL-GLUED HEADER FOR WALL-PANEL SYSTEM.

### PANEL AND FIELD ASSEMBLY

**Field-applied top plate must extend at least 2 feet beyond header.**

**Nail top plate with 1 1/4" nails 1-1/2" on center.**

**Two 1 1/2" nails driven through top flange into each jamb stud.**

**Plywood web nailed to top plate and jamb stud with 8d nails 4" on center.**

**Two 1 1/2" nails driven through jamb stud into each end of bottom flange.**

**FABRICATION OF WALL PANELS**

To build the wall panels, follow the instructions of the basic wall-panel framing system, as explained in Instruction Sheet #20, WALL-PANEL CONSTRUCTION, except as they must be modified by the shorter wall height and the use of the headers.

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**STRUCTURAL DESIGN DATA**

**Mathematical Analysis:** Under the design loads the stresses in the headers are as follows:

<table>
<thead>
<tr>
<th>Plywood Type</th>
<th>1 1/4&quot; Plywood</th>
<th>1 1/2&quot; Plywood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>1 1/4&quot; Plywood</td>
<td>1 1/2&quot; Plywood</td>
</tr>
<tr>
<td>Minimum fiber stress</td>
<td>550 psi</td>
<td>450 psi</td>
</tr>
<tr>
<td>Maximum horizontal shear</td>
<td>850 psi</td>
<td>650 psi</td>
</tr>
<tr>
<td>Maximum shear between plies of web</td>
<td>400 psi</td>
<td>300 psi</td>
</tr>
<tr>
<td></td>
<td>300 psi</td>
<td>200 psi</td>
</tr>
<tr>
<td></td>
<td>250 psi</td>
<td>150 psi</td>
</tr>
<tr>
<td></td>
<td>200 psi</td>
<td>100 psi</td>
</tr>
<tr>
<td></td>
<td>150 psi</td>
<td>40 psi</td>
</tr>
</tbody>
</table>

**Performance Tests:** To establish the deflection characteristics of the headers, three sample headers of each design were tested. Each header was made from randomly selected materials obtained through normal supply channels. For the testing operation, each header was assembled into a window panel, and then the window panel was assembled into a 1" wall section, which contained a 9" solid panel on either side of the window panel. The total assembly was tested by a continuous top plate following the pattern of normal construction. The top plate, which would normally be added in the field, was nailed only to the top flange of the header and to the top of the solid panels. Also, the extension of the plywood web at the top of the header was nailed to the field-applied top plate. No glue was used in either of these connections. A piece of 1/2" gypsum board was nailed to the inside surface of the header to simulate the interior wall finish.

In the process of study, slight modifications were made in the designs as the testing proceeded. Twelve samples of the 1/4" plywood header and 15 samples of the 3/8" header were loaded to 2700 pounds (at least twice the design load), without any evidence of fracture or rupture. The deflection of the header was recorded under a 2700 pound load. The deflection of the header was recorded under a 2700 pound load.

**Capacity of Headers:** In determining the load-carrying capacity of the headers, the deflection under load proved to be more critical than the calculated stress in the header. For the maximum allowable deflection limit is considered, the span length divided by 360, then the deflection of the header cannot exceed 0.333 inches. Under these circumstances, as shown by the performance tests, the maximum permissible concentrated load at the center of the span of the header is:

For header with 1/4" plywood, maximum load = 1200 lbs

For header with 3/8" plywood, maximum load = 1500 lbs

**CAPACITY OF HEADERS (Load at Center of 4-foot Span)**

<table>
<thead>
<tr>
<th>Plywood Type</th>
<th>1/4&quot; Plywood</th>
<th>3/8&quot; Plywood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum load</td>
<td>1200 lbs</td>
<td>1500 lbs</td>
</tr>
</tbody>
</table>

**LIMITATIONS**

The design is designed to be used under a single concentrated load in the center of the span. This load may be due to a truss or a rafter resting at this point. Other loads should not be used.

Do not use the horizontal joint with the nail-glued header systems. The double plate over the solid wall panels is not sufficiently strong to carry the superseded loads of the roof and ceiling structures without excessive deflection.

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**SHALLOW HEADERS FOR SMALL HOMES COUNCIL'S WALL-PANEL FRAMING SYSTEM**

**4'-0" Span**

**INSTRUCTION SHEET #23**

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