



ERECTION MANUAL

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NOTE: SEE LUDWIG STANDARD DETAILS FOR ADDITIONAL INFORMATION



ERECTION MANUAL

SECTION 2. INTRODUCTION

A. PURPOSE

This ERECTION MANUAL is intended to provide Ludwig Builders and Erectors, hereinafter called "Erector" with recommended procedures for properly erecting Ludwig buildings as efficiently as possible.

B. SAFETY

It is the Erector's responsibility to erect the Ludwig building using safe construction practices. The Erector should have an individual at each jobsite that is familiar with the requirements of the Occupational Safety and Health Act (OSHA) and applicable federal, state and local statutes, ordinances, rules and regulations.

C. LIABILITY

Ludwig is not liable for, and does not guarantee the quality of erection, nor does Ludwig assume any responsibility for building defects that may be attributed to improper erection techniques, the negligence of other parties or if the Ludwig building is not installed in strict compliance with the instructions and details shown on Ludwig erection drawings and in this manual.

D. CAUTION

Care should always be exercised when installing roof panels. Oils or other lubricants may be used to facilitate roll forming of the panels. Erector should remove these lubricants or use other means to prevent personnel from slipping during installation of the roof.

The building should be adequately braced at all times. Secure structure with temporary or permanent bracing during erection and at the end of each day.

E. SHIPMENT LIABILITY

1. LUDWIG WILL NOT BE RESPONSIBLE FOR LOSS OR DAMAGE OF ANY MATERIAL SHIPPED WHEN SUCH LOSS OR DAMAGE OCCURS AFTER LUDWIG HAS DELIVERED THE MATERIAL TO THE CARRIER. FILE ALL CLAIMS FOR LOSSES OR DAMAGES IN TRANSIT DIRECTLY WITH THE CARRIER.
2. In order to readily check each shipment, each truckload has a "Bill of Lading". This "Bill of Lading" shows the number of bundles, boxes, etc. that were shipped on each individual truckload. If all items listed on the "Bill of Lading" have been accounted for and are found to be in good condition (no broken bundles, boxes, etc.) the truck can be released as having delivered all items.



ERECTION MANUAL

SECTION 2. INTRODUCTION

(Continued)

E. SHIPMENT LIABILITY (Continued)

3. If the carrier does not deliver all items listed on the "Bill of Lading" or items are found to be damaged, the shortage or damage must be noted in writing on the "Bill of Lading" and a claim must be filed with the carrier within thirty (30) days. Failure to do so voids the claim. The carrier signs for all material listed on the "Bill of Lading" and by doing so acknowledges that he received the material in good condition.

F. SHORTAGE CLAIMS

1. IT IS ESSENTIAL THAT A CLAIM FOR HIDDEN SHORTAGES BE MADE WITH LUDWIG WITHIN FOURTEEN (14) DAYS FROM THE TIME OF UNLOADING AND NOT AS PARTS ARE DISCOVERED MISSING DURING ERECTION.
2. The number of items in each bundle or box must be checked against the shipping list and the packing tags. Because of the probability of pilferage or loss at the jobsite, Ludwig cannot be responsible for a shortage within a bundle or box that has been subject to possible pilferage for an extended period of time.
3. If new parts are required because of shortages, or hidden damage in shipment, contact Ludwig Customer Service and provide the following information:
 - a. Ludwig Job Number
 - b. Part number, description and quantity of each part required and received.
4. Upon receipt of the above information a "Claim Report" will be issued by Ludwig Customer Service. The plant will work from the information provided to replace the necessary parts.
5. If investigation reveals that the parts were omitted from the shipping list by the Ludwig Engineering Department or were not shipped, the parts will be shipped freight prepaid at no cost.
6. If Ludwig's records confirm that the parts were shown on the shipping list and shipped, the parts will be shipped collect.



ERECTION MANUAL

SECTION 2. INTRODUCTION

(Continued)

G. BACK CHARGES

1. All erection work is to be treated as outlined in MBMA Common Industry Practices, Section 6 and in AISC Code of Standard Practice for Steel Buildings and Bridges, Section 7. These sections deal with the correction of errors in situations where the material is not being erected by the manufacturer and is quoted in part:

"Normal erection operations include the correction of minor misfits by moderate amounts of reaming, chipping or cutting, and the drawing of elements into line through the use of drift pins. Errors which cannot be corrected by the foregoing means or which require major changes in member configuration are reported immediately to the owner and fabricator by the erector, to enable whoever is responsible either to correct the error or to approve the most efficient and economic method of correction to be used by others."

2. Only Ludwig authorized back charges for factory errors will be accepted. Such authorizations must be obtained by telephone, PRIOR TO START OF CORRECTIVE WORK, from Ludwig Customer Service.

When seeking such authorization, the Erector should have the complete information and accurate estimates of time and material costs required to repair factory errors.

All telephone calls must be confirmed by a complete "Claims Report" with photographs and samples of errors, if possible, to insure prompt settlement of backcharges.

NO BACK CHARGE WILL BE HONORED UNLESS IT HAS LUDWIG'S PRIOR APPROVAL.

H. COLOR MATCH

Ludwig is not responsible for an exact color match between the replacement parts or new additions to older existing buildings. Exposure to the weather and dirt accumulations will cause differences between old, new, exposed and unexposed paint finishes. Varying degrees of color change must be expected on all paint finishes.



ERECTION MANUAL

SECTION 2. INTRODUCTION

(Continued)

I. WET STORAGE STAIN

1. All metal panels, galvanized, GalvalumeTM, and prepainted, are subjected to some degree of localized discoloration or stain when they are exposed to water trapped between closely fitted surfaces. Extreme precautions are taken during Ludwig fabricating procedures to insure that all panel stock is dry when received, dry during storage and dry during fabrication. When these panels leave the Ludwig plant, they are of prime quality. However, due to climatic conditions, water can be formed from humid air by condensation between the finished sheets. Also, if after leaving the Ludwig plant they are exposed to rain, water can be trapped between the finished panels. The discoloration, caused by trapped moisture, is known as Wet Storage Stain.
2. Claims for wet storage stain will not be honored by Ludwig. Claims for wet storage stain must be placed with the carrier or persons who allowed the panels to become wet, resulting in discoloration.
3. The stain on panels is usually superficial and has essentially no effect on their service life. If, however, the trapped moisture is permitted to remain on the panel, the attack may become severe, reducing the effective service life of the panel. Therefore, it is imperative that all panels be inspected for moisture upon receipt of the order. If moisture is present, the panels should be dried at once. When stored in a warehouse or in the field prior to application to the building, do not permit moisture from the weather, condensation or from other sources to remain between the panels. Under such circumstances, it has been found to be effective to stand the formed panels on end and on wood blocks, separating the sheets to allow moisture to drain off and air to circulate. Any method by which the panels are separated and moisture can evaporate and air circulate will prevent discoloration.

J. PROTECTION OF PRIMER

1. Structural parts are factory painted with red oxide primer. If water is allowed to remain for extended periods in bundles of primed parts, such as girts, purlins, endwall columns, etc., the oxide can be leached out, the red pigment will fade, and the paint will gradually soften, thus reducing the bond to the steel.



ERECTION MANUAL

SECTION 2. INTRODUCTION

(Continued)

J. PROTECTION OF PRIMER (Continued)

2. Upon receipt of a shipment, Erector should loosen all bundles of primed parts and stand them on an angle to allow trapped water to drain away and permit air circulation for drying. This will prevent leaching, fading, and paint softening. Also puddles of water should not be permitted to remain in columns or rafters lying down since the same action on the primer will occur.
3. All primer should be touched up as required before erection. If a finish interior paint is required by the customer, final painting should be done over the primer after erection. Since red oxide paint is a primer and not intended as permanent protection against weather, it is recommended that all primed steel members that are exposed to the weather be given a field applied coat of an exterior finish paint.

K. PREPAINTED TOUCH-UP

1. Ludwig furnishes adequate touch-up paint for all prepainted colors supplied. Erector must use extreme care to touch-up any scratched or damaged area with the smallest, practical brush.
2. Avoid coating any excess areas around the scratched or damaged areas, since the fading rate of the touch-up paint differs from prepainted materials.

L. INSULATION STORAGE

If the building is to be insulated, the faced insulation should be stored prior to installation in accordance with the "Laminated Fiberglass Insulation Producers Association" Insulation Bulletin No 1, "Recommended Storage Procedure of Faced Insulation at the Jobsite" which is available from the manufacturer or supplier of the insulation.



ERECTION MANUAL

SECTION 3. TOOLS AND EQUIPMENT

The following list of tools and equipment is considered necessary for each erection phase of most Ludwig Buildings. Actual equipment required may vary due to differences in building type and size, jobsite conditions, and erection personnel. This list is intended to serve as a recommendation only, and should not be used as a limitation to your inventory of erection equipment.

PHASE I: UNLOADING STEEL FROM TRUCK

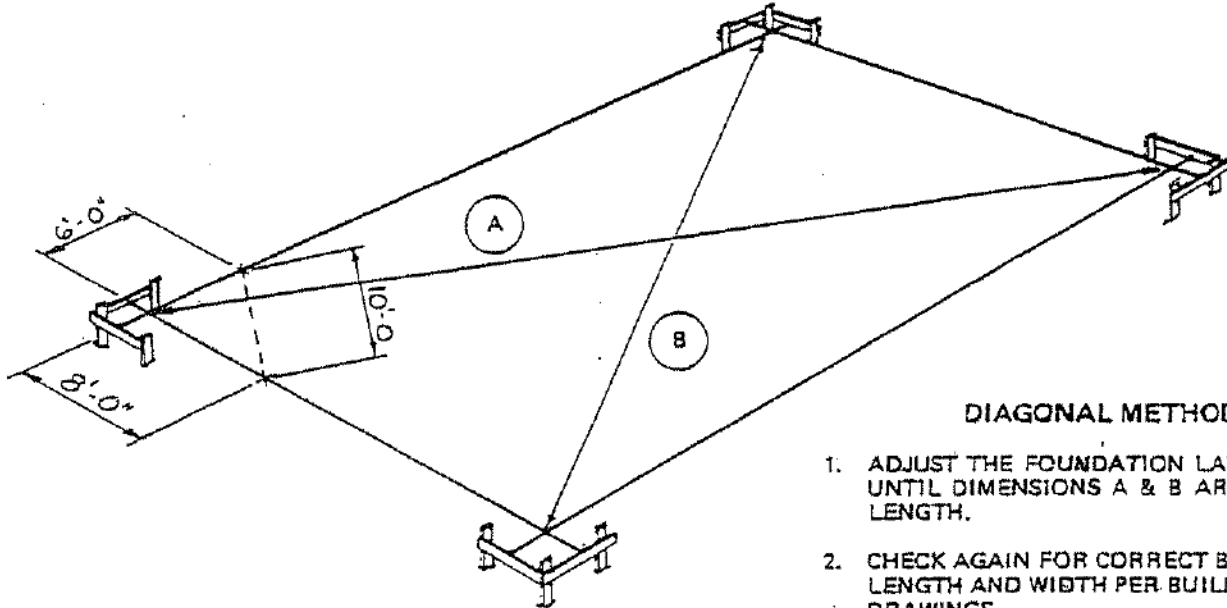
- A. Fork lift or crane of adequate size
- B. Slings, chokers, spreader bars and ropes
- C. 4 x 4 Dunage for stacking steel on

PHASE II: ERECTION OF STRUCTURAL MEMBERS

- A. Gas powered generator or power access.
- B. Cutting torch set
- C. Fork lift or crane of adequate size
- D. Slings, chokers, spreader bars, and ropes
- E. Power impact wrench with (socket set)
- F. Roto hammer (concrete drill)
- G. Electric drills 1/2" and 1/4" drive
- H. 1/2" Drive ratchets & (deep socket set)
- I. Crescent wrenches (heavy duty)
- J. Boxed and open-end wrenches
- K. Vice-grips
- L. Spudwrenches, pry bars, and drift-pins
- M. Work platforms, scaffolding, and ladders
- N. Safety belts and hard hats and safety goggles
- O. Levels, framing, try squares, and plumb bob
- P. Steel measuring tapes, 30' and 100'
- Q. Tool pouches
- R. Electrical extension cords
- S. Screw guns high speed with 5/16" x 3/8" magnetic sockets
- T. Hammers, shop, sledge and rubber
- U. Comm-a-long two or three thousand lb.
- V. 20' Tow chain with hooks

PHASE III: SHEET METAL INSTALLATION

- A. Sheet metal nibblers
- B. Screw guns with 5/16" and 3/8" magnetic sockets
- C. Skill Saw
- D. Sheet metal cutters (left hand, right hand, & straight)
- E. Pop rivet guns
- F. Builders level 6'
- G. Plumb bob, chalk line, and nylon string
- H. Caulking guns
- I. Brooms, and dustpans

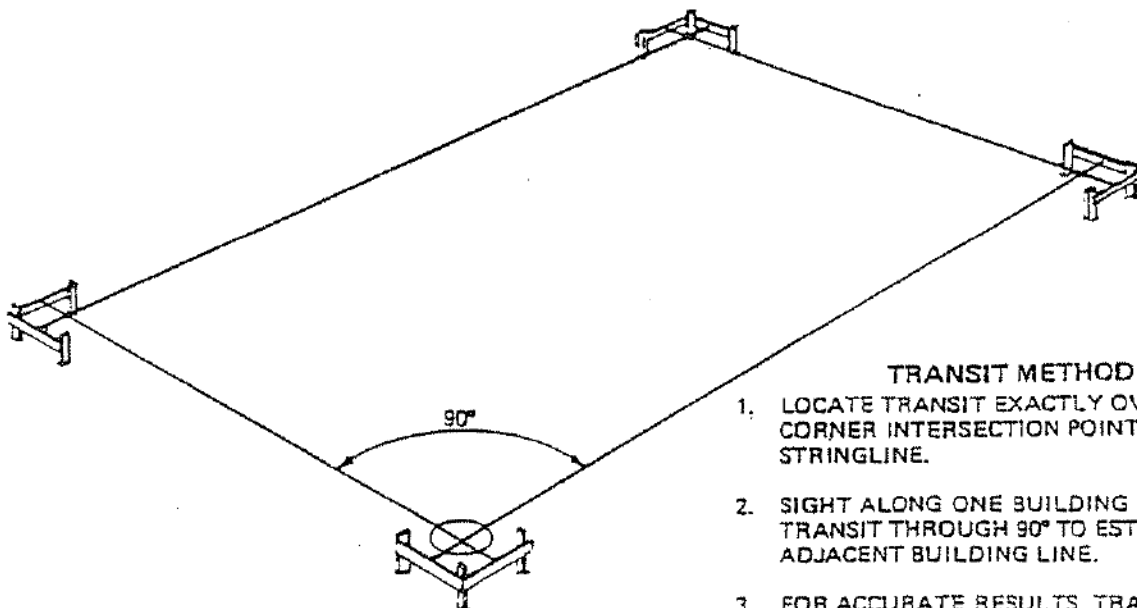


DIAGONAL METHOD

1. ADJUST THE FOUNDATION LAYOUT LINES UNTIL DIMENSIONS A & B ARE EQUAL IN LENGTH.
2. CHECK AGAIN FOR CORRECT BUILDING LENGTH AND WIDTH PER BUILDING DRAWINGS.

NOTE:

WITH EITHER METHOD, USE A TRANSIT TO SET THE TOP ELEVATION OF ALL BATTER BOARDS AT THE SAME EXACT ELEVATION. USUALLY THIS ELEVATION IS THE REQUIRED FINISHED CONCRETE FLOOR SLAB ELEVATION.



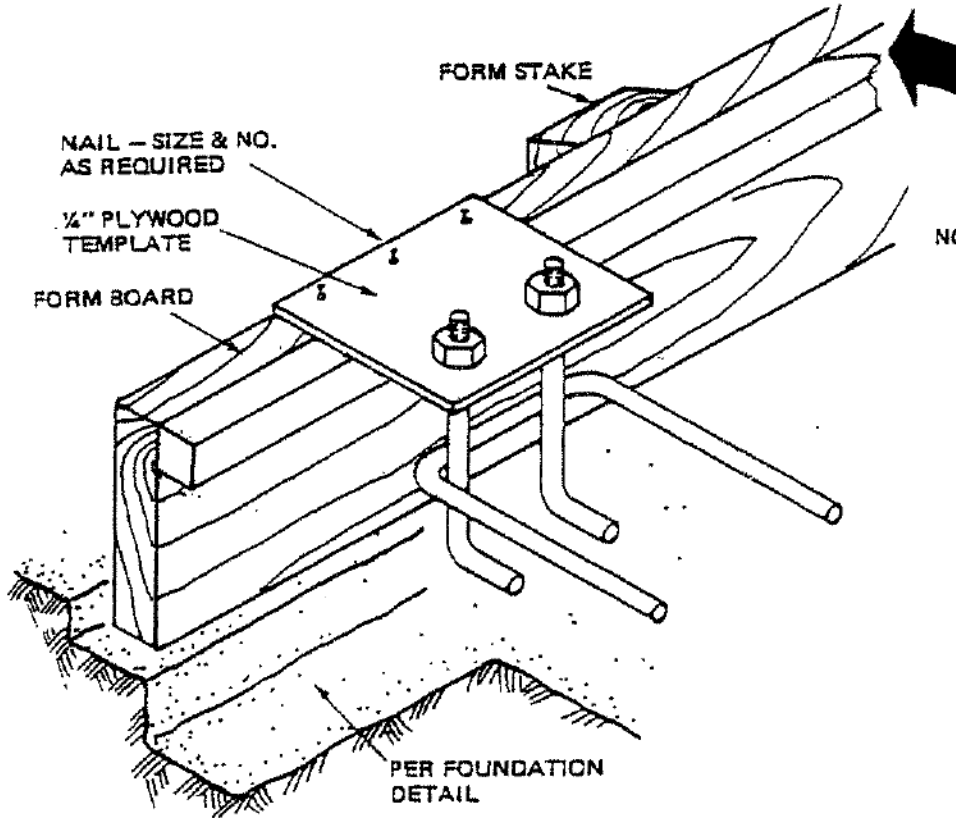
TRANSIT METHOD

1. LOCATE TRANSIT EXACTLY OVER CORNER INTERSECTION POINT OF STRINGLINE.
2. SIGHT ALONG ONE BUILDING LINE, SWING TRANSIT THROUGH 90° TO ESTABLISH ADJACENT BUILDING LINE.
3. FOR ACCURATE RESULTS, TRANSIT MUST BE EXACTLY LEVEL AND IN PERFECT WORKING CONDITION.
4. CHECK DIAGONAL DIMENSIONS AS SHOWN ABOVE.



CONCRETE ANCHORS- ANCHOR BOLTS

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BRACE FORMS SUFFICIENTLY TO MAINTAIN B.L. TO B.L. DIMENSIONS AS SPECIFIED ON DRAWINGS.

NOTES:

ANCHOR BOLT SIZE AND DIMENSIONS ALONG WITH DIMENSIONS (X) (Y) & (Z) WILL BE SHOWN ON A DETAILED ANCHOR BOLT LAYOUT.

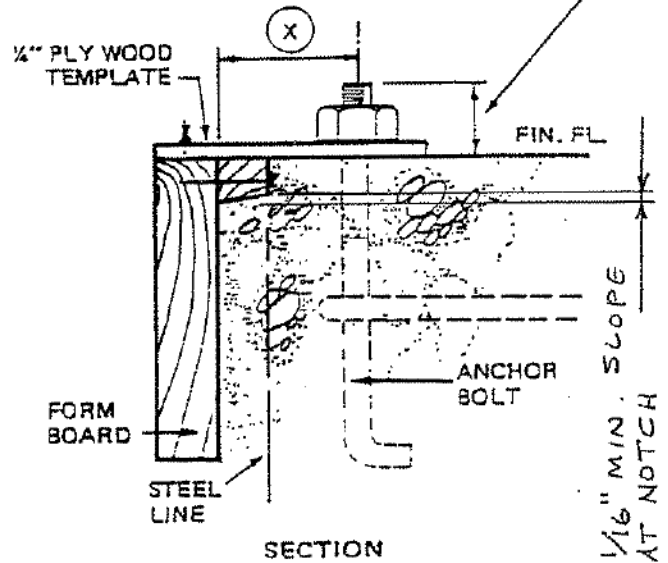
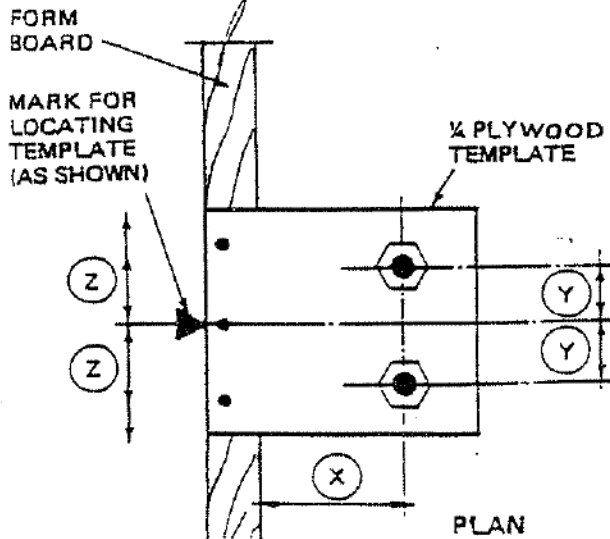
NOTE:

GREASE BOLT THREADS FOR PROTECTION DURING POURING OF CONCRETE

IMPORTANT:

ALL REINFORCING STEEL FOR FOUNDATION WALLS, FOOTINGS, TIE RODS, HAIR PINS, WIRE MESH OR ANY OTHER STEEL USED SPECIFICALLY FOR CONCRETE APPLICATION SHALL BE DESIGNED AND FURNISHED BY OTHERS. ALL REINFORCING STEEL SHOWN IN THIS MANUAL IS STRICTLY FOR ILLUSTRATIVE PURPOSE ONLY.

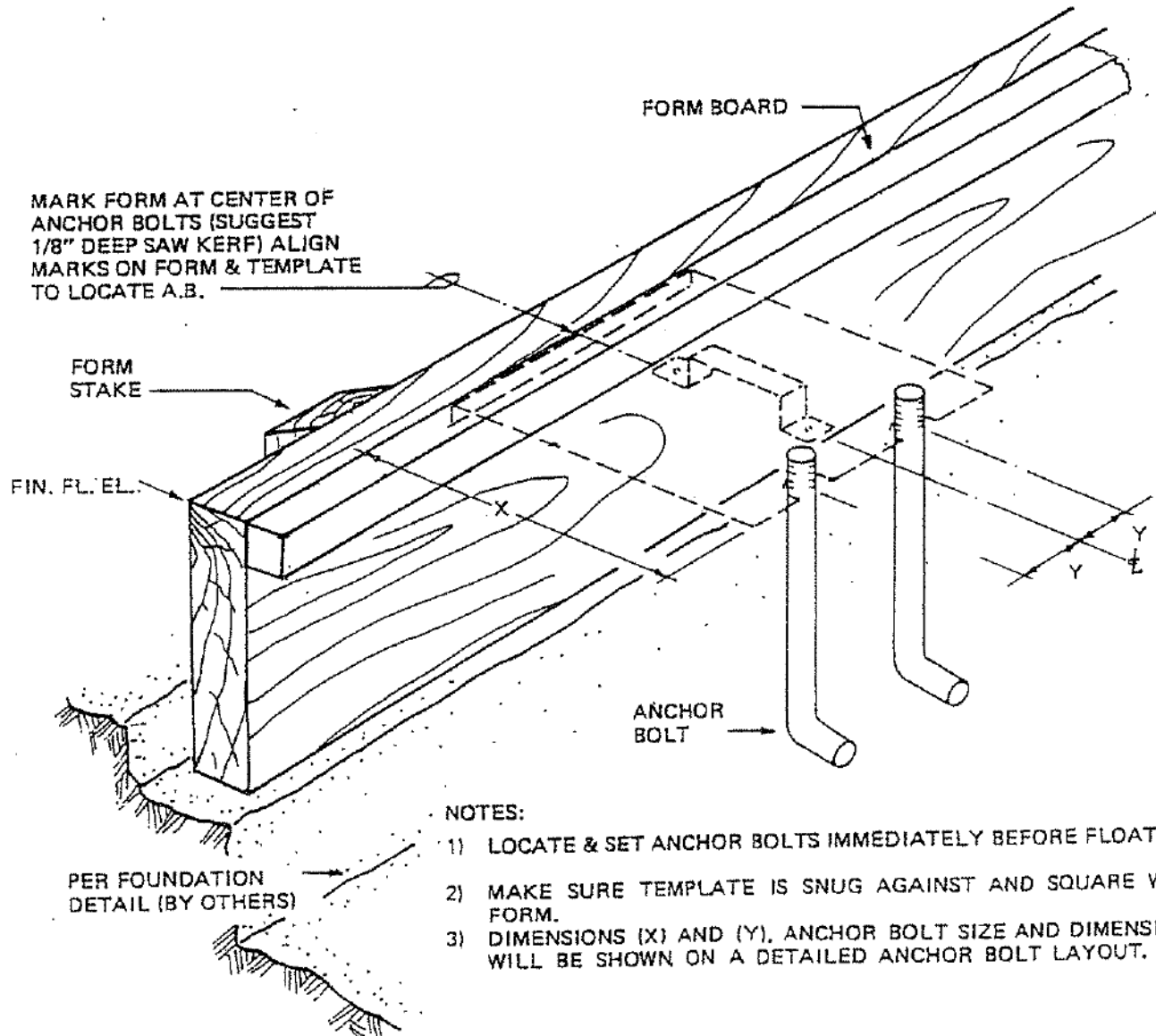
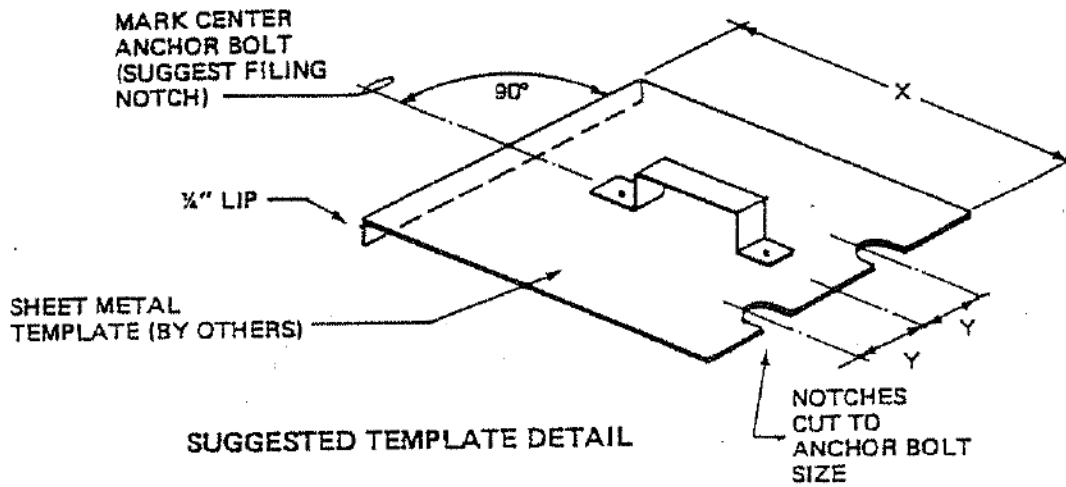
PROJECTION DETERMINED BY ANCHOR BOLT SETTING PLAN



1/16" MIN. SLOPE AT NOTCH

CONCRETE ANCHORS- ANCHOR BOLTS (ALTERNATE METHOD)

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COMPONENTS- UNLOADING PROCEDURES

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ARRIVAL AT THE BUILDING SITE

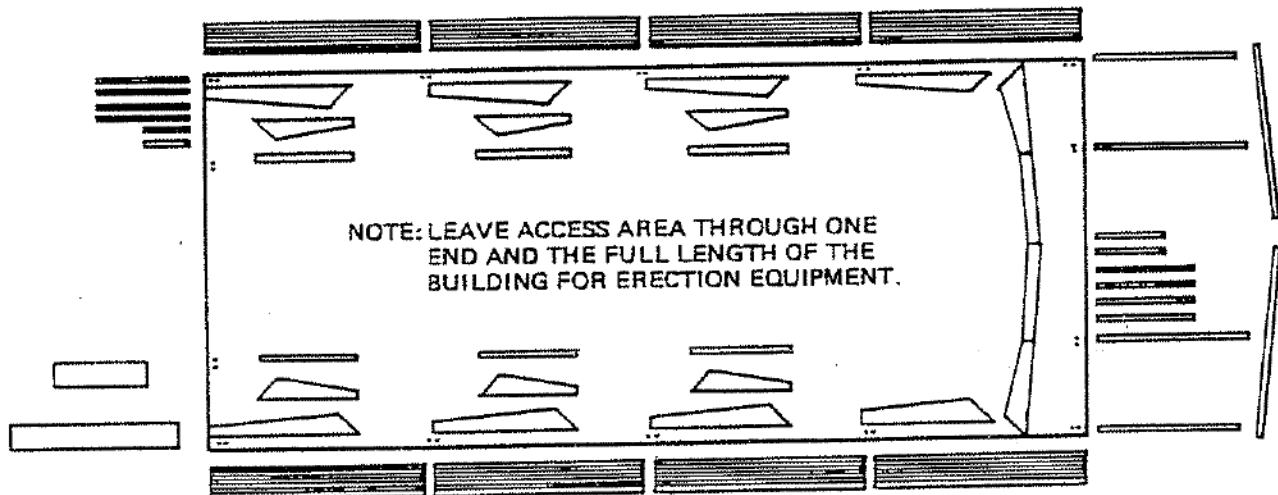
WHEN FABRICATION IS COMPLETE, SHIPMENT IS MADE TO THE BUILDING SITE. ALL E.B.L. BLDG. COMPONENTS ARE CAREFULLY BUNDLED, CRATED AND INSPECTED TO PREVENT DAMAGE DURING TRANSPORTATION. THE TRANSPORTATION COMPANY IS RESPONSIBLE FOR DELIVERING THESE COMPONENTS UN-DAMAGED.

WHEN THE SHIPMENT IS RECEIVED, CHECK EACH ITEM AGAINST THE PROPER SHIPPING DOCUMENT. IF A SHORTAGE IS DISCOVERED, HAVE THE TRANSPORTATION AGENT MAKE A NOTATION TO THAT EFFECT, ON YOUR BILL.

EXAMINE YOUR SHIPMENT CAREFULLY FOR DAMAGE. IF ANY DAMAGE IS FOUND, BE SURE THE AGENT MAKES A DAMAGE NOTATION ON THE BILL BEFORE ACCEPTING IT.

IF DAMAGE IS CONCEALED UNTIL CRATING OR PACKING IS REMOVED, CALL YOUR AGENT AT ONCE FOR AN INSPECTION AND OBTAIN AN INSPECTION MEMO COVERING CONCEALED DAMAGE.

UNLOADING AND MATERIAL LAYOUT



AS THE BUILDING MATERIAL IS UNLOADED, IT SHOULD BE PLACED IN AND AROUND THE BUILDING SITE NEAR THE PLACE WHERE IT WILL BE USED. WHILE EACH JOB WILL VARY ACCORDING TO THE SIZE OR SITE CONDITIONS, THE ABOVE LAYOUT TYPIFIES AN ARRANGEMENT WHICH OFFERS CONVENIENCE AND ACCESSIBILITY DURING ASSEMBLY.

RIGID FRAME COLUMNS ARE LAID IN POSITION FOR RAISING. RAFTERS ARE STACKED FOR SUB-ASSEMBLY AND EASILY ACCESSIBLE FOR SETTING.

GIRTS, PURLINS, EAVE STRUTS AND BRACES ARE DIVIDED ACCORDING TO THE REQUIREMENTS OF EACH BAY. NESTED PARTS SHOULD BE SEPARATED AND BLOCKED.

ENDWALLS ARE LAID OUT FOR EACH END.

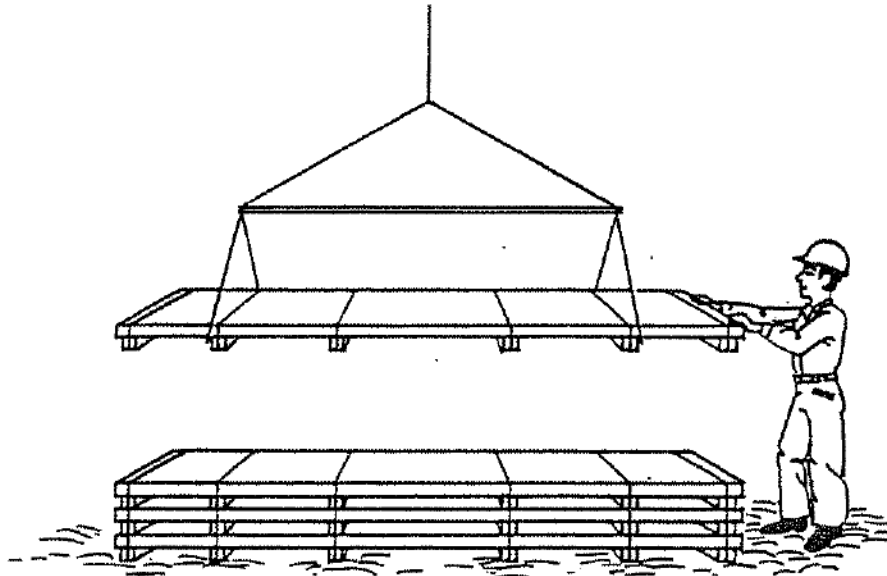
SMALL COMPONENTS (NUTS AND BOLTS, CLIPS, BRACE RODS, FASTENERS, ETC.) ARE ASSEMBLED IN A GIVEN AREA AND CONVENIENT TO ALL PARTS OF THE BUILDING.

WALL AND ROOF SHEETS AND OTHER COMPONENTS, WHICH WILL NOT BE USED IN THE INITIAL STAGE OF ERECTING THE STEEL, ARE PLACED TO THE OUTSIDE ON BOARDS AND COVERED TO PROTECT THEM FROM THE WEATHER.

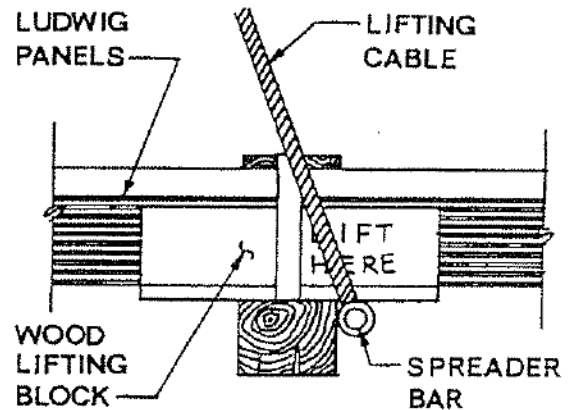
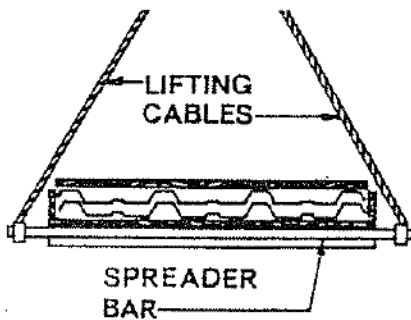


COMPONENTS- UNLOADING PROCEDURES

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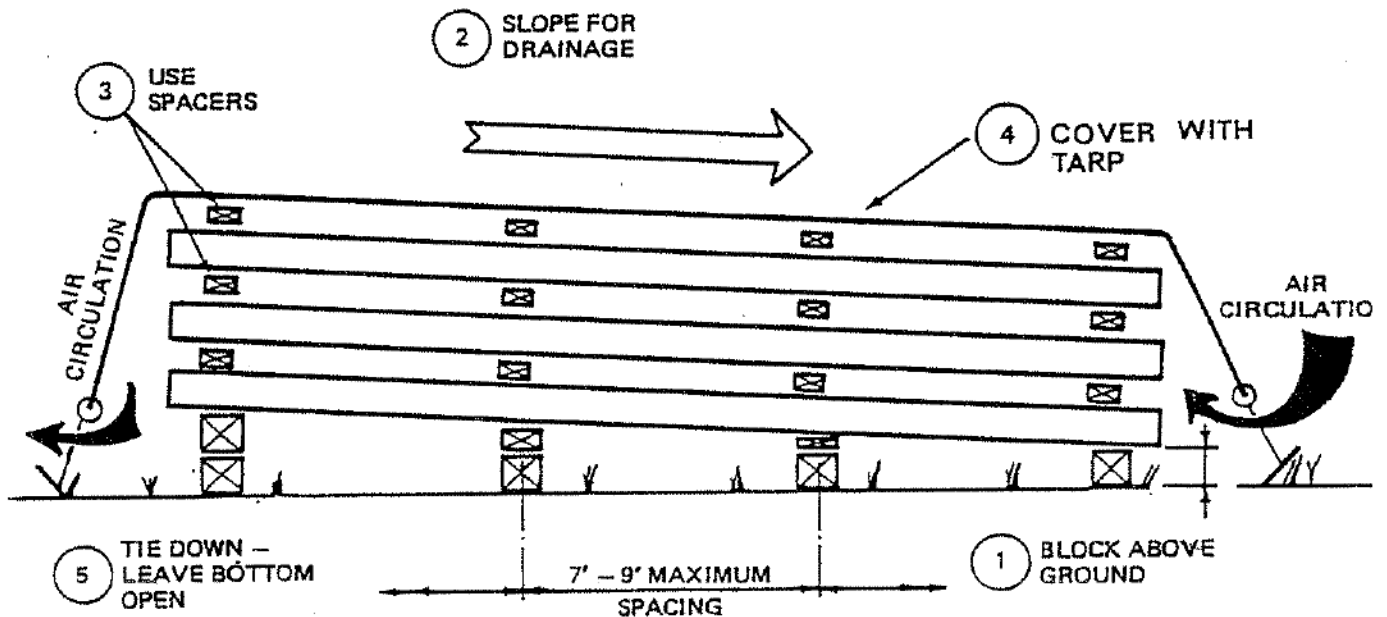


INSERT SPREADER BARS UNDER THE BUNDLES AT THE PLACES MARKED "LIFT HERE" AND RAISE THE BUNDLES WITH YOUR CRANE. THIS WILL KEEP THE PANELS BALANCED AND HELP TO PREVENT THEM FROM BEING DAMAGED WHILE RAISING.



CAUTION! NEVER HOOK INTO STEEL WRAPPING BANDS WHEN LIFTING BUNDLES.

IMPORTANT—READ THIS



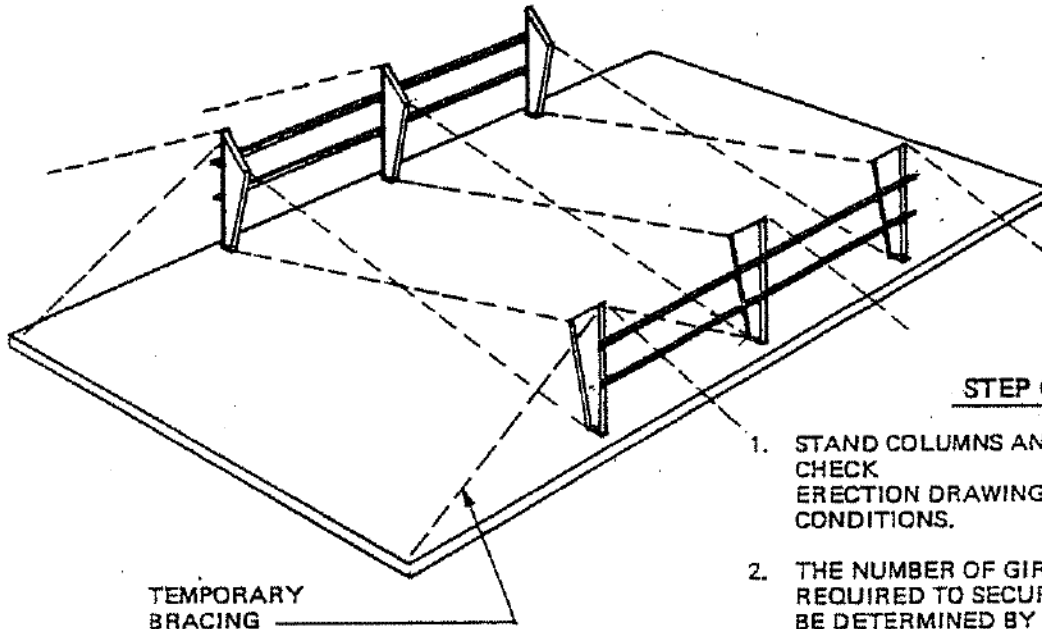
RECOMMENDED JOBSITE STORAGE & PROTECTION FOR WALL & ROOF SHEETING

1. BLOCK ABOVE GROUND TO KEEP OUT WATER.
2. SLOPE BUNDLES FOR DRAINAGE.
3. STACK SHEETING WITH SPACERS BETWEEN BUNDLES.
4. COVER WITH TARP TO PROTECT FROM RAIN OR SNOW.
5. TIE DOWN COVER ENDS AWAY FROM STACK TO PERMIT FREE AIR MOVEMENT. DO NOT WRAP UNDER OR RESTRICT AIR MOVEMENT.



STRUCTURAL FRAMING ERECTION PROCEDURES

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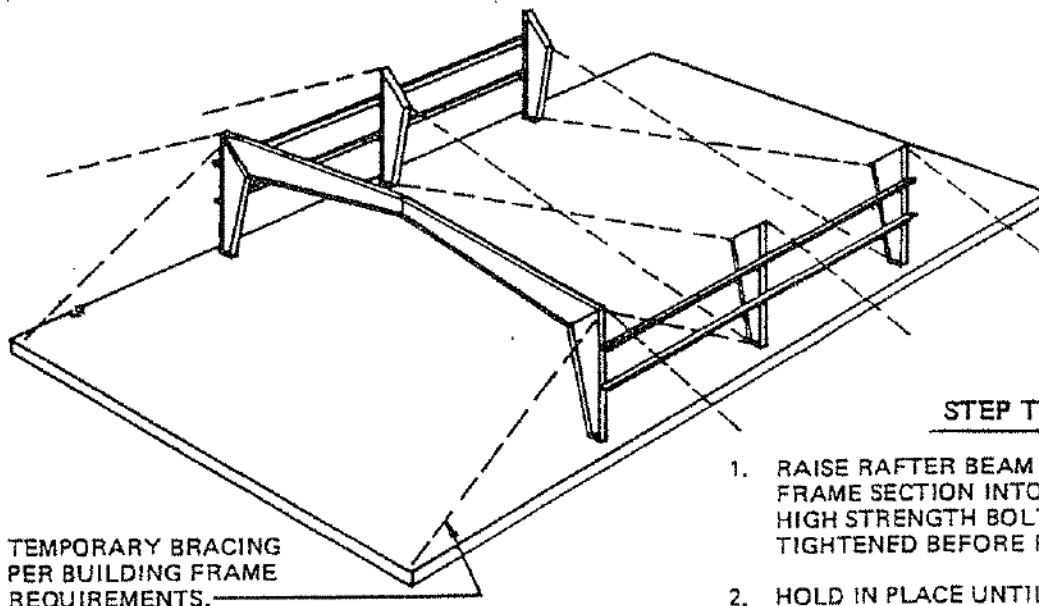
NOTE:
ON TALLER BUILDINGS,
ENSURE THAT ALL
COLUMNS ARE ERECTED
JUST PRIOR TO FRAME
AND SECONDARY
FRAMING ERECTION.

STEP ONE

1. STAND COLUMNS AND ATTACH GIRTS. CHECK ERECTION DRAWINGS FOR SPECIAL CONDITIONS.
2. THE NUMBER OF GIRTS AND BRACING REQUIRED TO SECURE COLUMNS SHALL BE DETERMINED BY ERECTOR.

NOTE:

1. PLAN TO ERECT A BRACED BAY FIRST. USUALLY THIS IS THE FIRST INTERIOR BAY FROM EITHER END OF THE BUILDING.
2. REFER TO A.I.S.C. MANUAL OF STEEL CONSTRUCTION FOR DEFINITION OF "TURN-OF-NUT" METHOD OF TIGHTENING BOLTS.
3. BOLT IN PLACE AS MANY CLIPS AND FLANGE BRACES AS POSSIBLE BEFORE RAISING FRAME TO REDUCE IN-THE-AIR ERECTION TIME.
4. IT IS THE RESPONSIBILITY OF THE ERECTOR TO PROVIDE TEMPORARY ERECTION BRACING UNTIL THE STRUCTURE IS COMPLETE.



STEP TWO

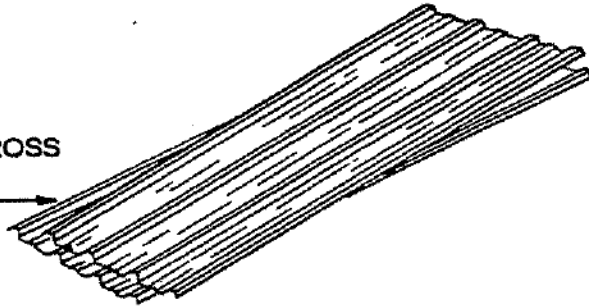
1. RAISE RAFTER BEAM AND HAUNCH FRAME SECTION INTO PLACE. ALL HIGH STRENGTH BOLTS ARE TO BE TIGHTENED BEFORE RAISING.
2. HOLD IN PLACE UNTIL THIS SECTION IS SECURED TO COLUMNS AND TEMPORARY BRACING IS TIED OFF TO HOLD FRAME IN PLACE.



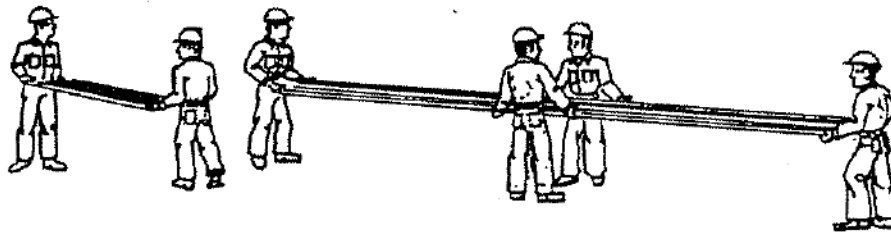
COMPONENT-HANDLING PROCEDURES

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STACK PANELS IN SLIGHTLY CRISS CROSS PATTERNS IF THEY GET WET

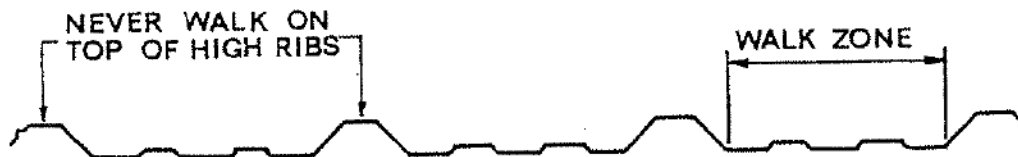


IF PANELS ARRIVE WET OR DAMP, UNBUNDLE AND DRY THEM AT ONCE. THEN STACK THEM AND DRY THEM IN SMALL STACKS WITH WOODEN STRIPS BETWEEN PANELS OR IN A SLIGHTLY CRISS CROSS PATTERN TO ALLOW AIR CIRCULATION. ALWAYS SLOPE PANELS FOR DRAINAGE.

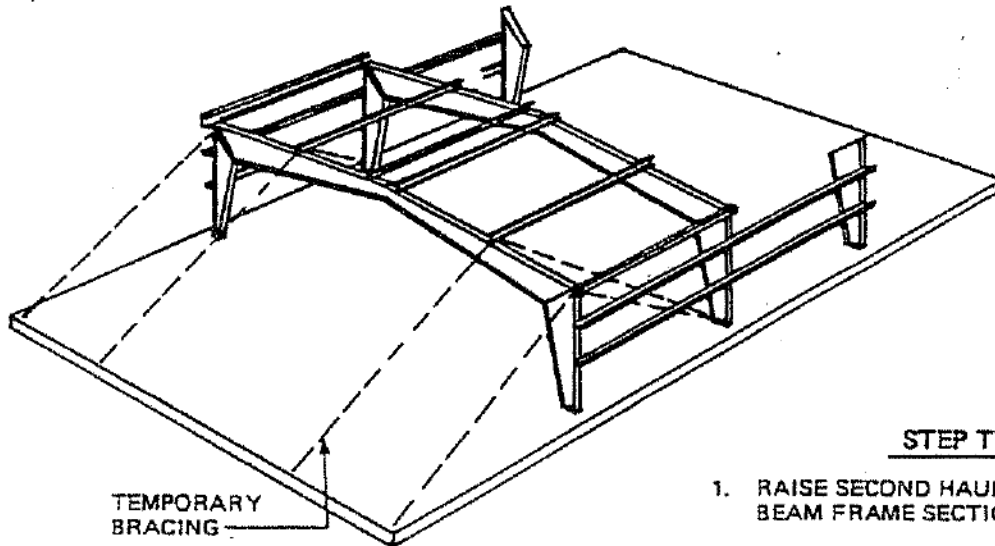


MOST PANELS CAN EASILY BE CARRIED BY TWO MEN. EXTRA LONG PANELS MUST HAVE ADDITIONAL SUPPORT AT MID POINT TO PREVENT EXCESSIVE BENDING.

AVOID DENTING OR SCRATCHING PANELS THROUGH ABUSIVE HANDLING.



CAUTION ERECTORS NOT TO USE SHOES WITH HARD SOLES OR HEELS. NEVER WALK ON TOP OF HIGH RIBS WHILE ON THE GROUND OR ON THE ROOF.

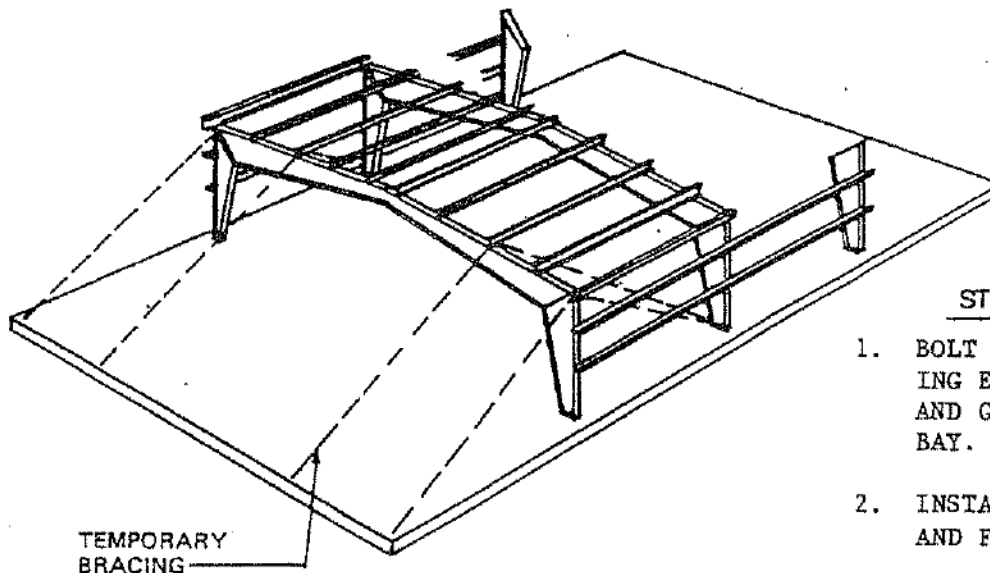


STEP THREE

1. RAISE SECOND HAUNCH AND RAFTER BEAM FRAME SECTION.
2. HOLD IN PLACE UNTIL THIS SECTION IS BOLTED TO COLUMNS AND PEAK PURLINS HAVE BEEN ATTACHED.

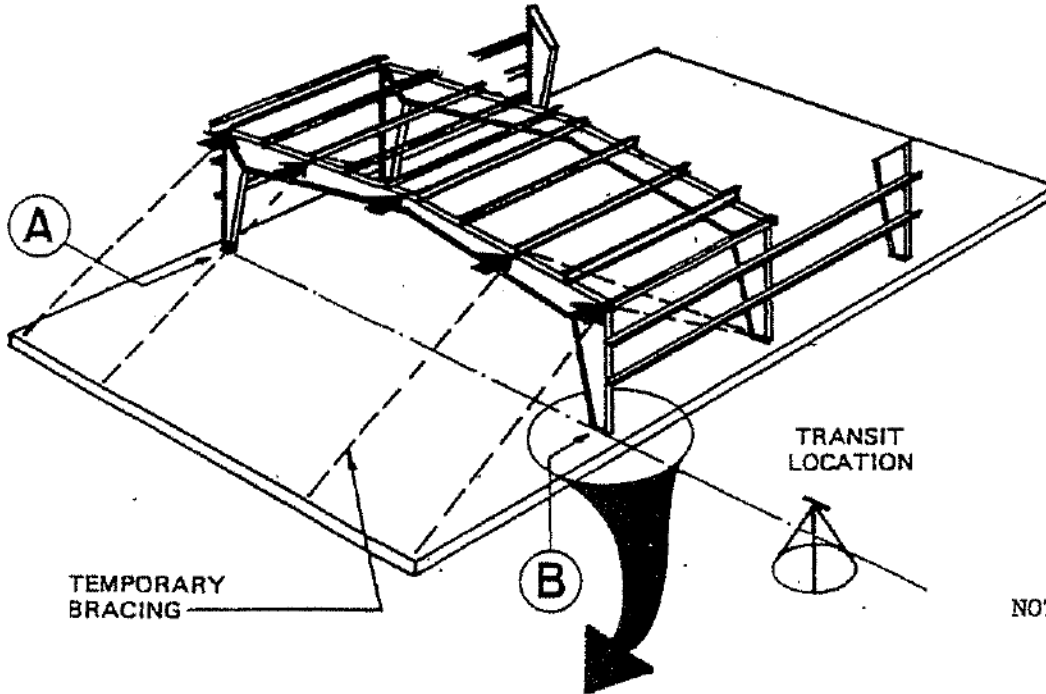
NOTE:

IT IS THE RESPONSIBILITY OF THE ERECTOR TO PROVIDE ADEQUATE TEMPORARY BRACING.

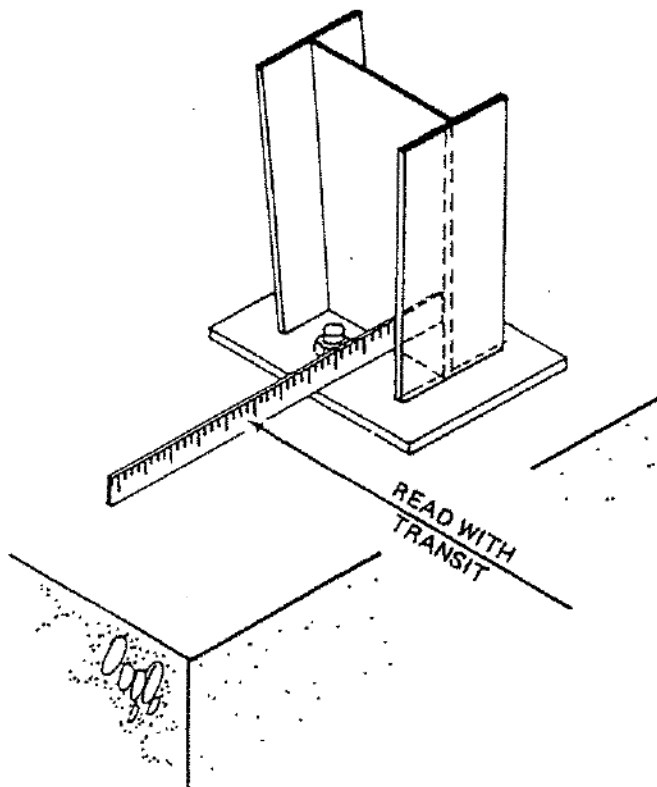


STEP FOUR

1. BOLT IN PLACE ALL REMAINING EAVE MEMBERS, PURLINS AND GIRTS OF THE BRACED BAY.
2. INSTALL BRACE CABLES, RODS AND FLANGE BRACES.
3. SQUARE AND PLUMB BRACED BAY.

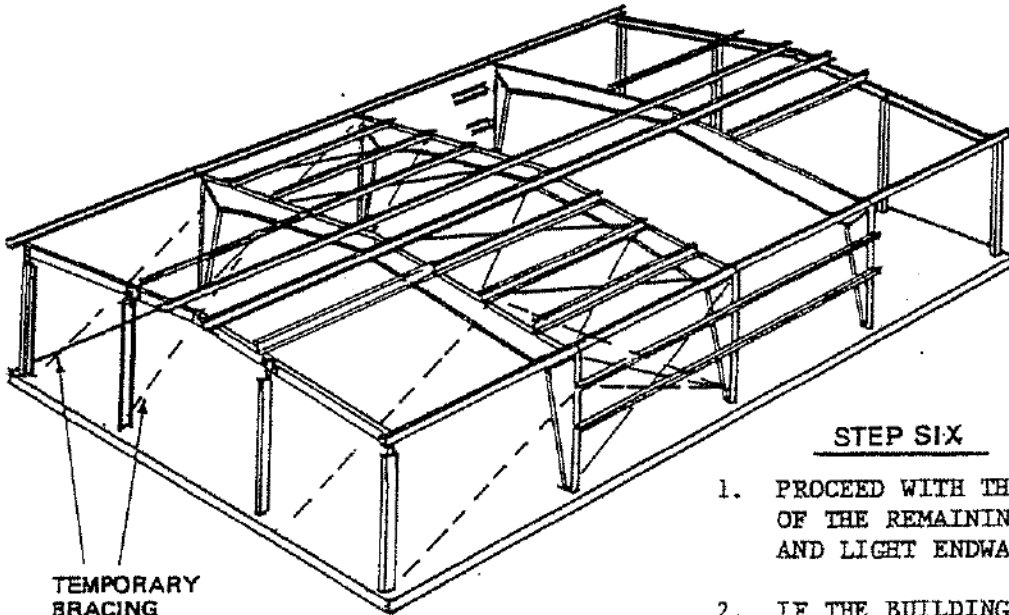


NOTE: A 6' CARPENTER'S LEVEL MAY BE USED TO CHECK PLUMB OF COLUMNS.



STEP FIVE

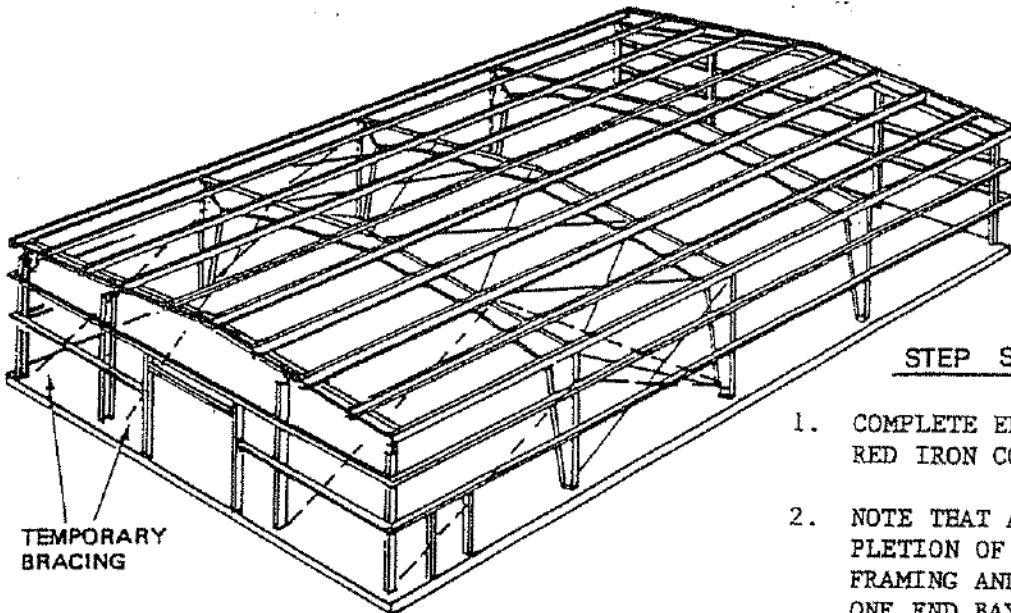
1. LOCATE TRANSIT AS SHOWN ABOVE (IN THIS PARTICULAR CASE SLIGHTLY TO THE LEFT OF THE FIRST RIGID FRAME).
2. MAKE SURE TRANSIT IS PERFECTLY LEVEL.
3. ROTATE TRANSIT UNTIL YOU GET THE SAME EXACT TAPE READING AT POINTS A & B (BASE OF COLUMN, OUTSIDE OF WEB - SEE DETAIL).
4. LOCK HORIZONTAL ROTATION OF TRANSIT.
5. ADJUST CABLE OR ROD BRACING UNTIL THE TAPE READING AT POINTS A & B IS OBTAINED AT ALL POINTS INDICATED ON ABOVE SKETCH - TAKE ALL READINGS FROM OUTSIDE FACE OF WEB.



NOTE: REMOVE TEMPORARY BRACING AFTER ALL PANELING HAS BEEN INSTALLED.

STEP SIX

1. PROCEED WITH THE ERECTION OF THE REMAINING FRAMES AND LIGHT ENDWALLS.
2. IF THE BUILDING LENGTH DOES NOT EXCEED THE LENGTH SHOWN IN SKETCH, ONLY EAVE MEMBERS AND PEAK PURLINS MAY BE USED TO STABILIZE FRAMES AND LIGHT ENDWALLS - THIS COULD SAVE VALUABLE CRANE TIME.

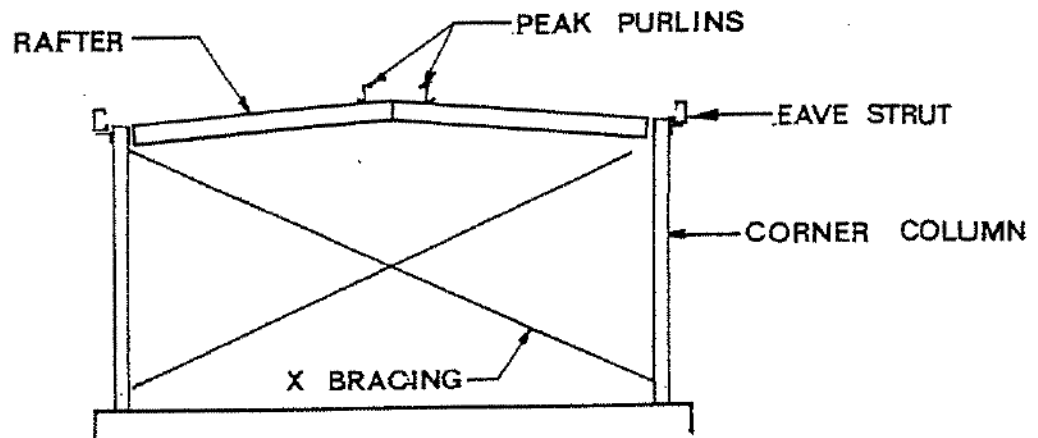


STEP SEVEN

1. COMPLETE ERECTION OF ALL RED IRON COMPONENTS.
2. NOTE THAT AFTER THE COMPLETION OF ALL SECONDARY FRAMING AND PLUMBING IN ONE END BAY, ATTACHMENT OF WALL PANELS MAY COMMENCE AND BE WORKED IN CONJUNCTION WITH THE COMPLETION OF RED IRON.

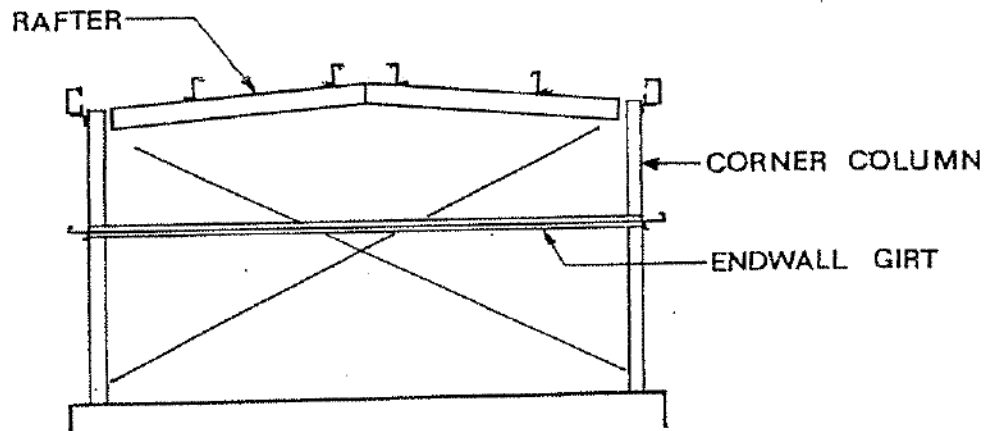
P. M. END FRAME ERECTION PROCEDURE 20' & 25' SPAN

SECTION NO.	EM-1-5
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DATE	8-14-89'



STEP ONE:

1. ERECT BOTH CORNER COLUMNS. MAKE SURE ALL CLIPS ARE ATTACHED.
2. HOIST RAFTER INTO PLACE AND BOLT TO CORNER COLUMN CLIPS.
3. STILL SUPPORTING RAFTER, BOLT IN PLACE PEAK PURLINS AND EAVE STRUTS.
4. ATTACH REQUIRED X-BRACING TO THE END FRAME AND HAND TIGHTEN.



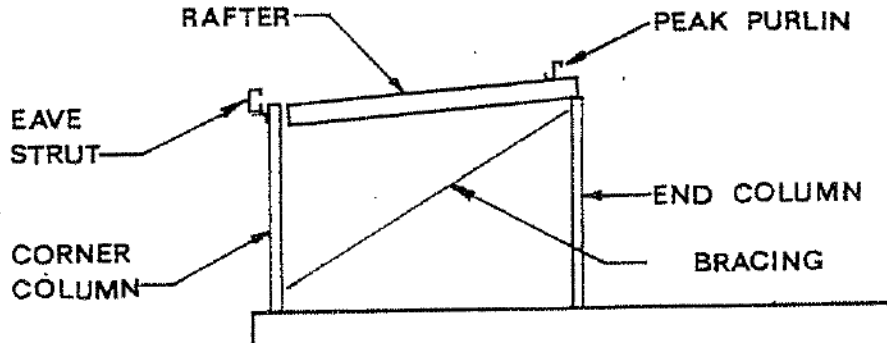
STEP TWO:

1. BOLT IN PLACE ALL REMAINING PURLINS AND GIRTS.
2. SQUARE AND PLUMB END BAY.



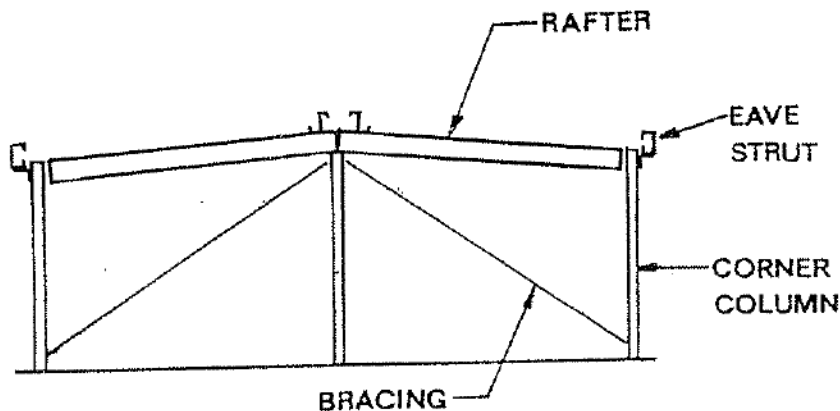
P. M. END FRAME ERECTION PROCEDURE MULTIPLE SPAN

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STEP ONE

1. ERECT ONE CORNER COLUMN AND THE END COLUMN. MAKE SURE ALL CLIPS ARE ATTACHED.
2. HOIST FIRST RAFTER INTO PLACE AND BOLT TO CLIPS.
3. STILL SUPPORTING RAFTER, BOLT IN PLACE ONE EAVE STRUT AND PEAK PURLIN.
4. ATTACH REQUIRED X-BRACING TO THE END FRAME AND HAND TIGHTEN.



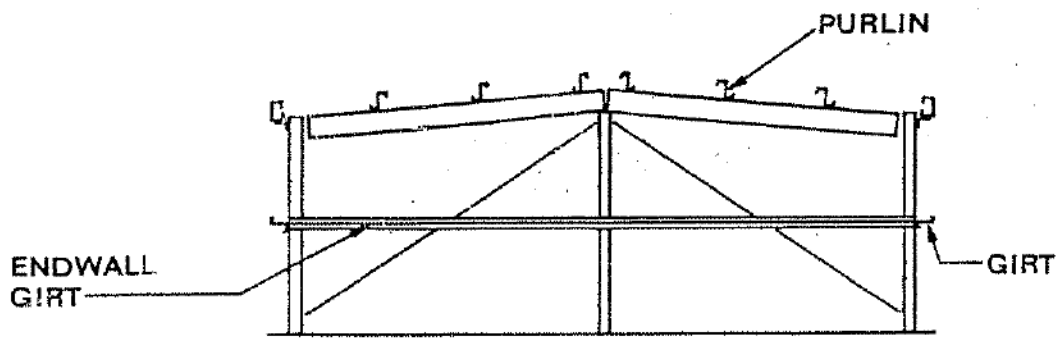
STEP TWO

1. ERECT OTHER CORNER COLUMN, WITH CLIPS ATTACHED.
2. HOIST SECOND RAFTER INTO PLACE AND BOLT TO CLIPS.
3. STILL SUPPORTING RAFTER, BOLT IN PLACE REMAINING EAVE STRUT AND PEAK PURLIN.
4. ATTACH REMAINING X-BRACING TO THE END FRAME AND HAND TIGHTEN.



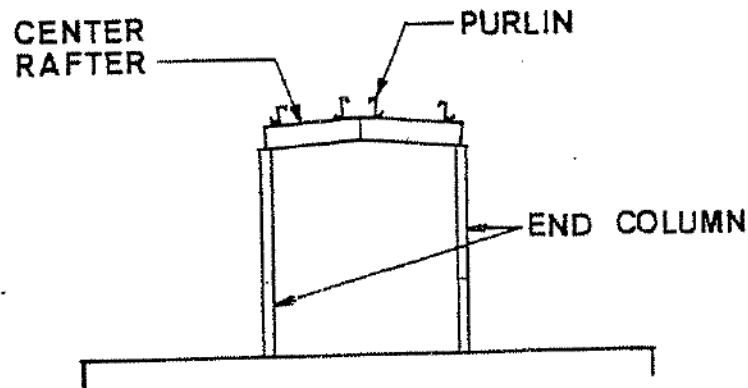
P. M. END FRAME ERECTION PROCEDURE MULTIPLE SPAN

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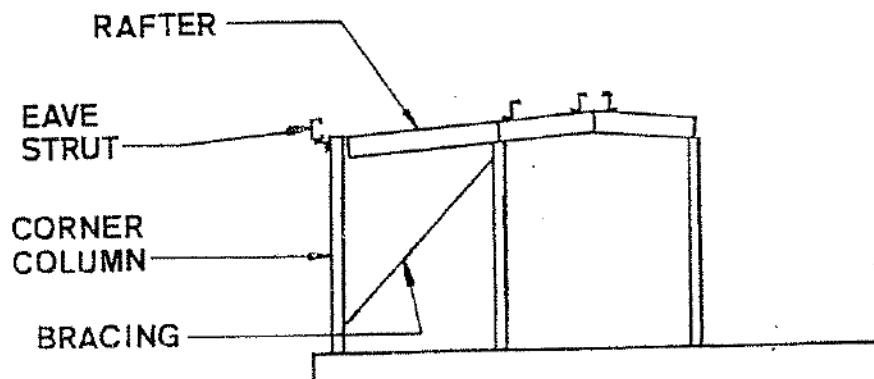
STEP THREE

1. BOLT IN PLACE ALL REMAINING PURLINS AND GIRTS.
2. SQUARE AND PLUMB END BAY.



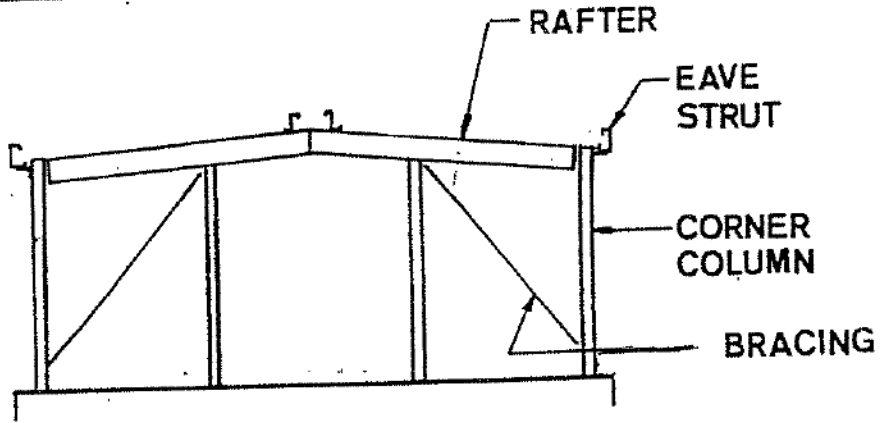
STEP ONE

1. ERECT BOTH END COLUMNS.
2. HOIST CENTER RAFTER INTO PLACE AND BOLT TO END COLUMN CLIPS.
3. STILL SUPPORTING RAFTER, BOLT IN PLACE PEAK PURLINS AND ANY OTHER PURLINS NECESSARY TO SUPPORT FRAME.



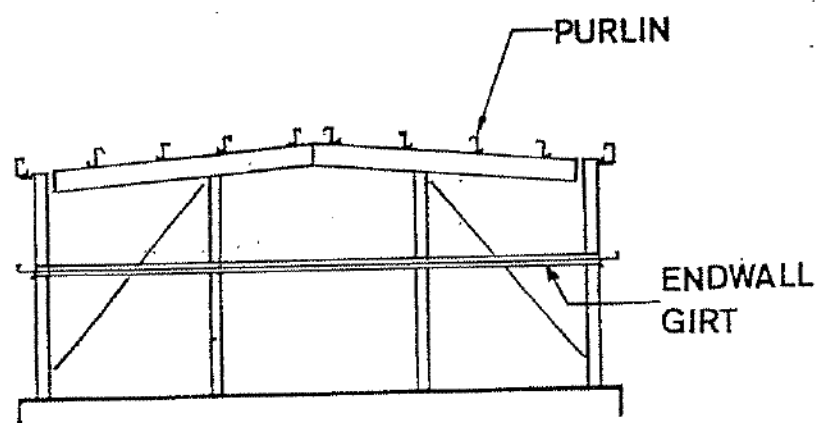
STEP TWO

1. ERECT CORNER COLUMN ON ONE SIDE, WITH CLIPS ATTACHED.
2. HOIST END RAFTER INTO PLACE AND BOLT TO CLIPS.
3. STILL SUPPORTING RAFTER, BOLT IN PLACE REQUIRED EAVE STRUT.
4. ATTACH REQUIRED X-BRACING TO THE END FRAME AND HAND TIGHTEN.



STEP THREE

1. REPEAT PROCEDURE IN STEP TWO TO ERECT REMAINING SIDE.

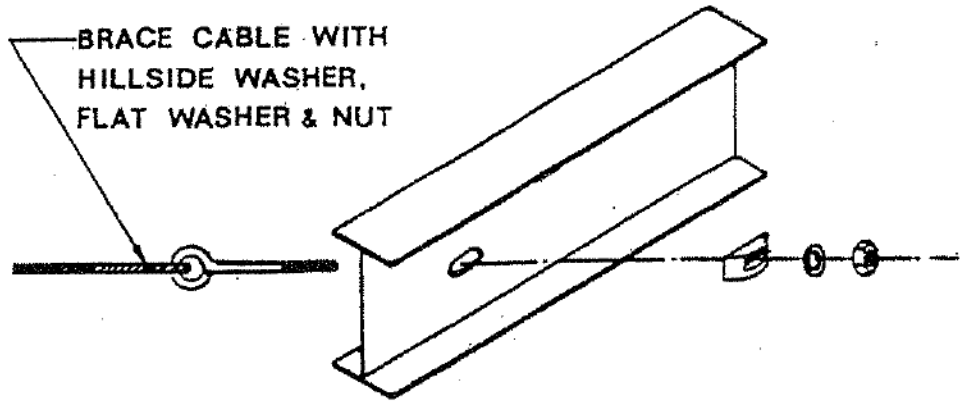


STEP FOUR

1. BOLT IN PLACE ALL REMAINING PURLINS AND GIRTS.
2. SQUARE AND PLUMB END BAY.

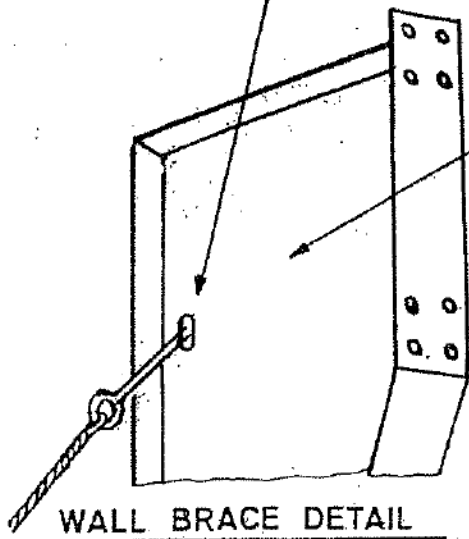
**STRUCTURAL PRIMARY
FRAMING
CABLE & ROD BRACING**

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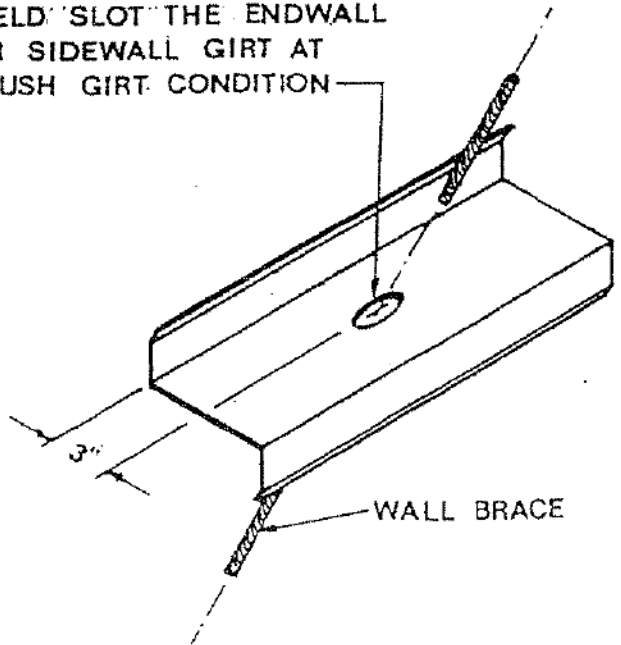


ROOF BRACE DETAIL

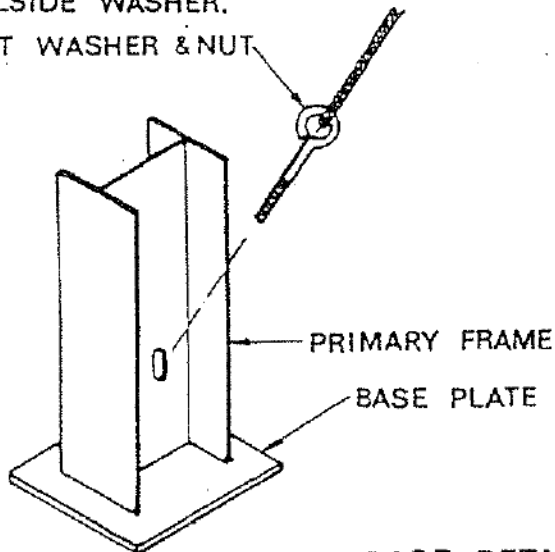
BRACE CABLE WITH
HILLSIDE WASHER,
FLAT WASHER & NUT



FIELD SLOT THE ENDWALL
OR SIDEWALL GIRT AT
FLUSH GIRT CONDITION

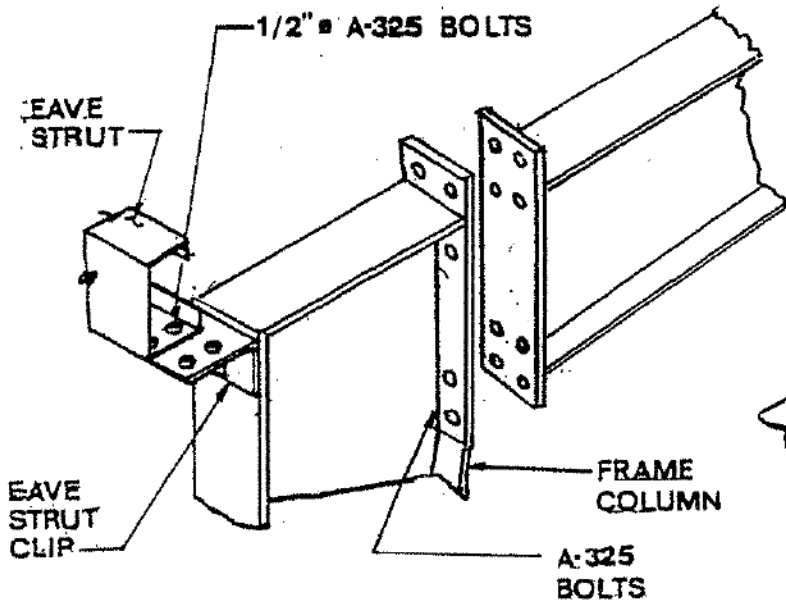


BRACE CABLE WITH
HILLSIDE WASHER,
FLAT WASHER & NUT

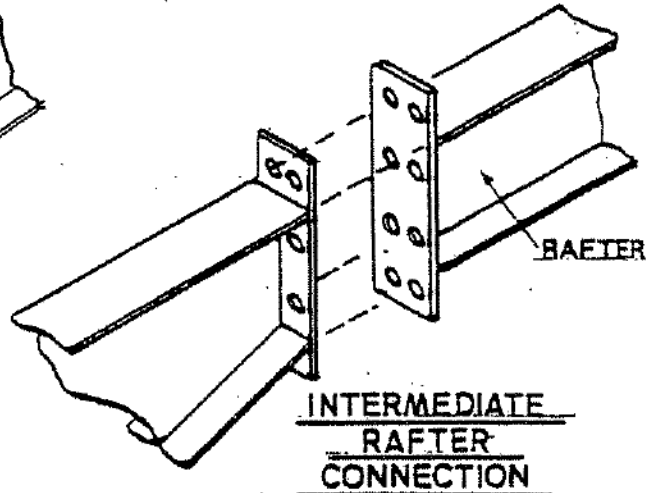


FRAME COMPONENTS - BOLTED CONNECTIONS

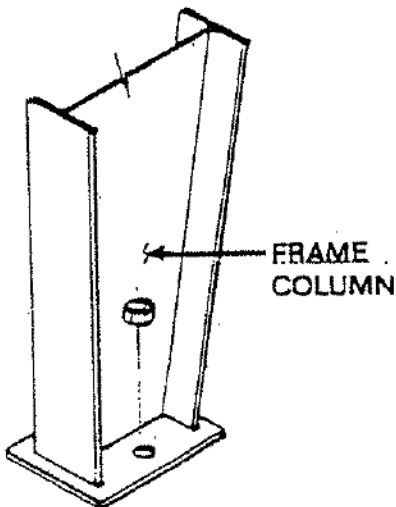
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COLUMN TO RAFTER
HAUNCH CONNECTION



INTERMEDIATE
RAFTER
CONNECTION
FIELD BOLTED PER BLDG.
REQUIREMENTS:
USE AISC "TURN-OF-NUT"
METHOD OF TIGHTENING



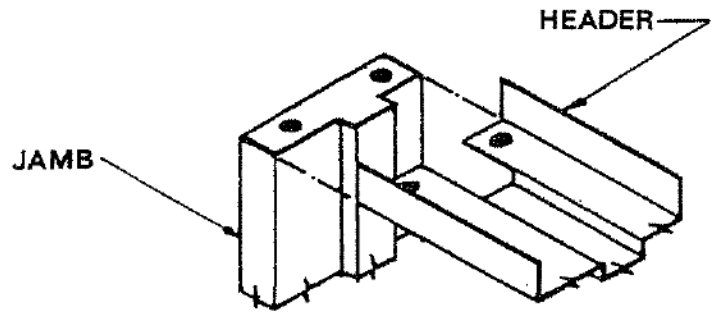
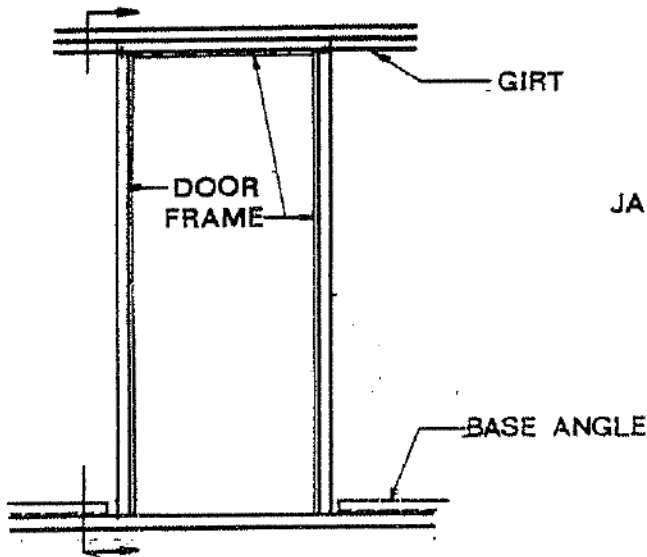
COLUMN AT BASE

IMPORTANT:

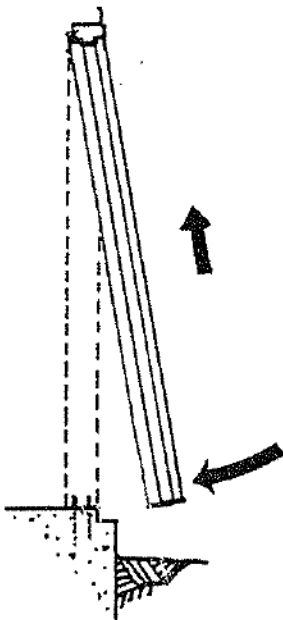
1. ALL CONN. BOLTS TO BE A-325 BOLTS WHERE FIELD FRAME COMPONENT CONNECTIONS ARE REQUIRED. INSTALL AND TIGHTEN ALL FRAME CONNECTIONS BOLTS AS EACH FRAME IS ERECTED.
2. ALL ASTM A-325 BOLTS MUST BE INSTALLED IN SUCH A MANNER AS TO FULLY COMPLY WITH AISC SPECIFICATIONS... "STRUCTURAL JOINTS USING A-325 BOLTS", TURN-OF-NUT METHOD.

WALK DOOR FRAME ERECTION

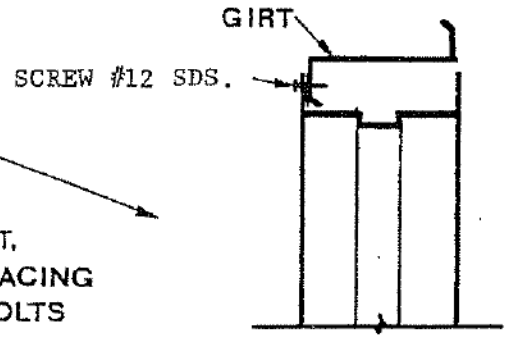
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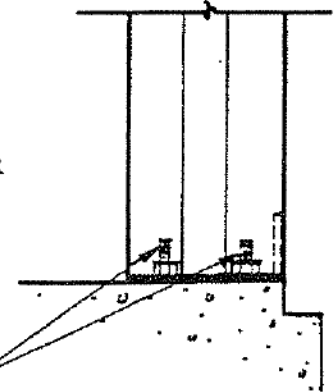
STEP ONE
BOLT DOOR FRAME TOGETHER
USING 1/2" MACHINE BOLTS



STEP TWO
LIFT FRAME PLACING
HEADER UNDER 7'-3" GIRT,
LIFTING BOTH WHILE PLACING
FRAME OVER ANCHOR BOLTS




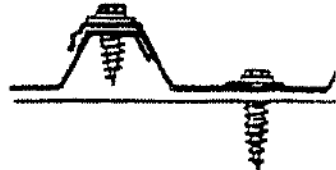



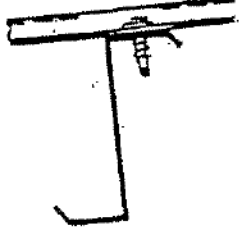



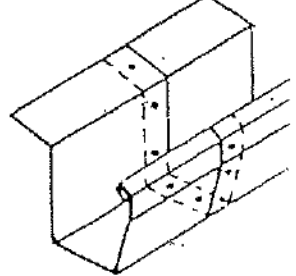
STEP THREE
SCREW HEADER TO THE GIRT.
ANCHOR AT BASE.
FASTEN BASE GIRTS TO DOOR
FRAME (IF REQ'D).



3/8" ϕ x 3" EXPANSION ANCHORS

FASTENER

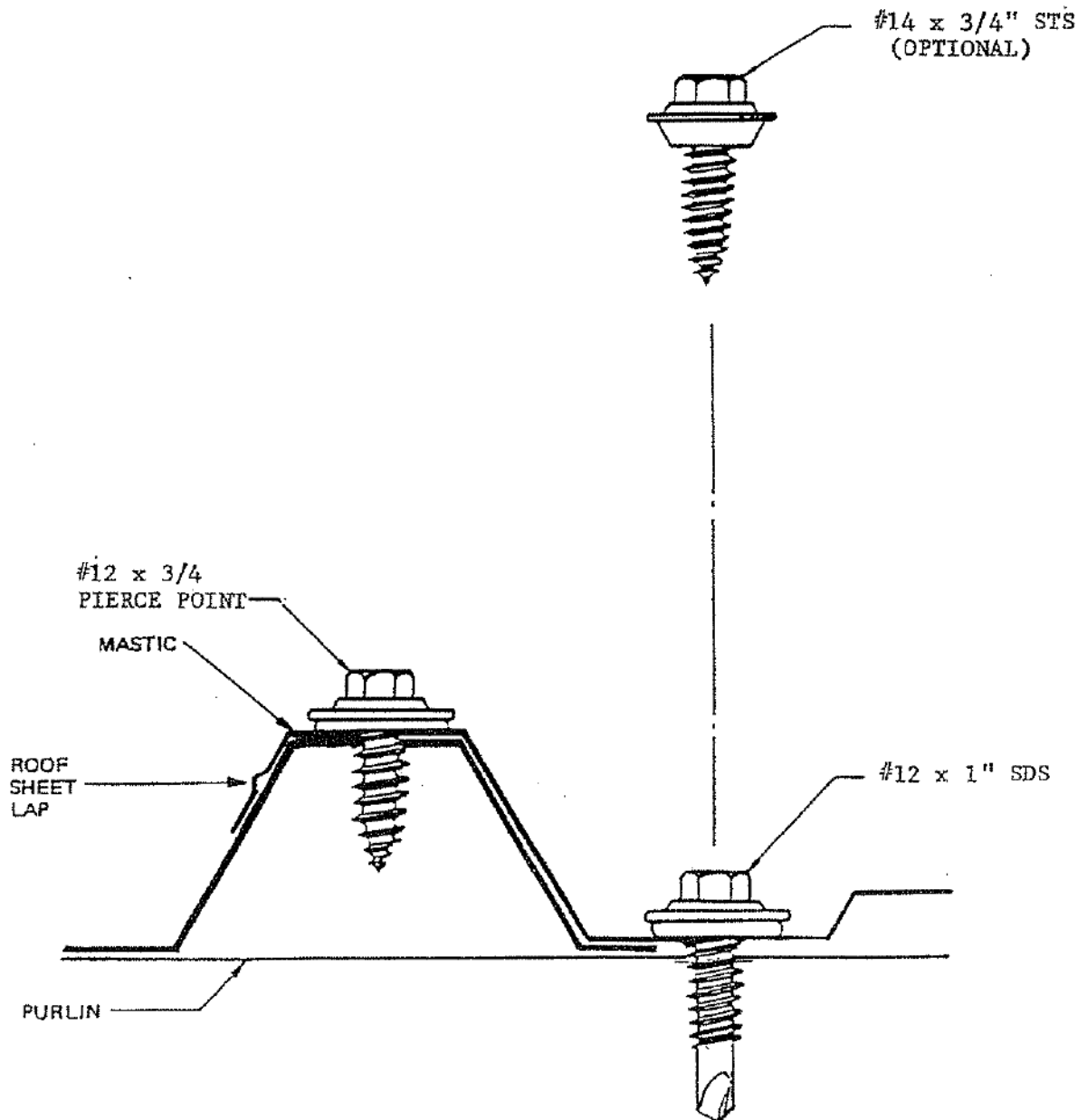
APPLICATION

 14 STS	<p>SELF-TAPPER AB</p> <p>3/4" LONG</p> <p>1 1/4" LONG</p>	<p>PANEL TO FRAMING</p> <p>PANEL TO FRAMING WITH 4" OR THICKER INSULATION</p>	
 17 STS	<p>SELF-TAPPER AB</p> <p>3/4" LONG</p>	<p>REPLACE STRIPPED SCREWS OR PANEL TO PANEL FRAMING</p>	
 12 SDS	<p>SELF-DRILLER</p> <p>1" LONG</p> <p>1 1/2" LONG</p>	<p>PANEL TO FRAMING ONLY. 1-1/2" FASTENER USED W/4" OR THICKER INSULATION.</p>	
 12 PP	<p>SELF-DRILLER</p> <p>3/4" LONG</p> <p>PIERCE POINT</p>	<p>PANEL TO PANEL</p>	
 POP RIVET	<p>STAINLESS STEEL & PAINTED</p>	<p>ALL TRIM SPLICES & DOWNSPOUTS</p>	



STANDARD METAL ROOF FASTENERS

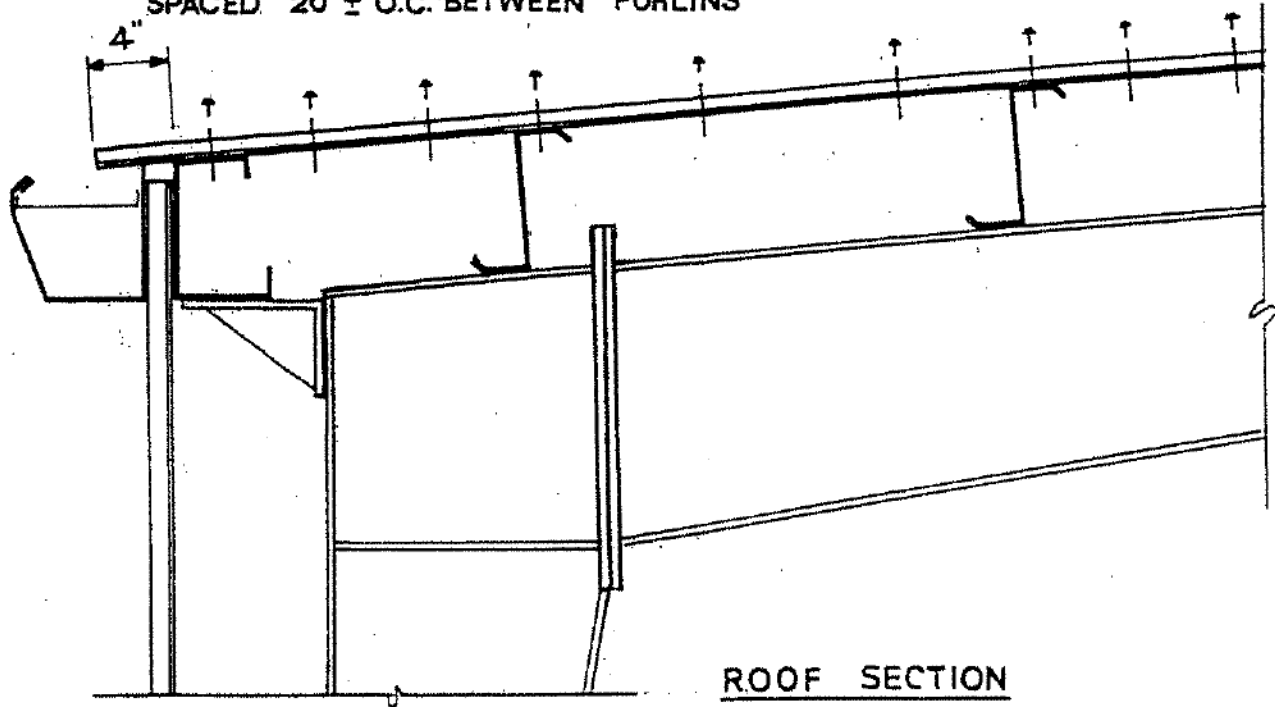
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FASTENER APPLICATION STANDARD ROOF CONSTRUCTION

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SIDE LAP, FASTENERS AT EACH PURLIN, AND
SPACED 20" ± O.C. BETWEEN PURLINS



SPACING AT PURLINS



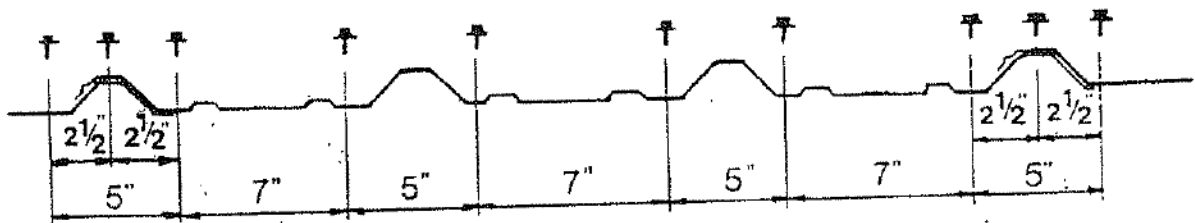
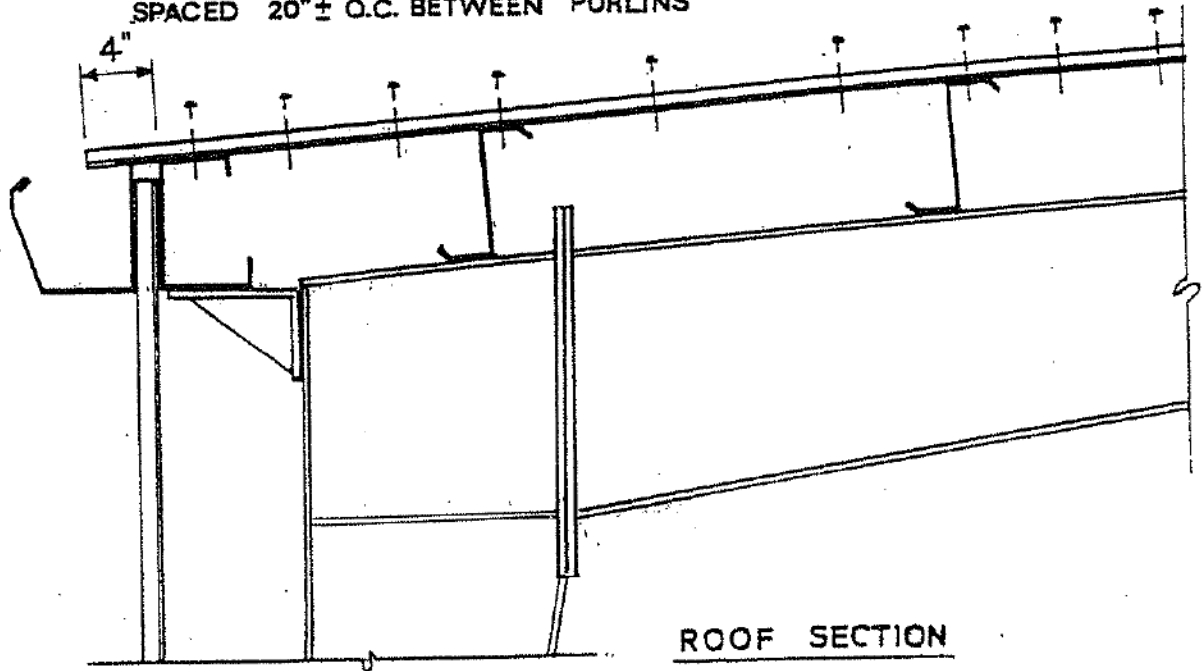
SPACING AT EAVE STRUTS & PEAK PURLINS
& PANEL ENDLAPS



FASTENER APPLICATION UL-90 ROOF CONSTRUCTION

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SIDE LAP FASTENERS AT EACH PURLIN. AND
SPACED 20" ± O.C. BETWEEN PURLINS



TYPICAL SPACING AT
ALL PURLINS
& EAVE STRUTS

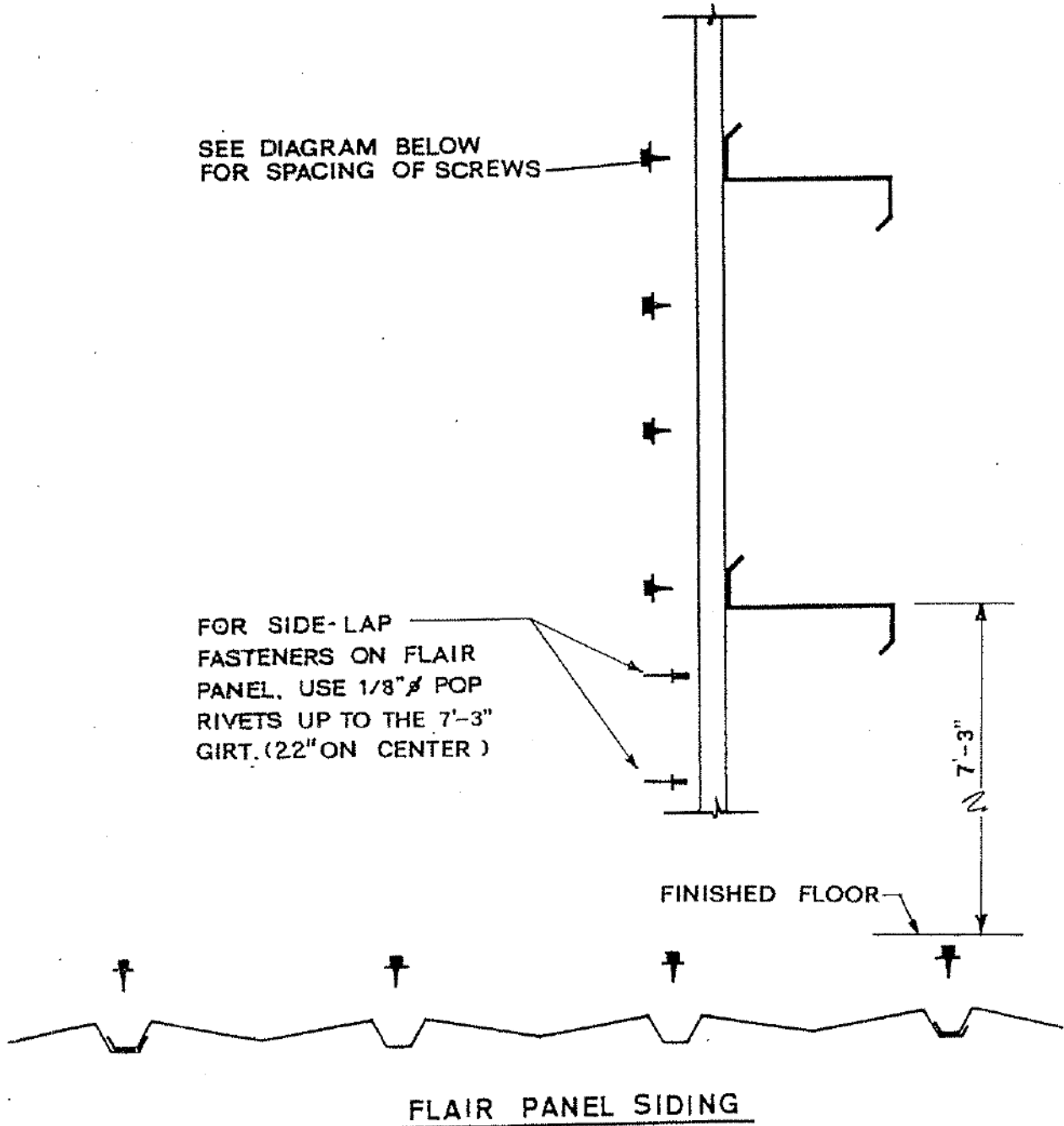


FASTENER APPLICATION STANDARD SIDING CONSTRUCTION

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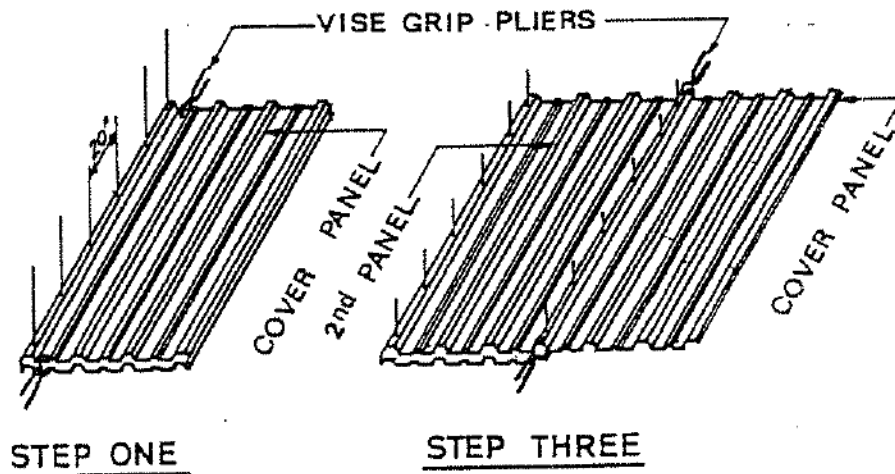
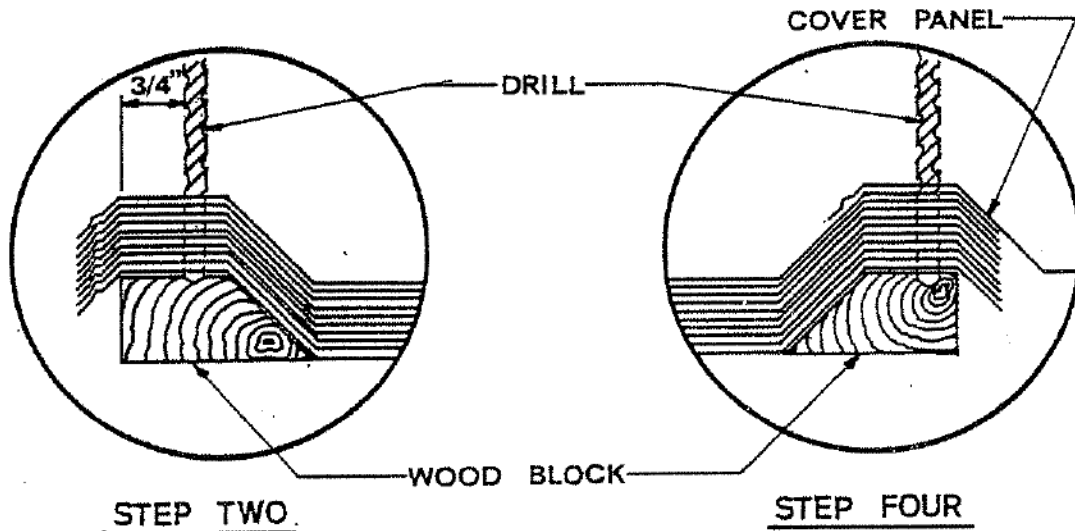
SEE DIAGRAM BELOW
FOR SPACING OF SCREWS

FOR SIDE-LAP
FASTENERS ON FLAIR
PANEL. USE 1/8" ϕ POP
RIVETS UP TO THE 7'-3"
GIRT. (22" ON CENTER)



RECOMMENDED PANEL ERECTION PREPARATIONS

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STEP ONE: STACK PANELS WITH ENDS FLUSH ON LEVEL GROUND IN STACKS NOT EXCEEDING 10 PANELS. PLACE SMALL TAPERED WOODEN BLOCKS UNDER SIDELAPPING EDGE OF PANELS. HOLD PANELS TIGHTLY AT EACH END WITH VISEGRIP PLIERS.

STEP TWO: DRILL HOLES FOR #14 X 3/4" SELF-TAPPING SCREWS ON TOP OF SIDE LAP SEAM. BE SURE PANELS ARE WELL NESTED BEFORE DRILLING (USE 13/64" DRILL).

STEP THREE: REMOVE TOP PANEL AND SHIFT IT OVER TO USE AS A TEMPLATE FOR DRILLING UNDERSIDE LAP SEAM.

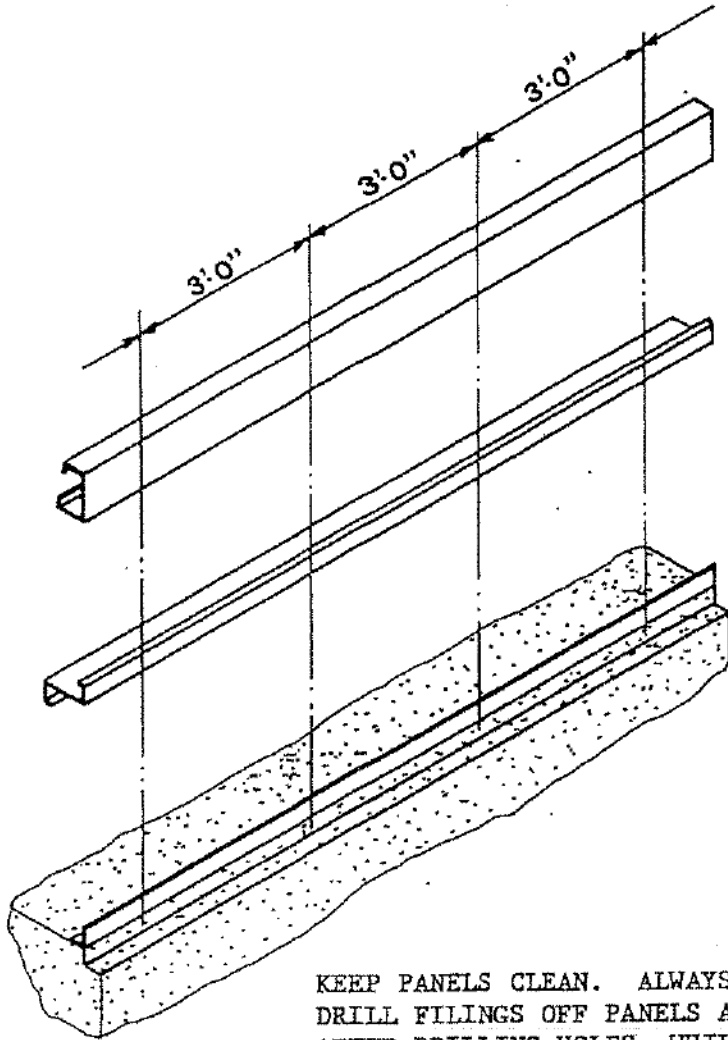
STEP FOUR: CENTER PUNCH TOP PANEL OF STACK DIRECTLY UNDER TEMPLATE PANEL AND DRILL HOLES. USE A DRILL 5/64" SMALLER ON THE UNDERSIDE LAP SEAM TO ALLOW THE BOTTOM PANEL TO BE DRAWN UP SNUGLY UNDER THE TOP LAP. (USE 1/8" DRILL ON UNDERSIDE LAP HOLES.)

NOTE: PRE-DRILLING IS FOR SELF-TAPPING SCREWS ONLY, NO PRE-DRILLING REQUIRED FOR #12 x 3/4 PIERCE POINT SCREWS.



RECOMMENDED PANEL ERECTION & CLEANING

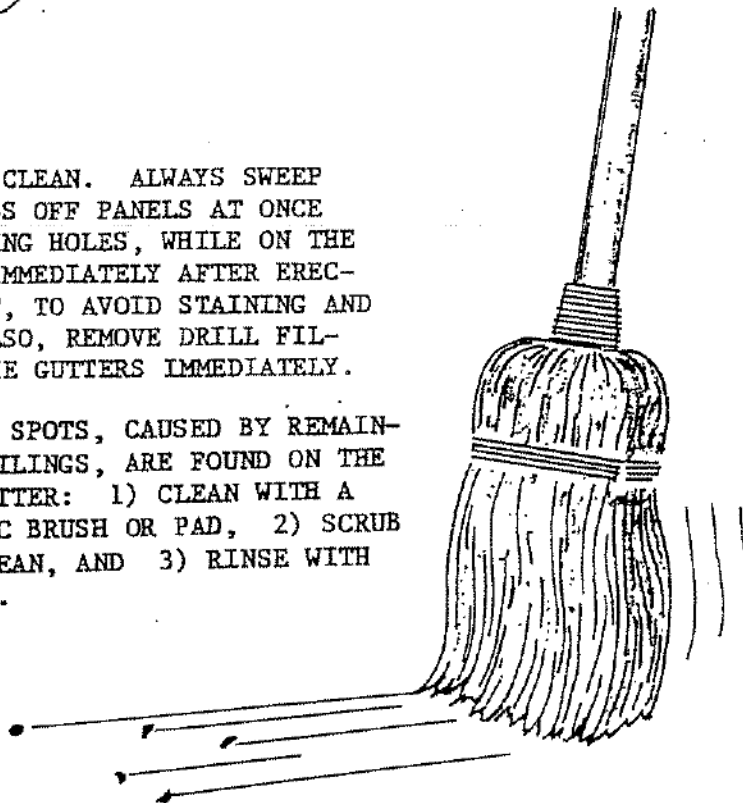
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PRE-MARKING SUPPORTING MEMBERS IN THREE FOOT MULTIPLES BEFORE ERECTION OF ROOF AND WALL PANELS WILL KEEP SHEET ON EXACT THREE FOOT MODULE. PRE-MARKING WILL ALSO KEEP SHEETS IN PROPER ALIGNMENT.

KEEP PANELS CLEAN. ALWAYS SWEEP DRILL FILINGS OFF PANELS AT ONCE AFTER DRILLING HOLES, WHILE ON THE GROUND AND IMMEDIATELY AFTER ERECTION ON ROOF, TO AVOID STAINING AND RUSTING. ALSO, REMOVE DRILL FILINGS FROM THE GUTTERS IMMEDIATELY.

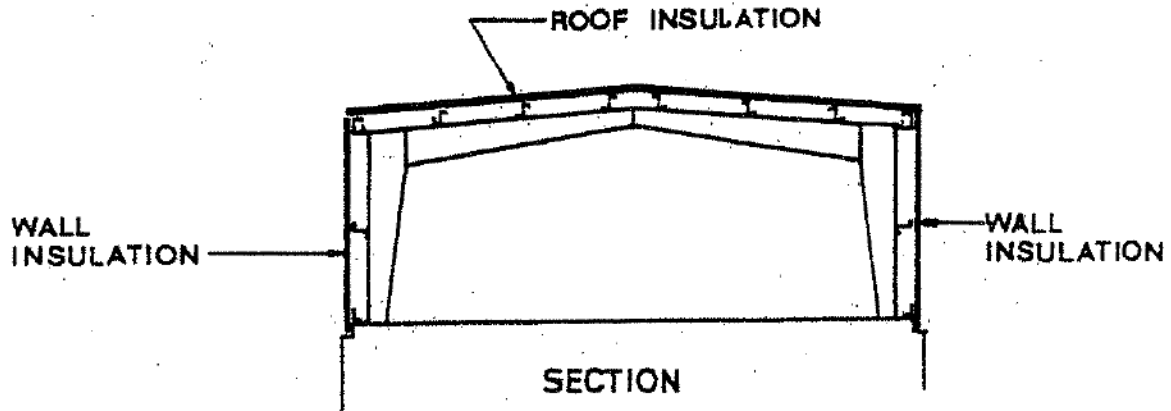
IF ANY RUST SPOTS, CAUSED BY REMAINING DRILL FILINGS, ARE FOUND ON THE PANEL OR GUTTER: 1) CLEAN WITH A NON-METALLIC BRUSH OR PAD, 2) SCRUB WITH MR. CLEAN, AND 3) RINSE WITH PLAIN WATER.





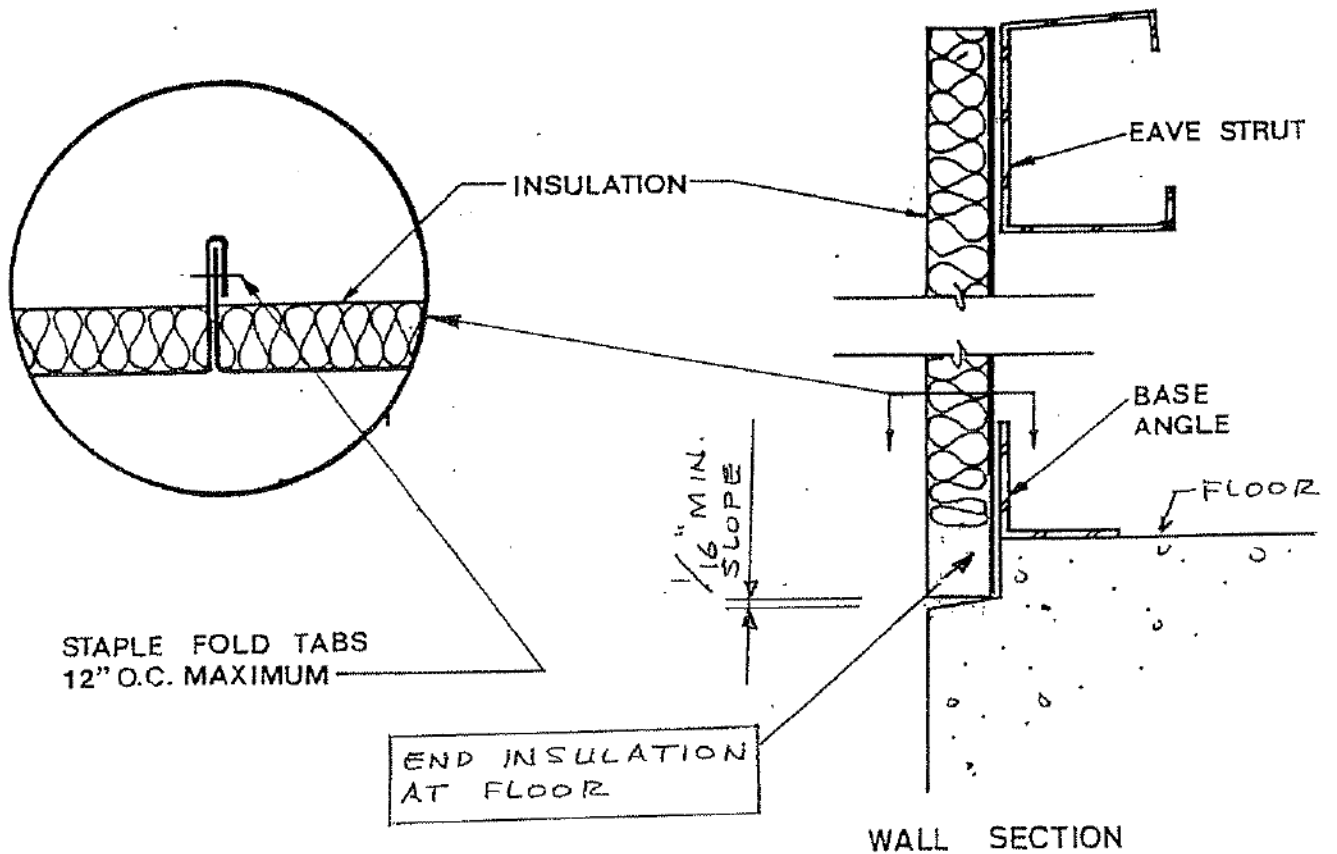
INSULATION PROCEDURES

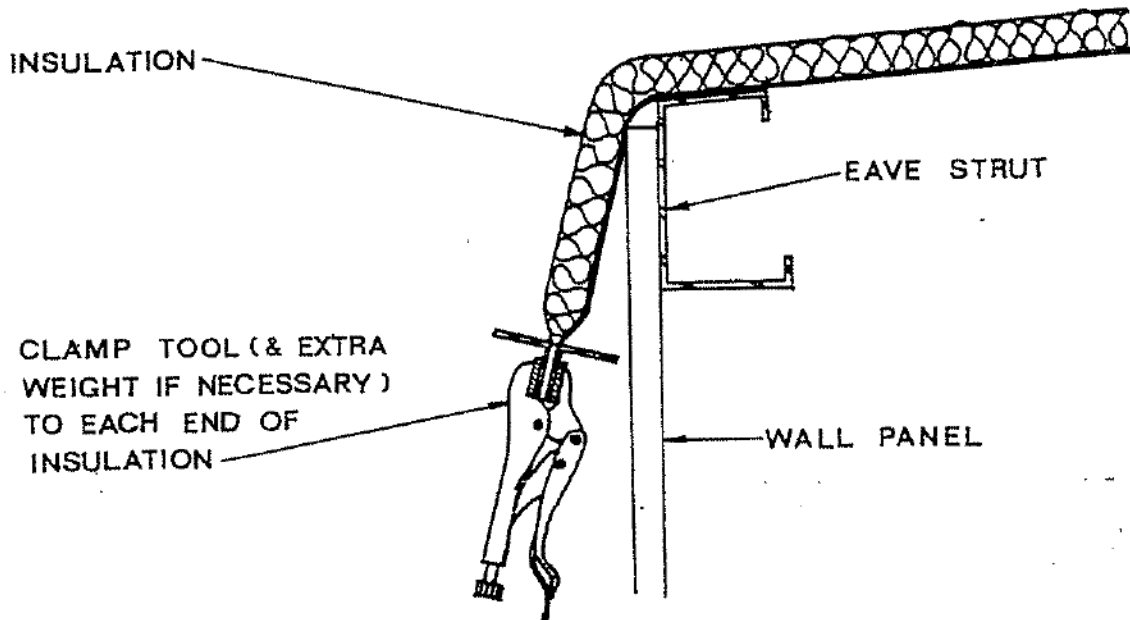
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WALL INSULATION IS SHIPPED IN MAXIMUM LENGTH ROLLS AND WILL BE FIELD CUT TO EXACT LENGTH BEFORE INSTALLING.

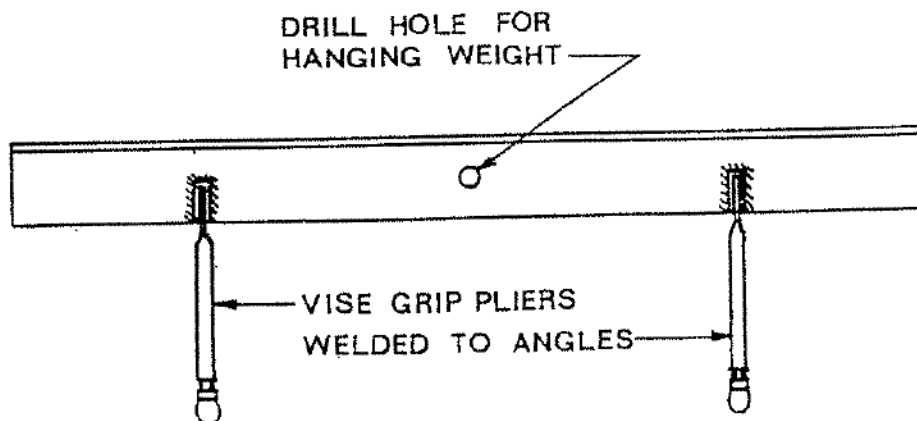
WALL INSULATION SHOULD EXTEND FROM TOP OF EAVE STRUT TO 1½" BELOW FLOOR ELEVATION. GLUE AT EAVE STRUT AND BASE ANGLE. PULL FACING TIGHT AND HOLD IN PLACE UNTIL WALL PANEL IS ATTACHED.





ROOF INSULATION IS SHIPPED AS ONE ROLL FOR EACH LENGTH, OR FOR TWO OR MORE LENGTHS TO FIELD CUT FROM A SINGLE ROLL, DEPENDING UPON BUILDING WIDTH.

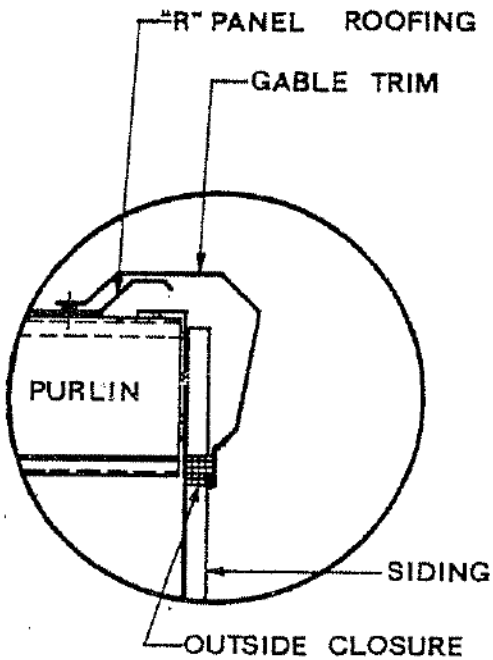
PULL INSULATION SIMULTANEOUSLY FROM EACH SIDE OF BUILDING UNTIL FACING IS TIGHT. HANG WEIGHT FROM EACH END (RECOMMENDED METHOD SHOWN ABOVE) TO SECURE INSULATION WHILE ROOF PANELS ARE INSTALLED.





CLOSURE STRIPS & APPLICATIONS

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GABLE DETAIL



OUTSIDE "R" PANEL



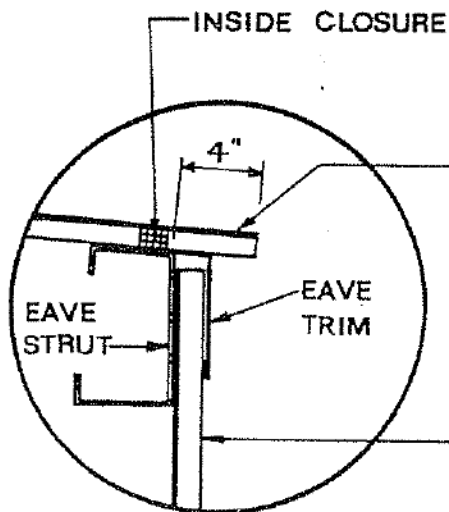
INSIDE "R" PANEL



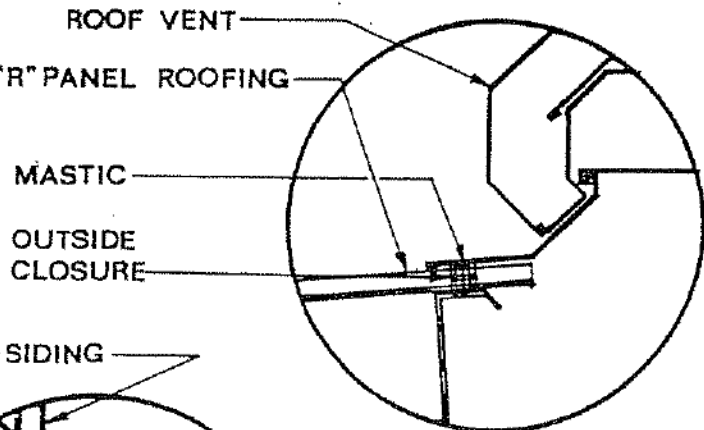
OUTSIDE FLAIR PANEL



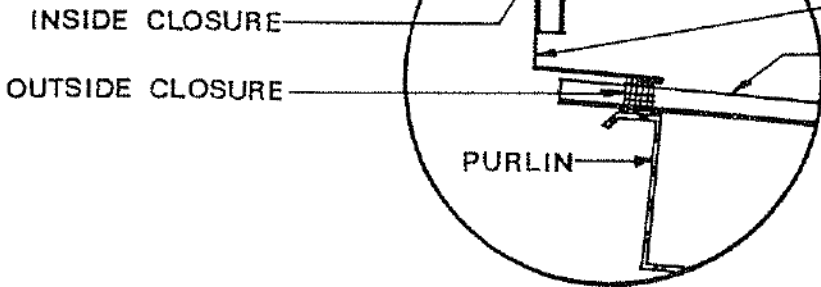
INSIDE FLAIR PANEL



EAVE DETAIL



ROOF VENT



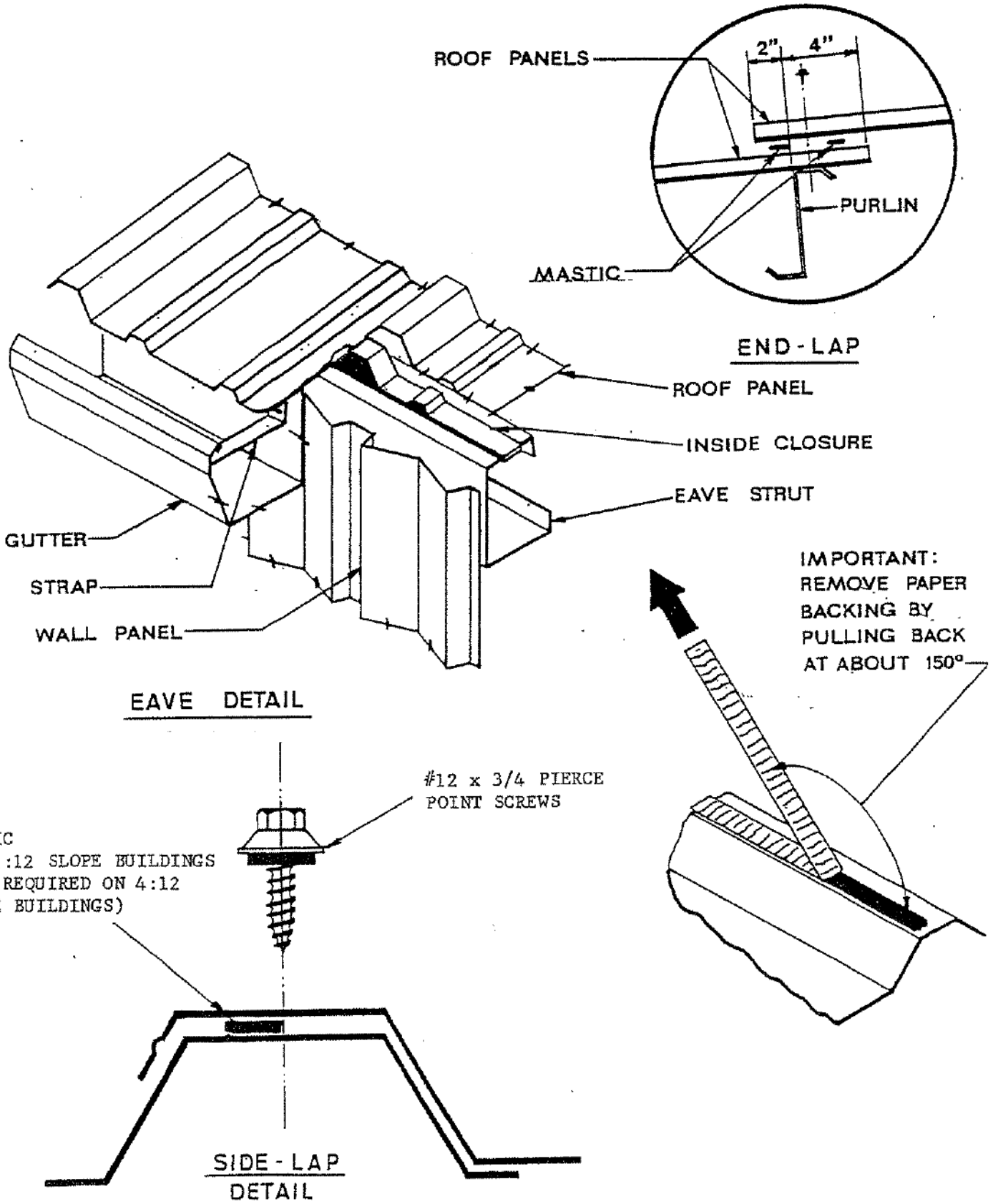
LEAN-TO

ELL FLASHING
"R" PANEL ROOFING



MASTIC APPLICATION

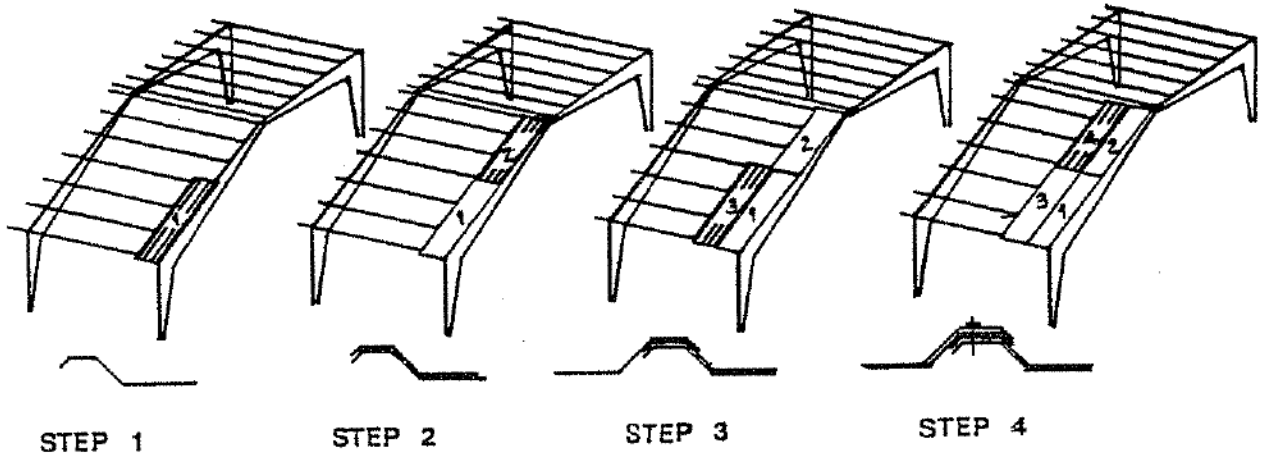
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ROOF & SIDEWALL PANEL APPLICATION

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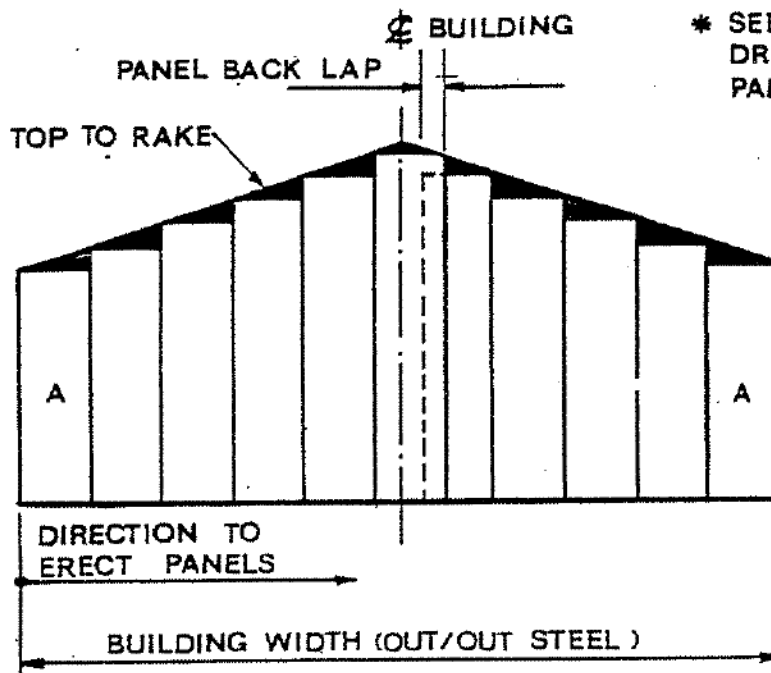
SHEETING SEQUENCE

1. Panel No. 1 should always be erected at end of roof or wall and must be plumb, straight and securely fastened to purlins.
2. Then erect Panel No. 2 and fasten to purlins.
3. Erect Panel No. 3 with sidelap rib placed over sidelap rib of Panel No. 1. Screw sidelap at Panel No. 1 and Panel No. 3 together before screwing Panel No. 3 to purlins.
4. Erect Panel No. 4 with sidelap rib over sidelap rib of Panel No. 2. Screw sidelap seam of Panel No. 4 and Panel No. 2 together before screwing Panel No. 4 to purlins. Continue this panel erection sequence to assure correct panel lap.
5. Check alignment of panel with each truss. If they are not correct, stretch or contract panel to bring them into alignment.
6. In the event a screw is installed in the wrong location or should a screw break during the driving process, remove the screw and install one of a larger diameter to prevent leaking. If removal of screw remnant is not possible, water proofing measures are to be taken to prevent leaks.
7. Erection crew is to sweep roof panels clear of all metal shavings daily until roofing is completed.



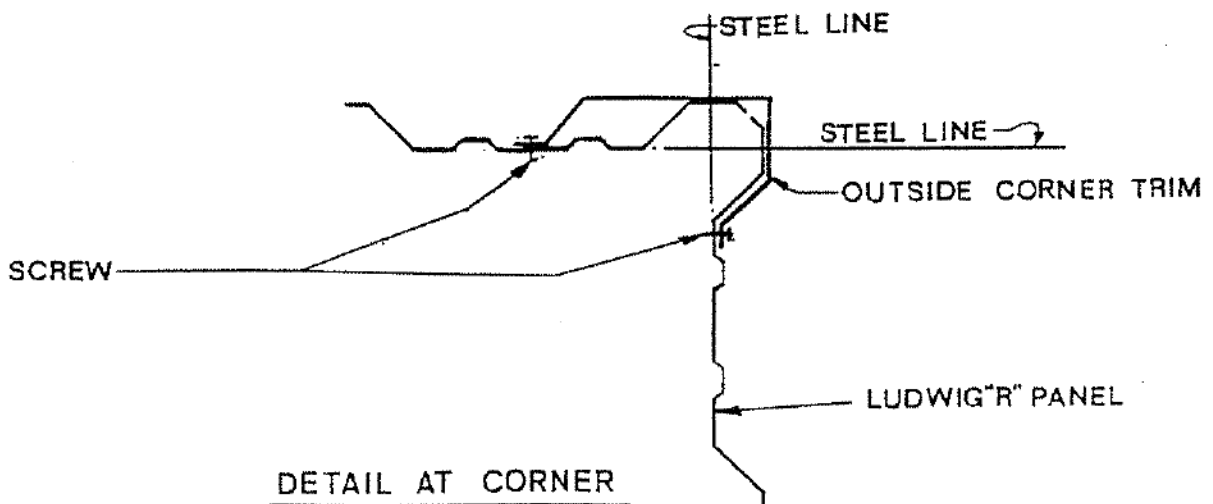
ENDWALL PANEL APPLICATION: LUDWIG "R" PANEL

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* SEE ERECTION
DRAWINGS FOR
PANEL LAYOUT

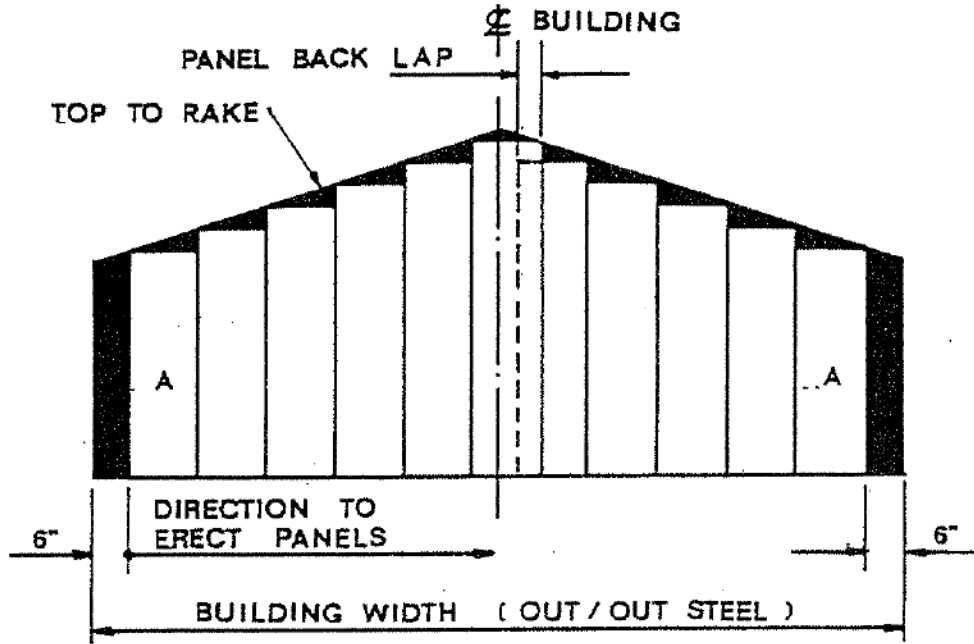
1. ENDWALL PANEL MARKED "A" MUST BE INSTALLED FIRST.
2. MEASURE AND MARK 3' O.C. ALONG THE BASE TO CHECK ANY DIMENSIONS LOSS OR GAIN DURING PANEL INSTALLATION.
3. THE BUILDING MUST BE TIGHT AND PLUMB BEFORE SHEETING CAN BEGIN.
4. FOUNDATION MUST BE SQUARE, LEVEL, AND CORRECT TO THE OUT TO OUT OF STEEL DIMENSIONS.
5. ERECTION CREW IS TO CLEAN ALL WALL PANELS BEFORE LEAVING THE JOB SITE.
6. FIELD CUT PANELS ALONG RAKE FOR ROOF SLOPES OVER 1:12.



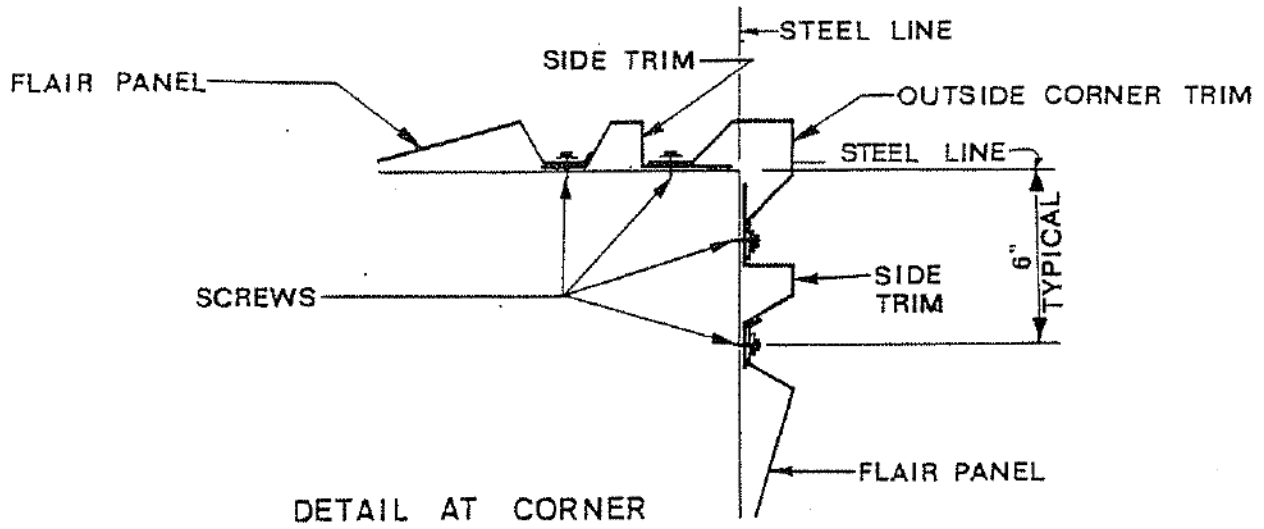


ENDWALL PANEL APPLICATION: FLAIR PANEL

SECTION NO.	EM-1-6
PAGE NO.	14
DATE	8-14-89

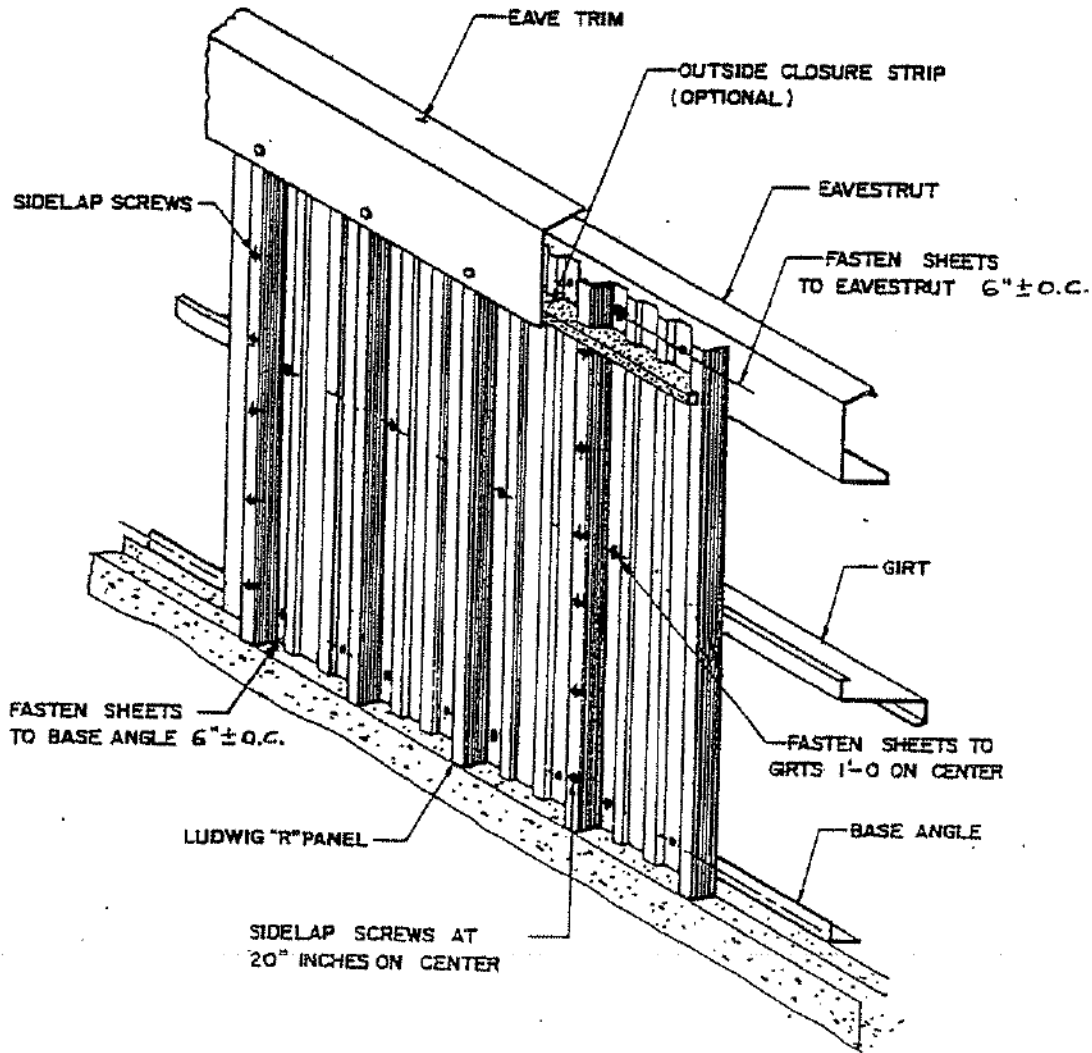


1. ENDWALL PANEL MARKED "A" MUST BE INSTALLED FIRST.
2. MEASURE AND MARK 3' O.C. ALONG THE BASE TO CHECK ANY DIMENSIONS LOSS OR GAIN DURING PANEL INSTALLATION.
3. THE BUILDING MUST BE TIGHT AND PLUMB BEFORE SHEETING CAN BEGIN.
4. FOUNDATION MUST BE SQUARE, LEVEL, AND CORRECT TO THE OUT TO OUT OF STEEL DIMENSIONS.
5. ERECTION CREW IS TO CLEAN ALL WALL PANELS BEFORE LEAVING THE JOB SITE.
6. FIELD CUT PANELS ALONG RAKE FOR ROOF SLOPES OVER 1:12.



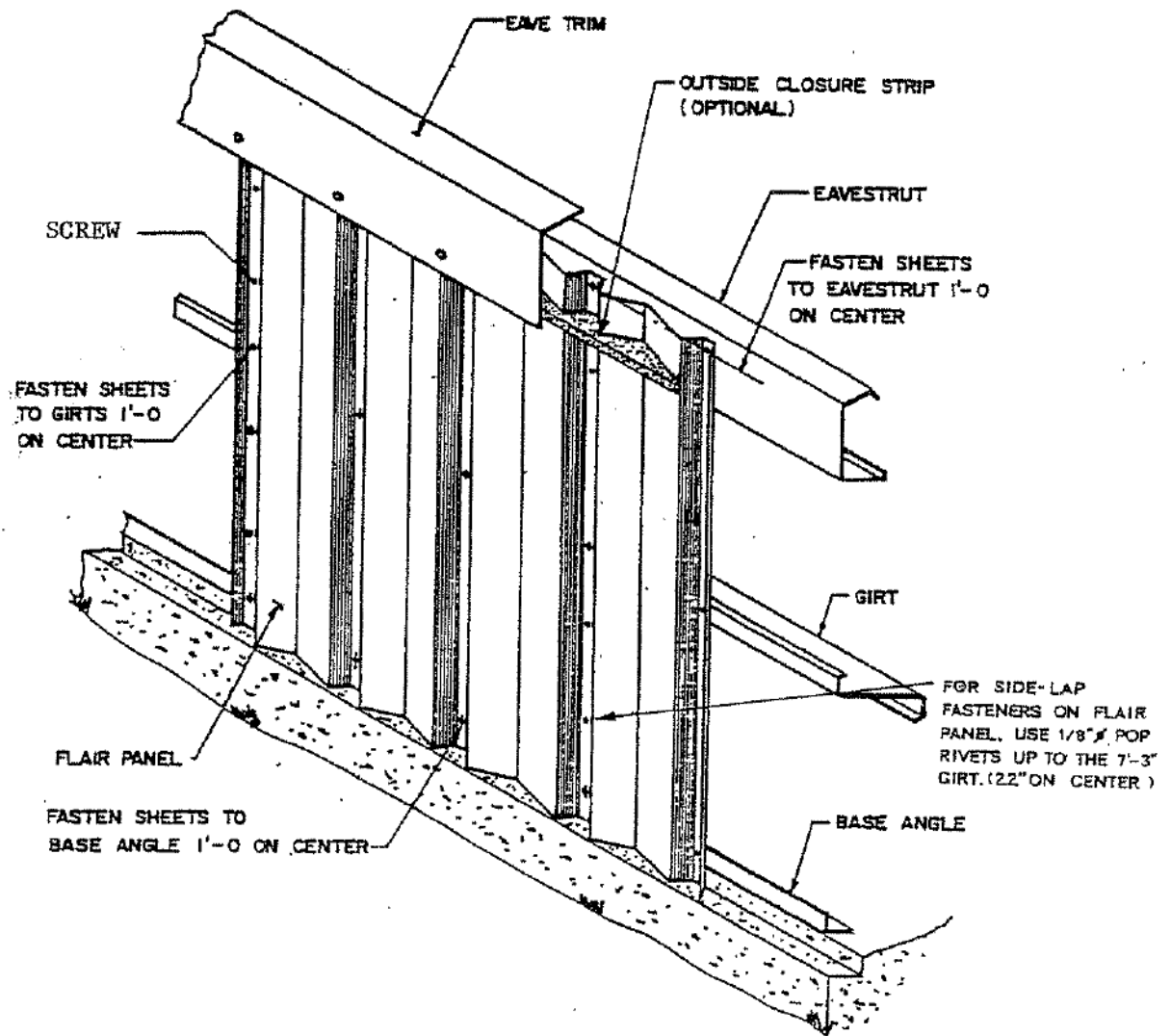
SIDEWALL PANEL INSTALLATION LUDWIG "R" PANEL

SECTION NO.	EM-1-6
PAGE NO.	15
DATE	8-14-89



PARTIAL SIDEWALL ELEVATION

1. BLOCK GIRTS TO "LEVEL" POSITION BEFORE STARTING PANEL ERECTION. MAINTAIN BLOCKING UNTIL PANEL TO STRUCTURAL FASTENERS ARE INSTALLED.
2. ALIGN AND PLUMB FIRST WALL PANEL WITH THE ROOF PANEL.
3. TO PREVENT "OIL CANNING", ALL PANEL FASTENERS SHOULD BE APPLIED FROM BASE ANGLE, SECURED TO EACH GIRT TOWARD EAVE STRUT.
4. MEASURE AND MARK 3' O.C. ALONG THE BASE ANGLE TO CHECK DIMENSIONAL GAIN OR LOSS DURING INSTALLATION.
5. FOUNDATION MUST BE SQUARE, LEVEL AND CORRECT TO THE OUT TO OUT OF STEEL DIMENSIONS.
6. ERECTION CREW IS TO CLEAN ALL WALL PANELS BEFORE LEAVING JOB SITE.



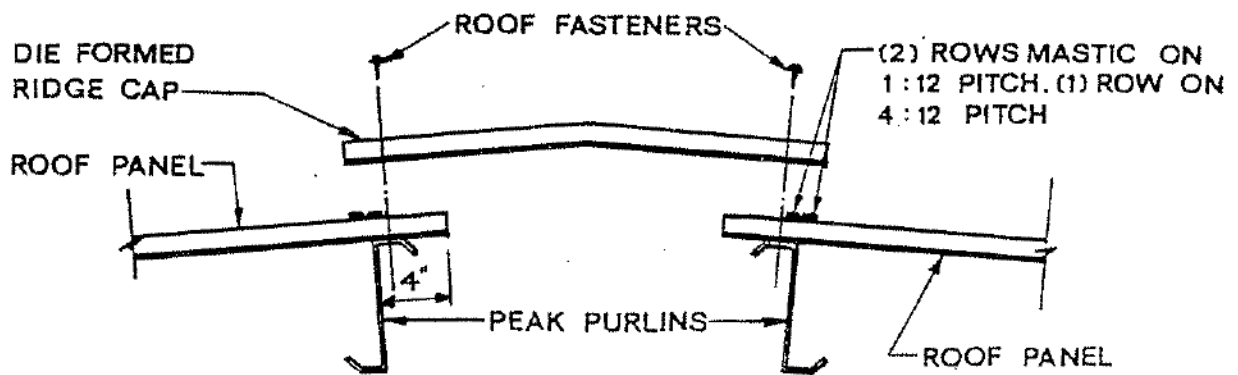
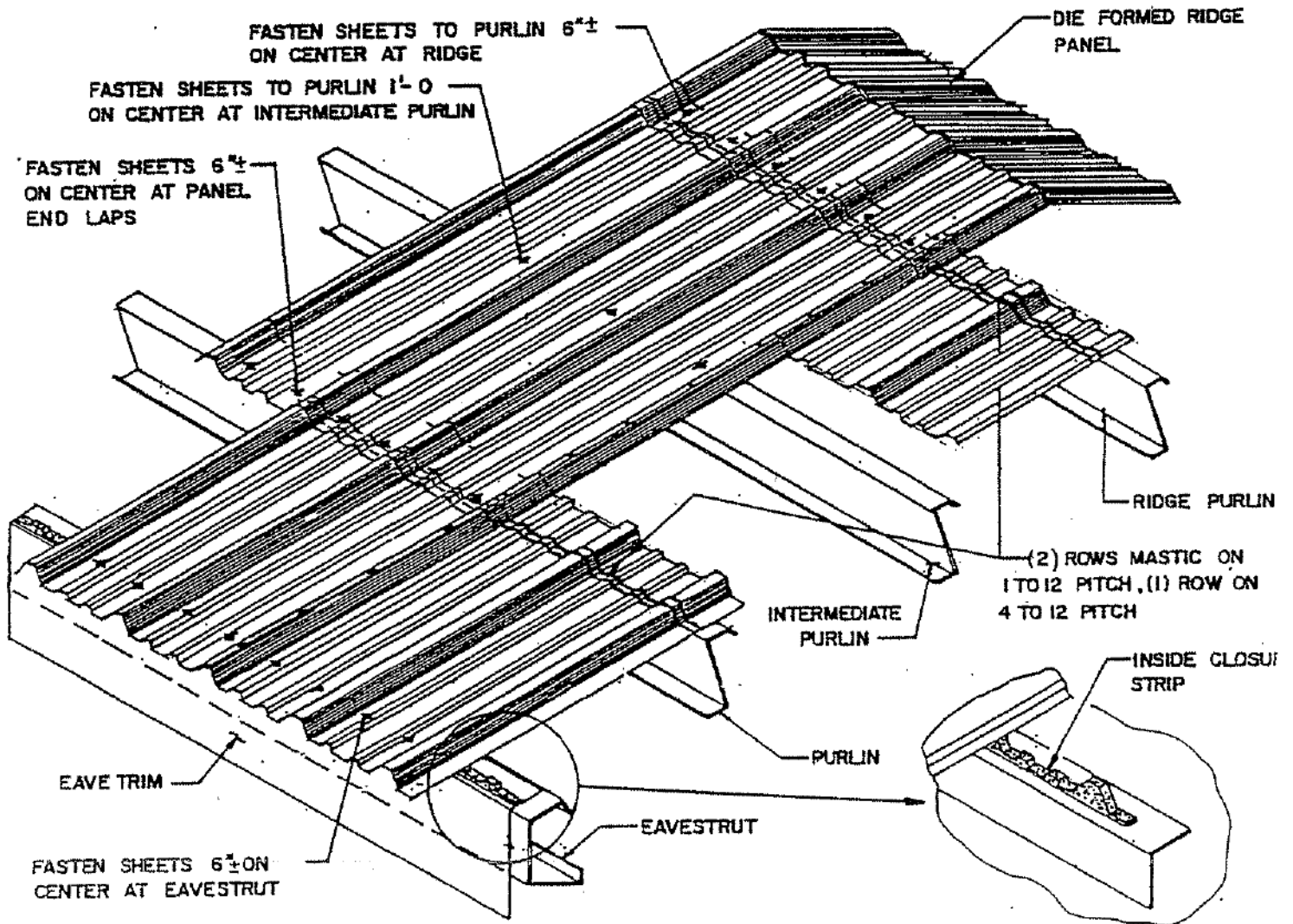
PARTIAL SIDEWALL ELEVATION

1. BLOCK GIRTS TO "LEVEL" POSITION BEFORE STARTING PANEL ERECTION. MAINTAIN BLOCKING UNTIL PANEL TO STRUCTURAL FASTENERS ARE INSTALLED.
2. ALIGN AND PLUMB FIRST WALL PANEL WITH THE ROOF PANEL.
3. TO PREVENT "OIL CANNING", ALL PANEL FASTENERS SHOULD BE APPLIED FROM BASE ANGLE, SECURED TO EACH GIRT TOWARD EAVE STRUT.
4. MEASURE AND MARK 3' O.C. (BEGINNING 6" FROM THE CORNERS) ALONG THE BASE ANGLE TO CHECK DIMENSIONAL GAIN OR LOSS DURING INSTALLATION.
5. FOUNDATION MUST BE SQUARE, LEVEL AND CORRECT TO THE OUT TO OUT OF STEEL DIMENSIONS.
6. ERECTION CREW IS TO CLEAN ALL WALL PANELS BEFORE LEAVING JOB SITE.

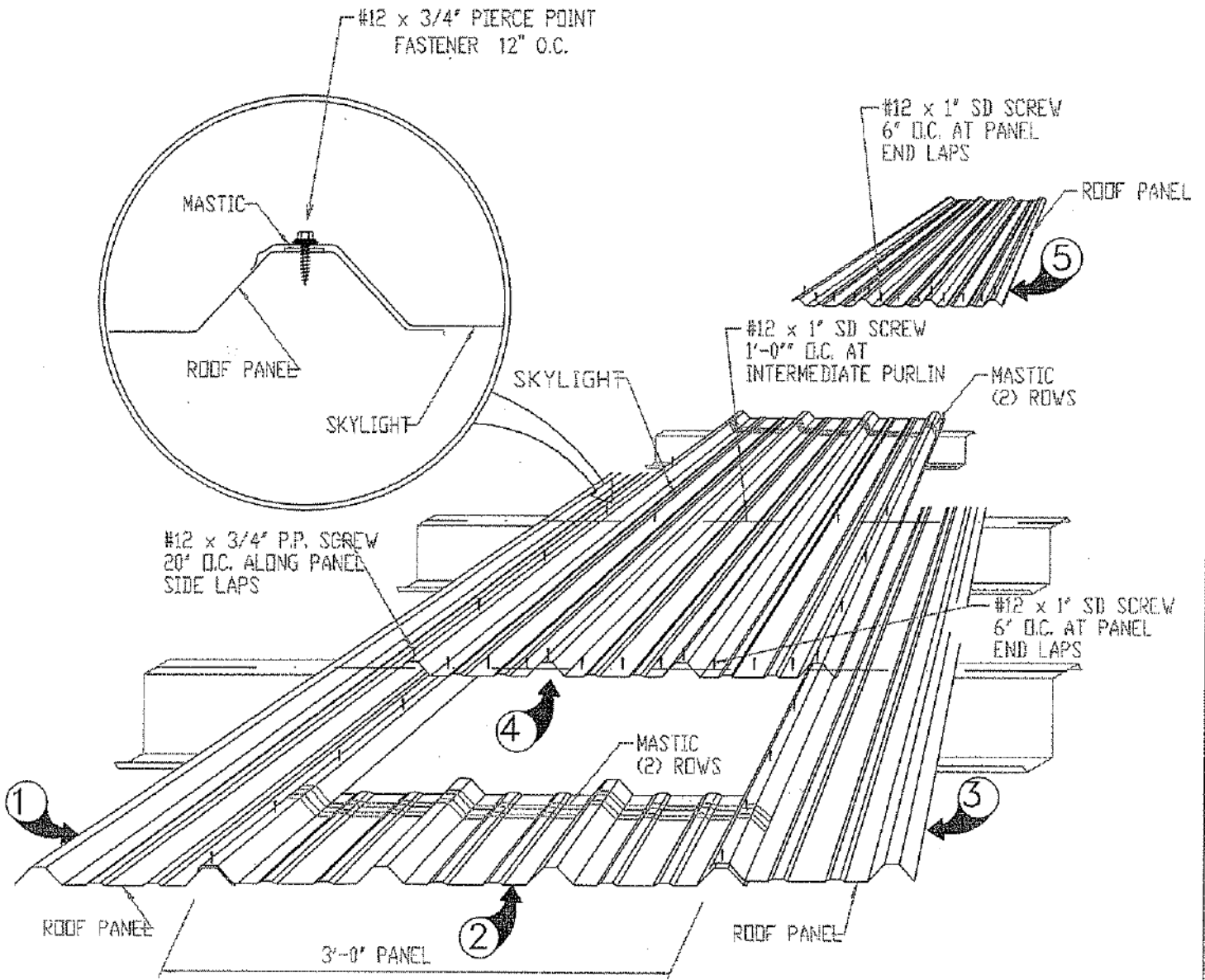


TYPICAL ROOF PANEL INSTALLATION

SECTION NO.	EM-1-6
PAGE NO.	17
DATE	8-14-89



TYPICAL SECTION THRU RIDGE



INSTALLATION SEQUENCE

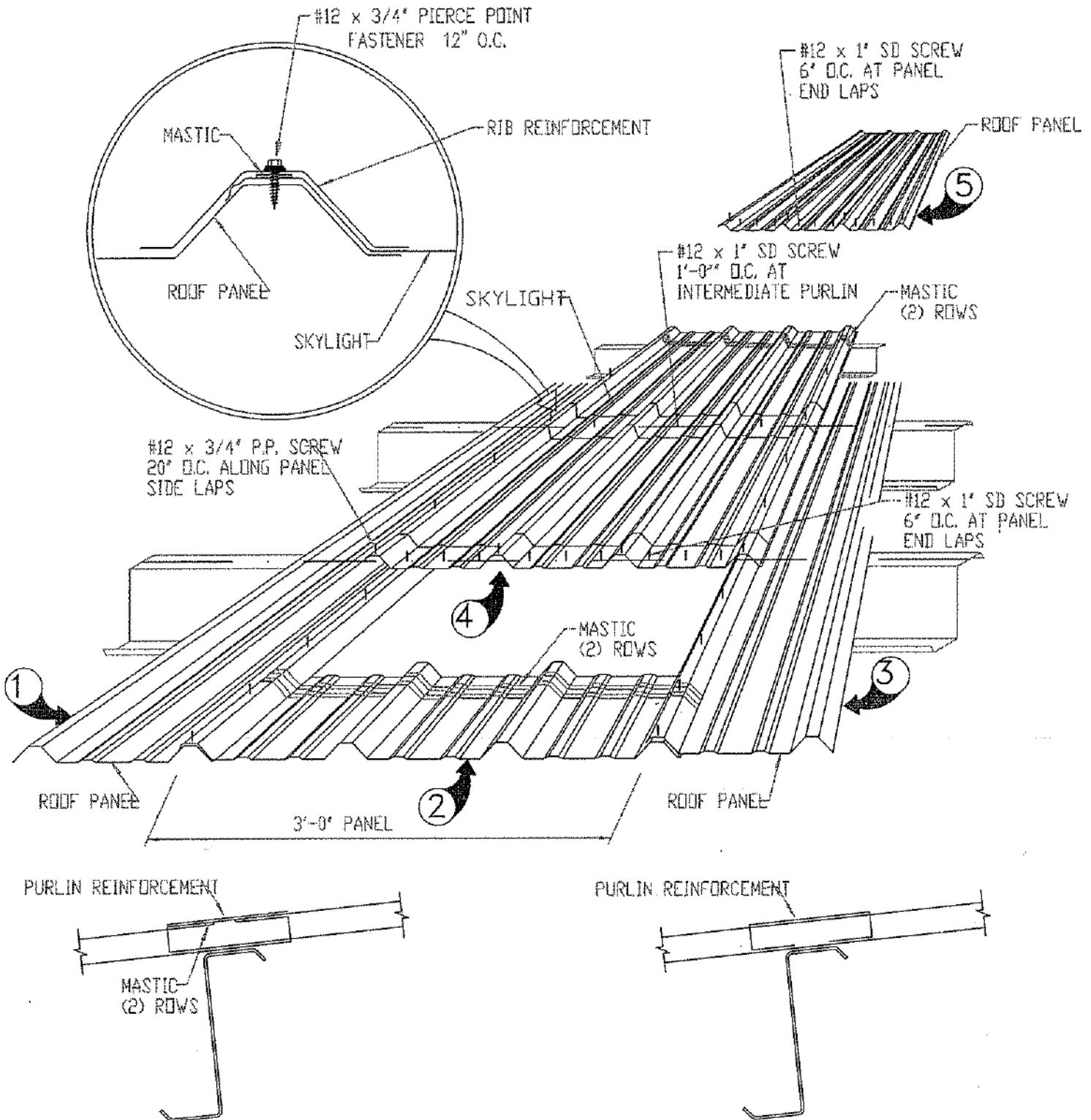
(INSTALL SKYLIGHT IN ROOF PANELS IN SEQUENCE AS SHOWN)

NOTE: SKYLIGHTS SHALL BE INSTALLED AS ROOF IS SHEETED. PROTECTIVE MEASURES SHOULD BE TAKEN TO PREVENT PERSONNEL FROM FALLING THROUGH SKYLIGHT. DO NOT WALK ON SKYLIGHT PANEL.



SKYLIGHT INSTALLATION UL-90

SECTION NO.:	EM-1-6
PAGE NO.:	18.2
DATE:	10-19-81



INSTALLATION SEQUENCE

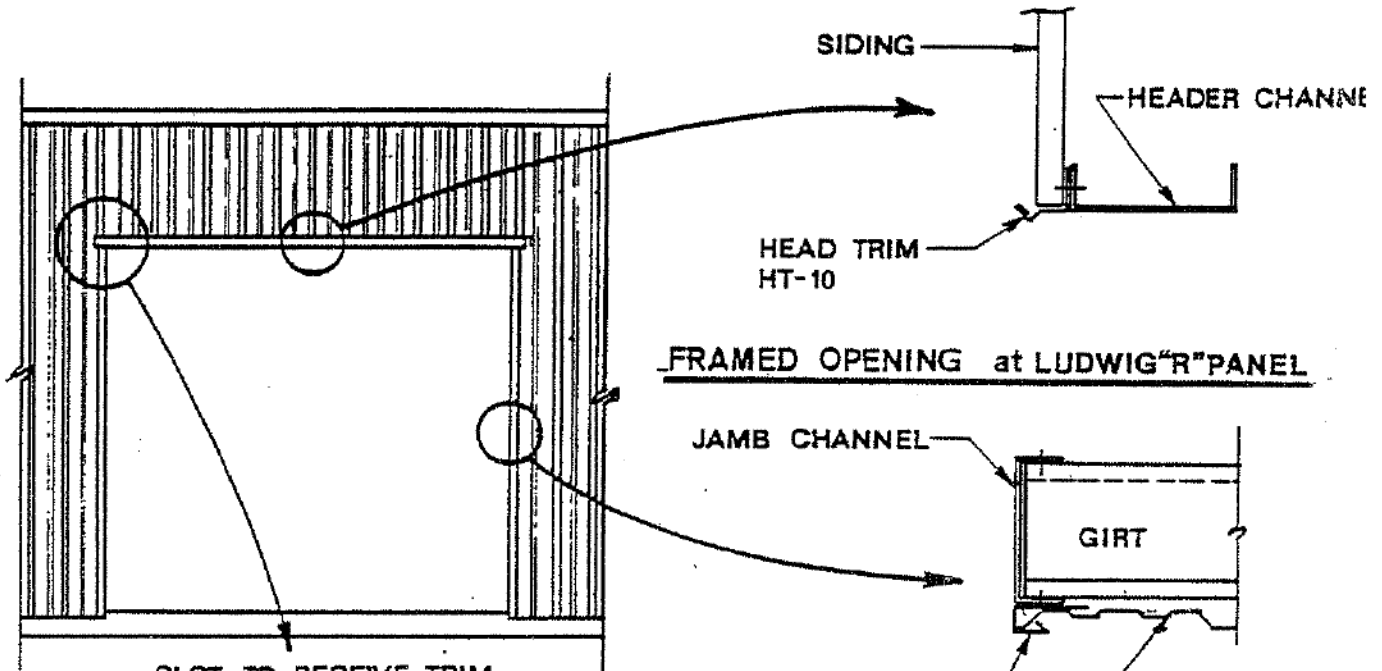
(INSTALL SKYLIGHT IN ROOF PANELS IN SEQUENCE AS SHOWN)

NOTE: SKYLIGHTS SHALL BE INSTALLED AS ROOF IS SHEETED. PROTECTIVE MEASURES SHOULD BE TAKEN TO PREVENT PERSONNEL FROM FALLING THROUGH SKYLIGHT. DO NOT WALK ON SKYLIGHT PANEL.

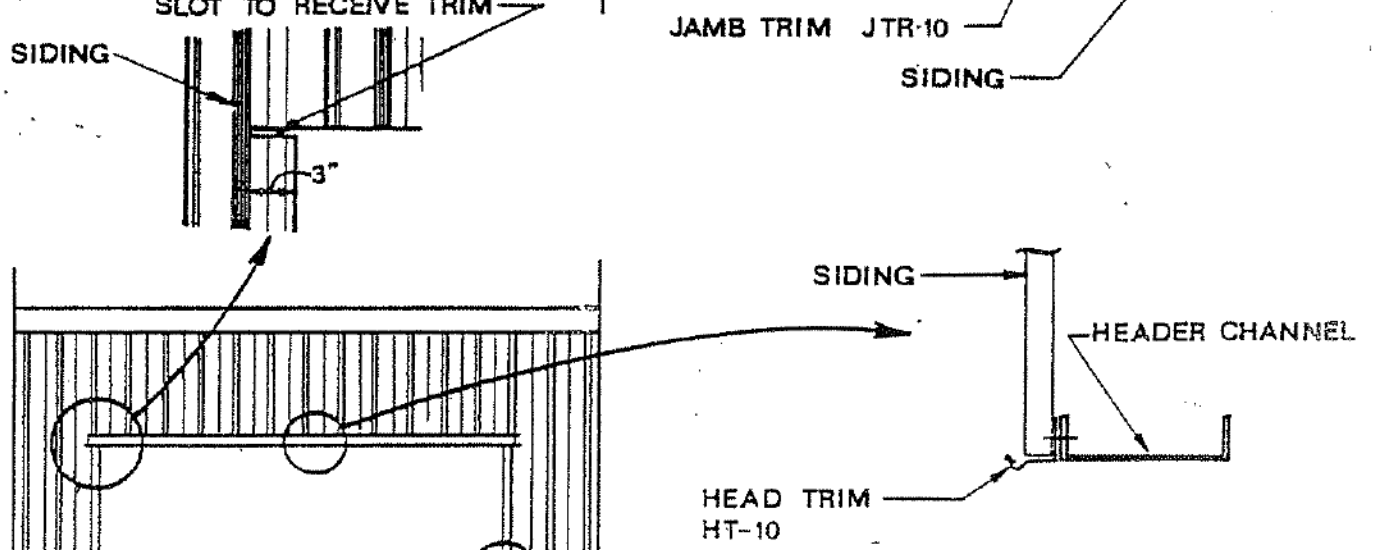


SIDING & TRIM APPLICATION FRAMED OPENING

SECTION NO.	EM-1-6
PAGE NO.	19
DATE	8-14-89



FRAMED OPENING at LUDWIG "R" PANEL

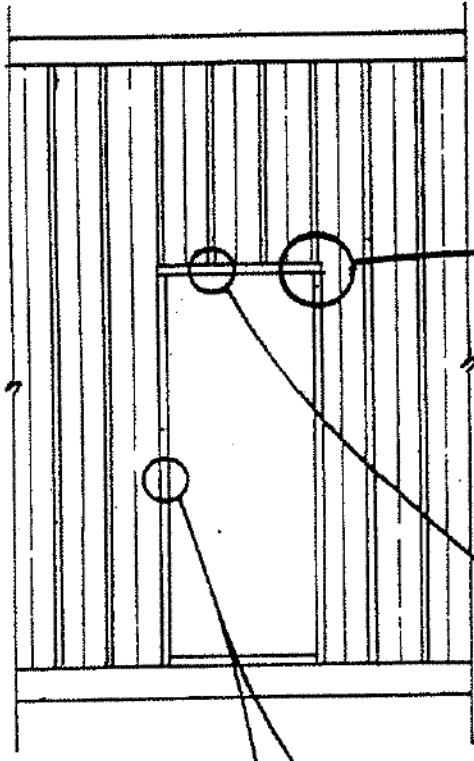


FRAMED OPENING at FLAIR PANEL

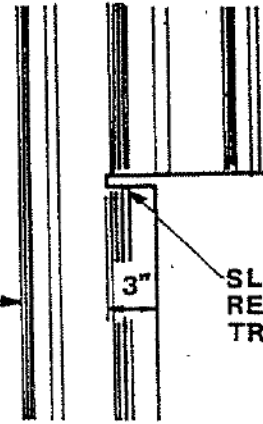


SIDING & TRIM APPLICATION - WALK DOOR

SECTION NO.	EM-1-6
PAGE NO.	20
DATE	8-14-89



SIDING



3"

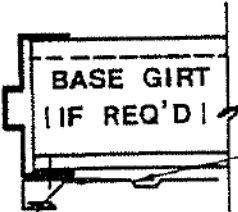
SLOT TO RECEIVE TRIM

SIDING

HEADER

HEAD TRIM HT-10

DETAIL AT HEAD

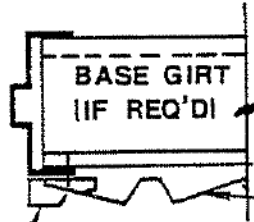


BASE GIRT (IF REQ'D)

SIDING

JAMB TRIM JTR-10

JAMB AT LUDWIG "R" PANEL



BASE GIRT (IF REQ'D)

SIDING

JAMB TRIM JTF-10

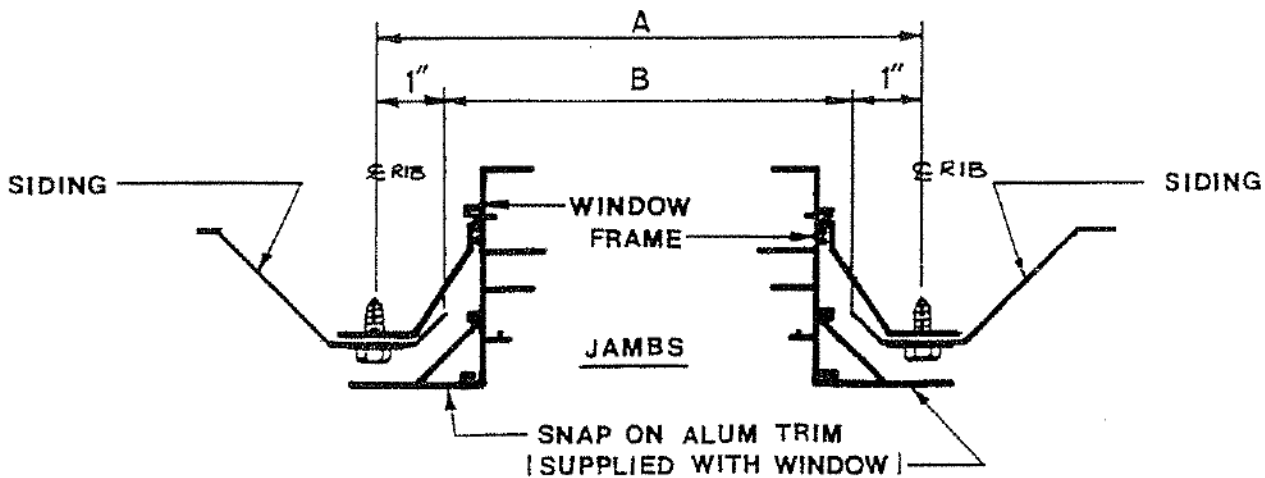
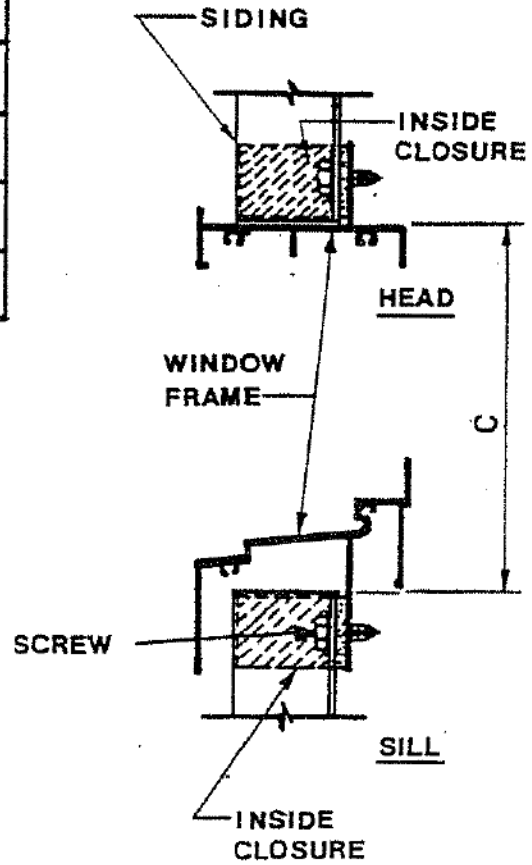
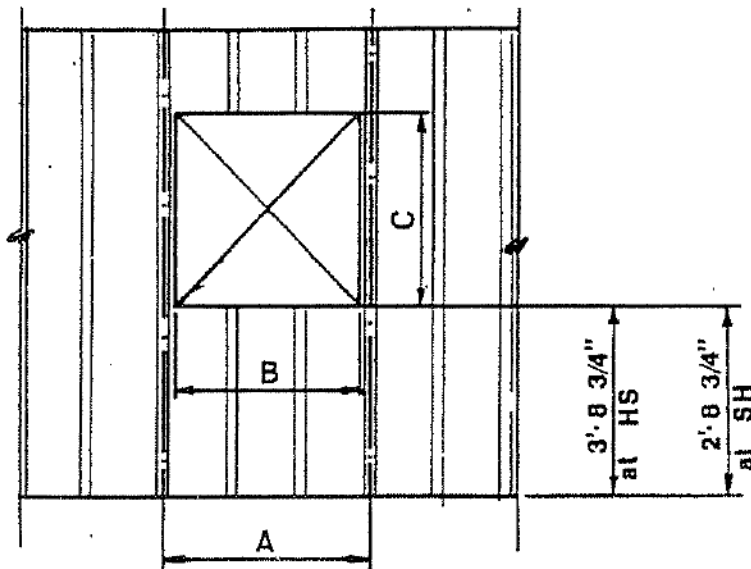
JAMB AT FLAIR PANEL



WINDOW CUTOUT & INSTALLATION AT LUDWIG "R" PANEL

SECTION NO.	EM-1-6
PAGE NO.	21
DATE	12-30-81

WINDOW SIZE	DIMENSIONS		
	A	B	C
3030 HS	3'-0"	2'-10"	3'-0 $\frac{1}{4}$ "
6030 HS	6'-0"	5'-10"	3'-0 $\frac{1}{4}$ "
3040 SH	3'-0"	2'-10"	4'-0 $\frac{1}{4}$ "

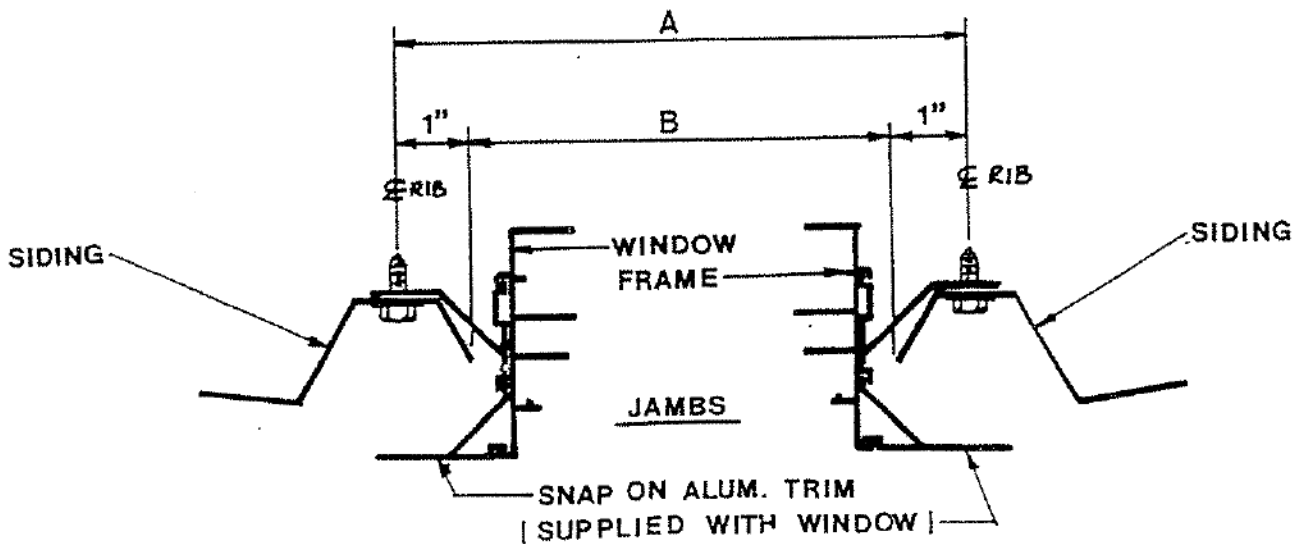
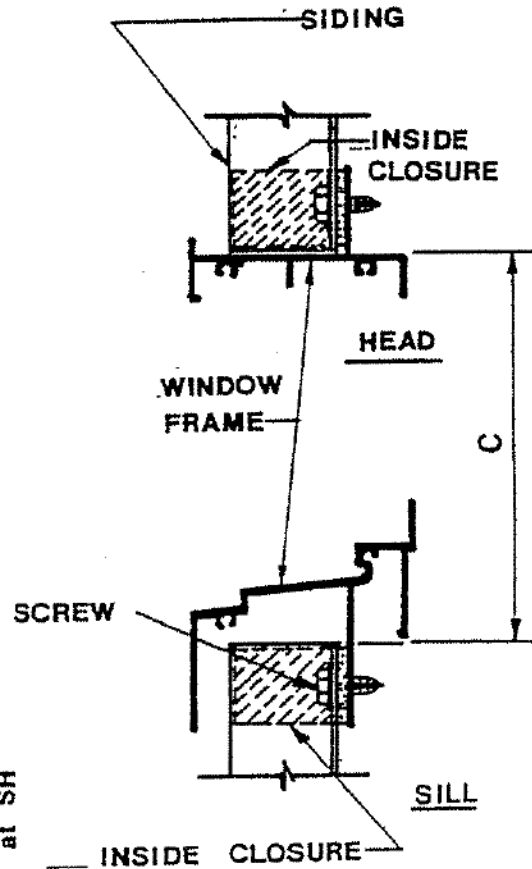
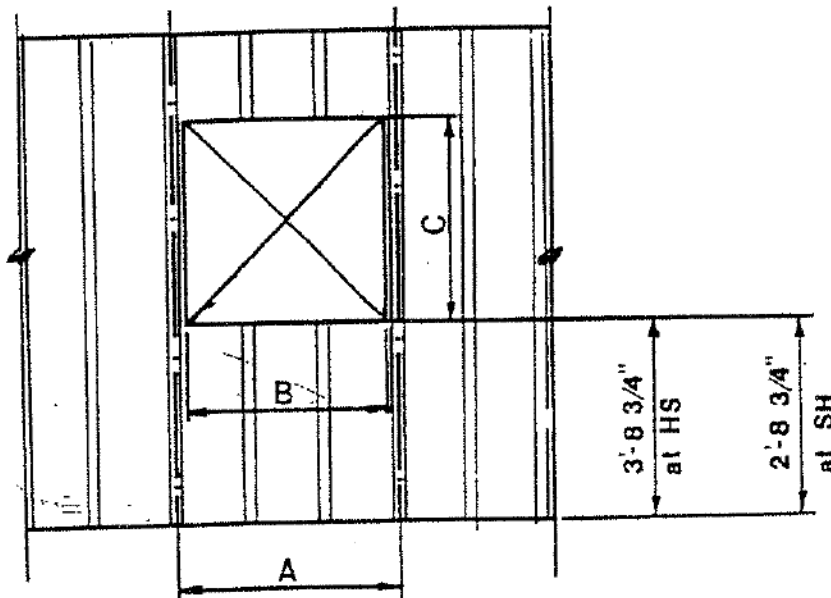




WINDOW CUTOUT & INSTALLATION AT FLAIR PANEL SIDING

SECTION NO.	EM-1-6
PAGE NO.	22
DATE	12-30-81

WINDOW SIZE	DIMENSIONS		
	A	B	C
3030HS	3'-0"	2'-10"	3'-0 1/4"
6030HS	6'-0"	5'-10"	3'-0 1/4"
3040SH	3'-0"	2'-10"	4'-0 1/4"

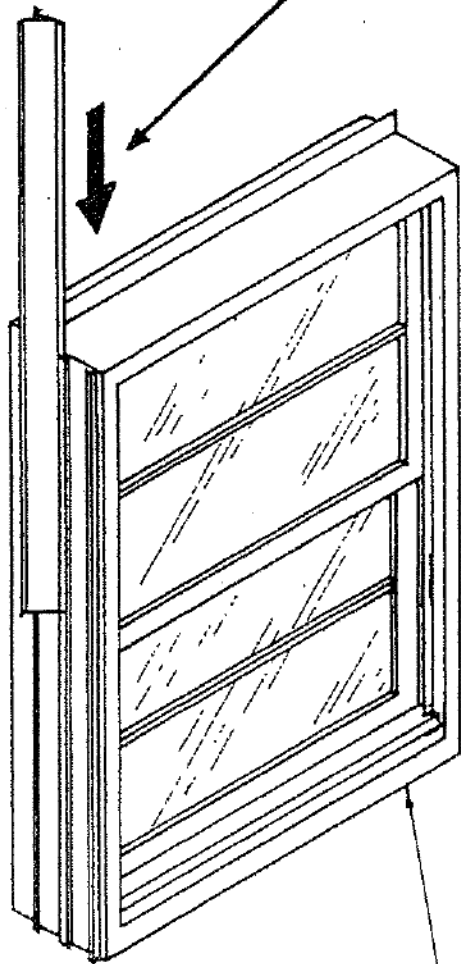




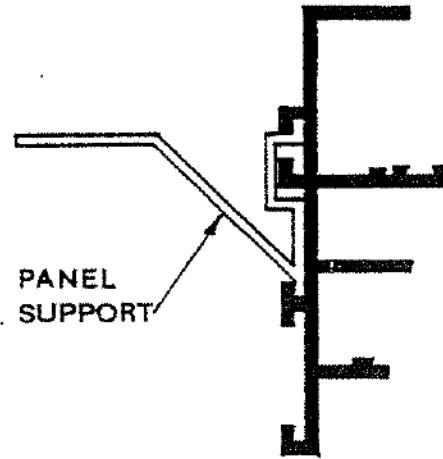
WINDOW FRAME COMPONENTS ASSEMBLY

SECTION NO.	EM-1-6
PAGE NO.	23
DATE	8-14-89

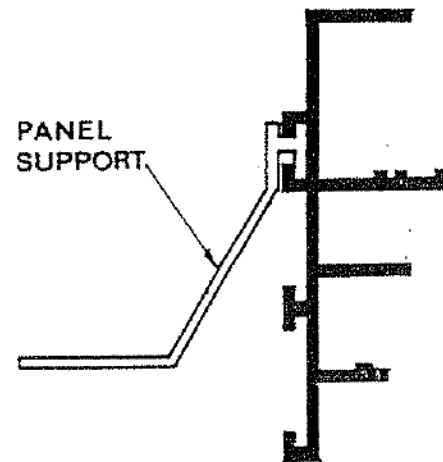
INSERT PANEL SUPPORT INTO PROPER SLOTS IN WINDOW FRAME AND SLIDE DOWNWARD *



WINDOW FRAME



JAMB AT FLAIR PANEL



JAMB AT LUDWIG "R" PANEL

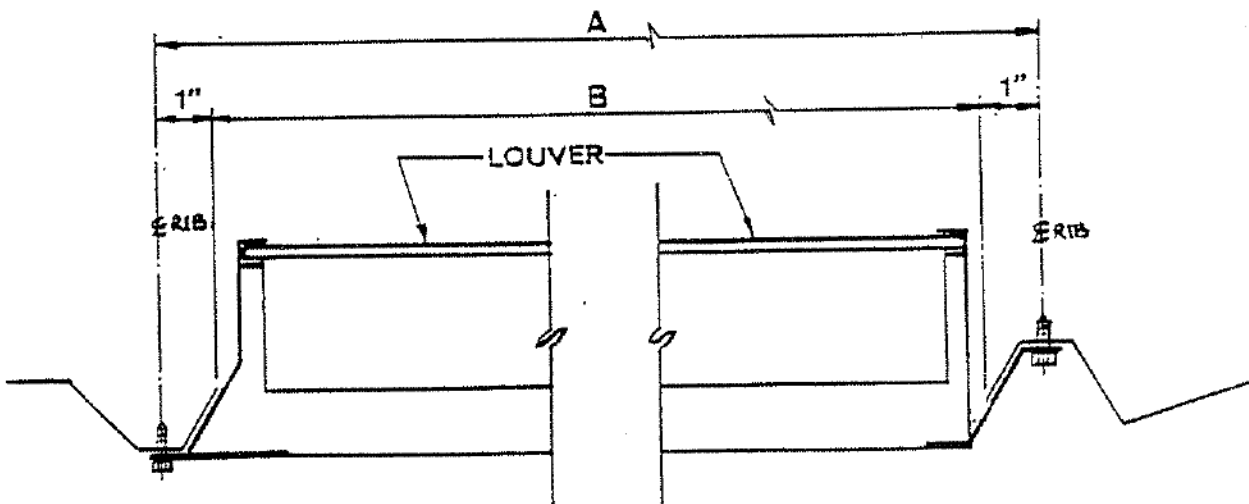
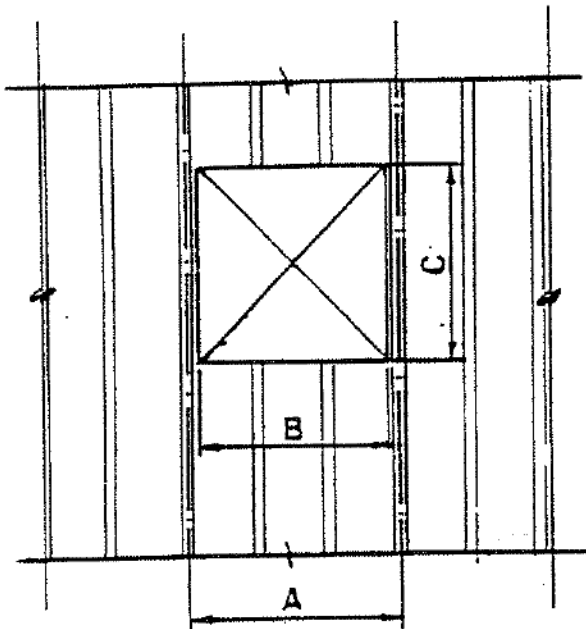
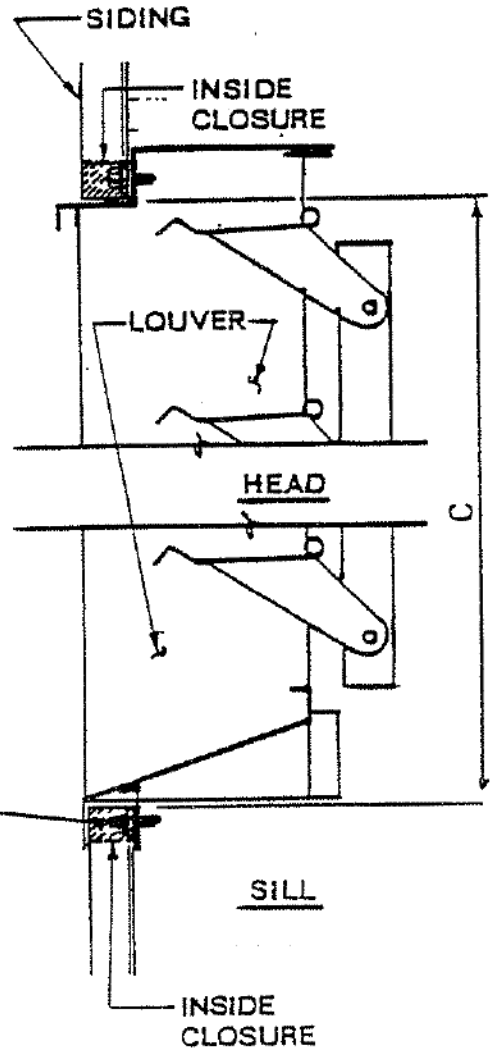
* IF INSERT WILL NOT SLIDE FREELY, LUBRICATE.



LOUVER CUTOUT & INSTALLATION

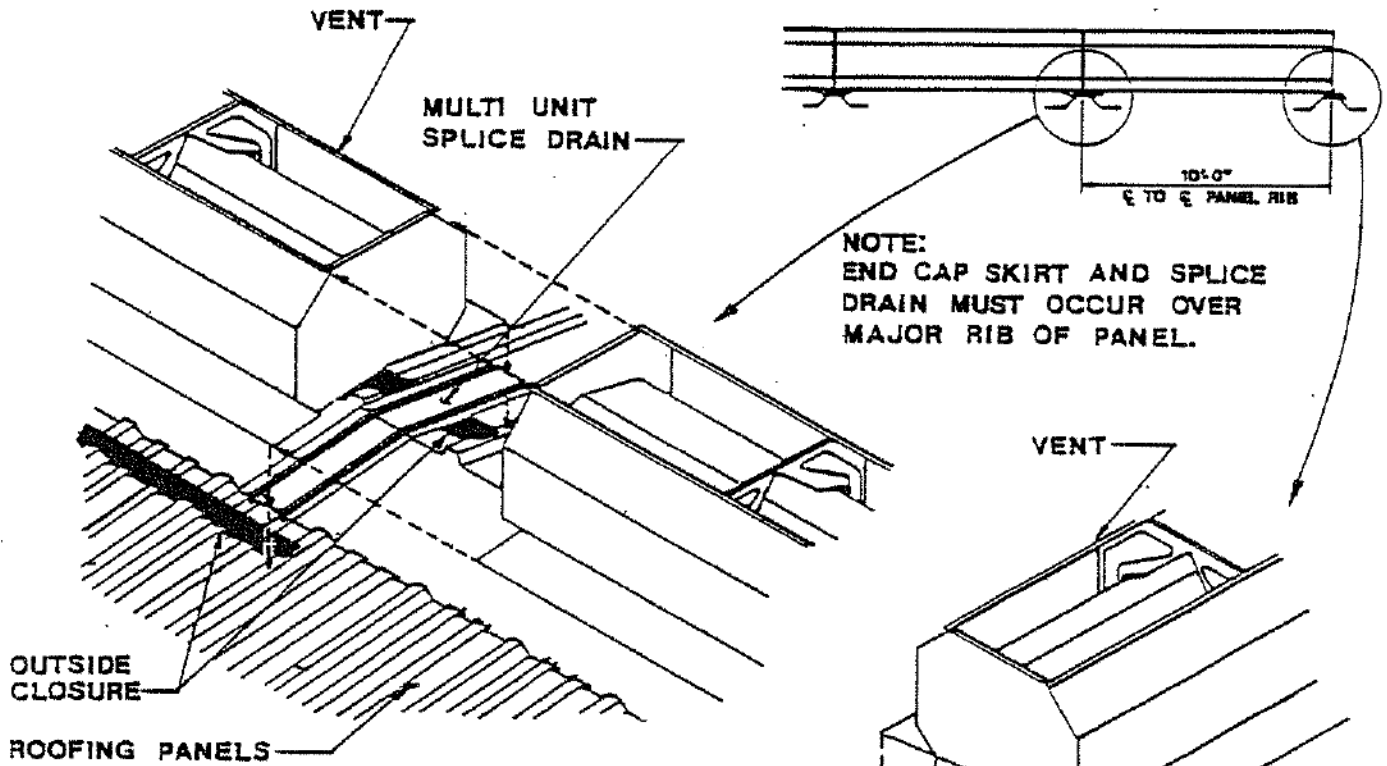
SECTION NO.	EM-1-6
PAGE NO.	24
DATE	8-14-89

LOUVER SIZE	DIMENSIONS		
	A	B	C
3050	3'-0"	2'-10"	5'-0 1/4"



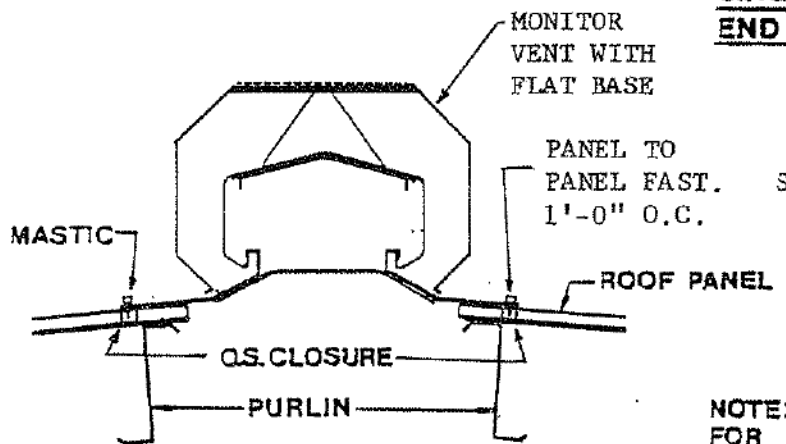
JAMB AT LUDWIG "R" PANEL

JAMB AT FLAIR PANEL

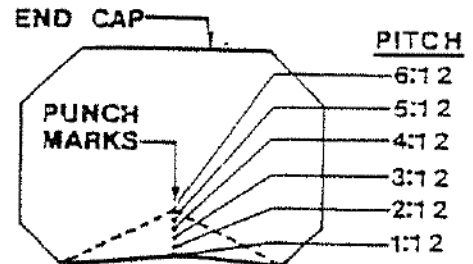


CONTINUOUS VENTILATOR
INSTALLATION

SINGLE and/or
END UNIT INSTALLATION



TYPICAL SECTION



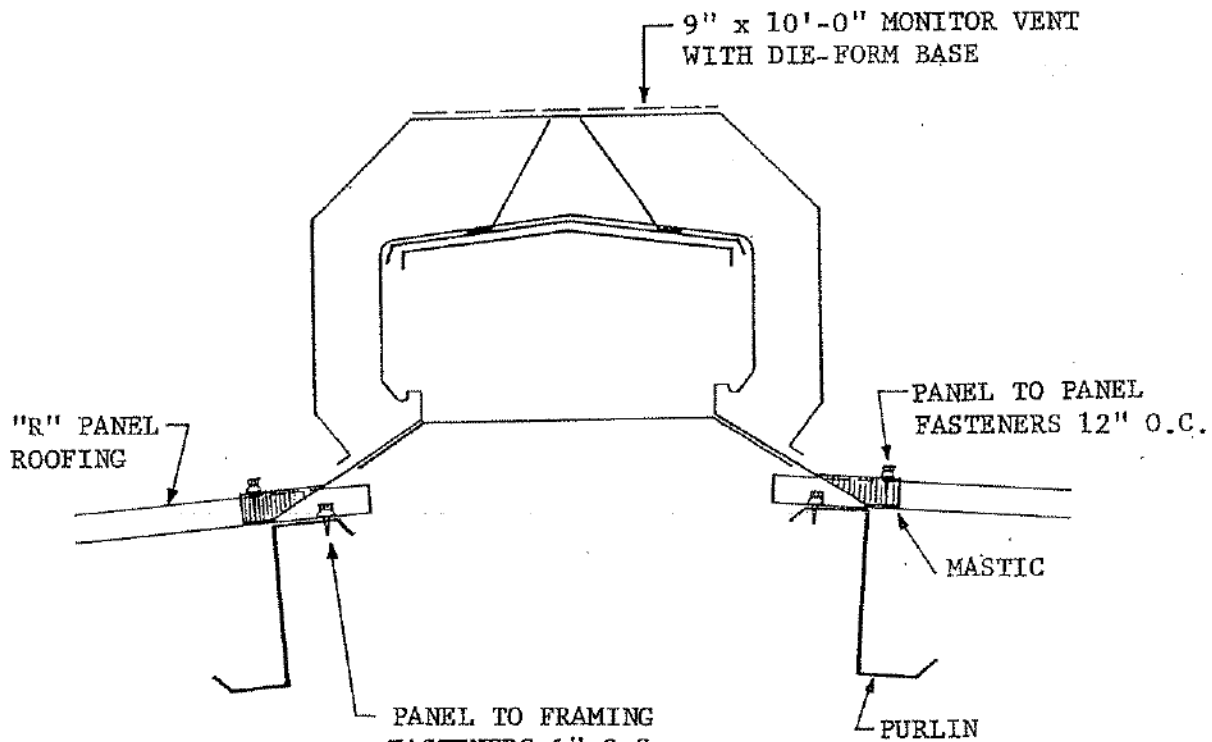
NOTE: DOTTED LINE INDICATES FIELD CUT FOR 6:12 ROOF SLOPE. OTHER SLOPES AS NOTED.

DETAIL AT END CAP



RIDGE VENTILATOR INSTALLATION

SECTION NO.	EM-1-6
PAGE NO.	25A
DATE	2-1-90

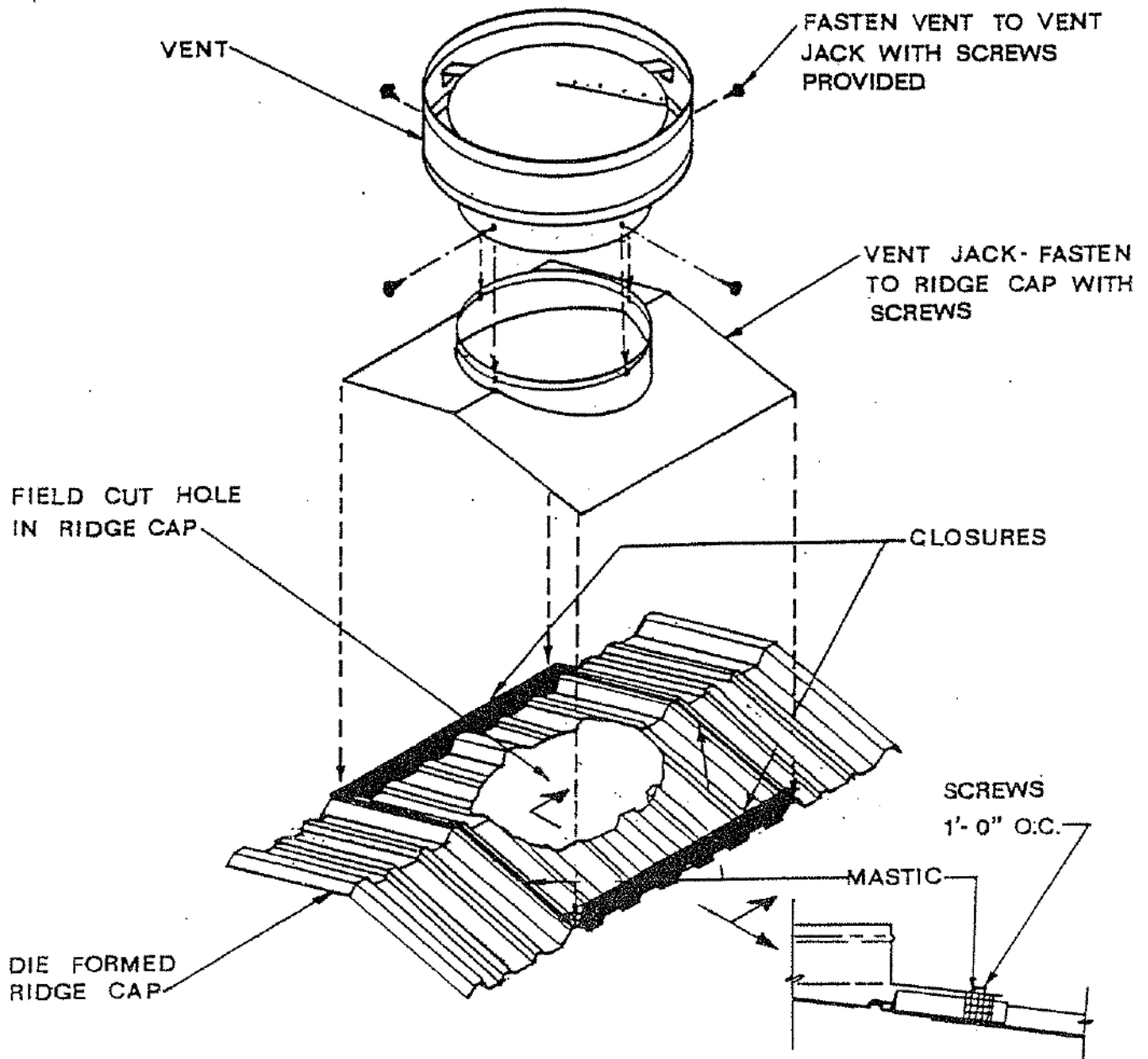


NOTE!
INSTALL FASTENERS NEAR
END OF PURLIN LEG TO
ALLOW CLEARANCE FOR VENT.

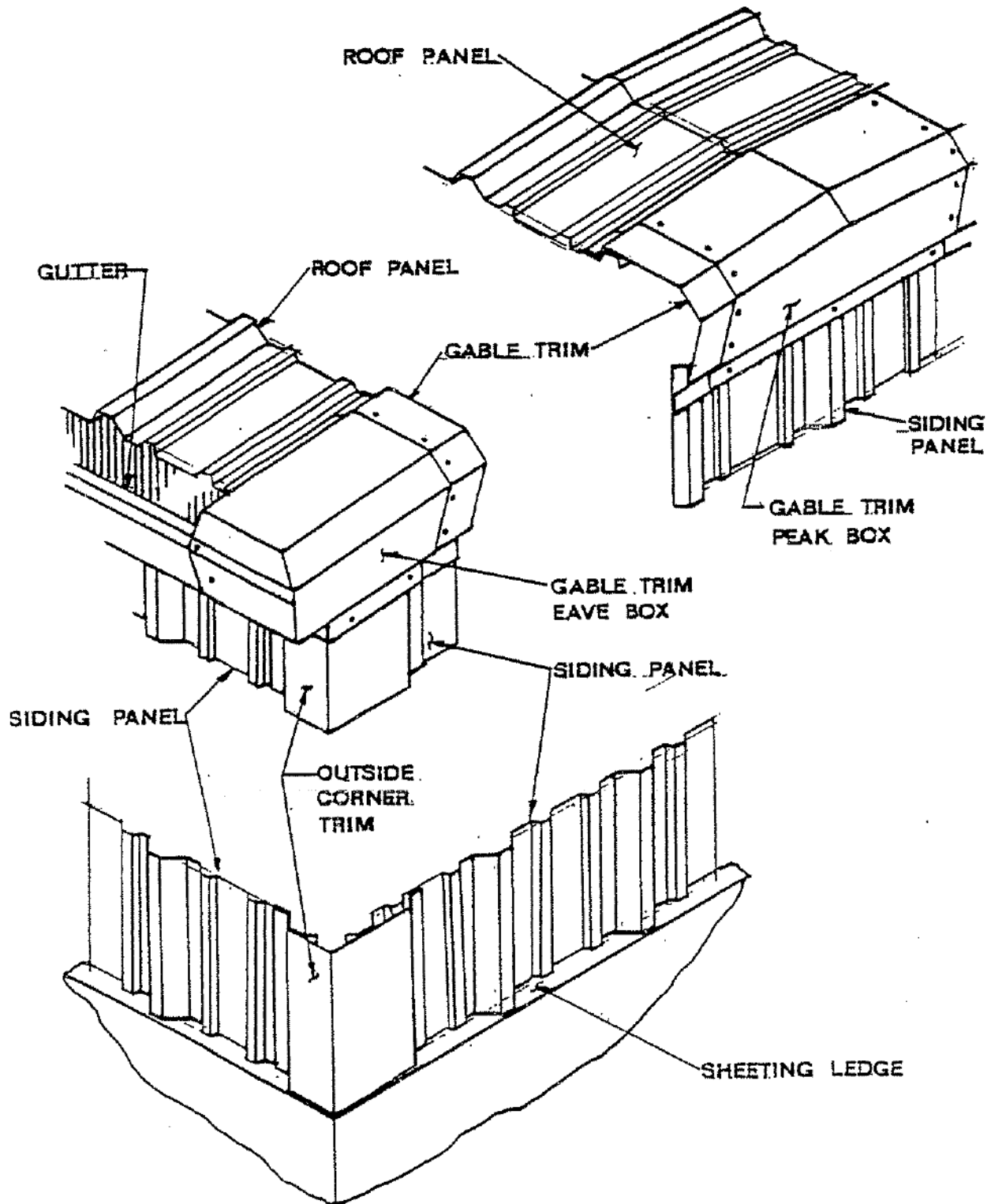


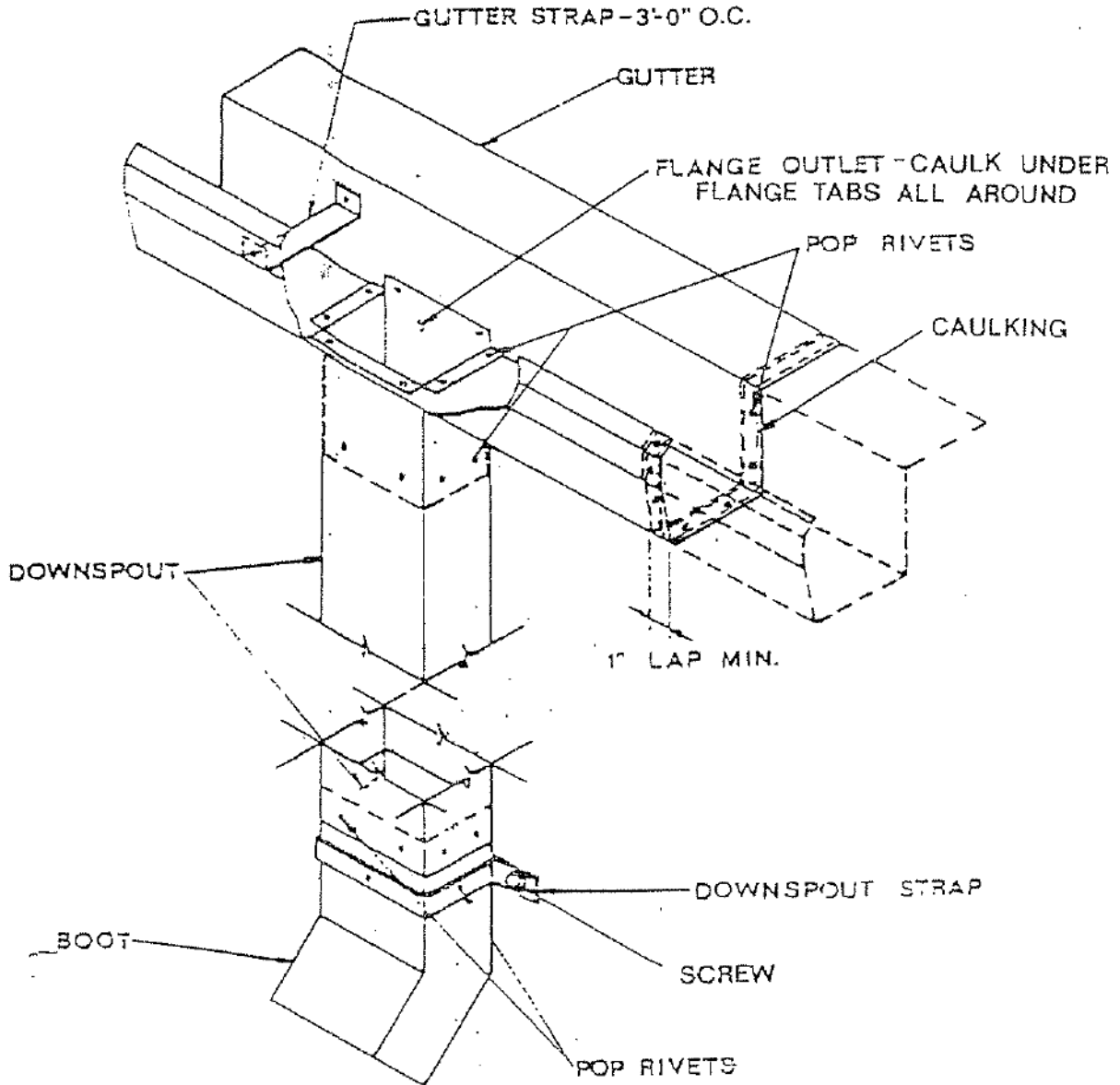
ROUND RIDGE VENTILATOR INSTALLATION

SECTION NO.	EM-1-6
PAGE NO.	26
DATE	1-11-82



ROUND RIDGE VENT INSTALLATION







ERECTION MANUAL

SECTION 9 - CLEAN UP

During installation, the roof must be swept clean (daily) of all metal shavings, chips, fasteners, and any other debris. The shavings and chips, if not removed, will embed themselves into the surface of the panel and rust, causing an unsightly appearance and can be damaging to the panels. Clean any oil, sealant, grease, etc., from the panels and trim with mineral spirits applied only to the areas that are contaminated.

Follow with a detergent cleaning using a solution of $\frac{1}{3}$ cup detergent per gallon of water. Apply the solution with a soft bristle brush. Follow with a clean water rinse.

Upon completion of erection, all unpainted or scratched surfaces should be painted with touch-up paint.

SECTION 10: MAINTENANCE

Once every 6 months, the roof should be swept clean of all dust, leaves, and debris. Be sure that all debris is removed from the gutters.

Even though the factory applied finishes on Ludwig panels are so durable that they will last many years more than ordinary building paints, eventually, it may be desirable to thoroughly clean the panels.

Dirt pickup may cause apparent discoloration of the paint where it has been exposed in some dirt laden atmospheres for long periods of time. Slight chalking may cause some change in appearance in areas of strong sunlight. A good cleaning will often restore the appearance of these buildings, and an occasional light cleaning will help maintain good appearance.

In many cases, simply washing the building with plain water using hoses or pressure sprays will be adequate. In areas where heavy dirt deposits dull the surface, a solution of water and detergent ($\frac{1}{3}$ cup detergent per gallon of water) may be used. A soft bristle brush with a long handle may be useful. A clean water rinse should follow.

Mildew may occur in areas subject to high humidity, but it is not normally a problem due to the high inherent mildew resistance of the finishes used. However, mildew can grow on dirt and spore deposits in some cases. To remove mildew along with the dirt, the following solution is recommended:

- $\frac{1}{3}$ cup detergent (for example, Tide)
- $\frac{2}{3}$ cup tri-sodium phosphate (for example, Soilex)
- 1 quart sodium hypochloride 5% solution (for example, Chlorox bleach)
- 3 quarts water

Solvent and abrasive type cleaners should be avoided. Caulking compounds, oil, grease, tars, wax, and similar substances can be removed with mineral spirits applied only to the areas that are contaminated. Follow up the use of solvent with detergent cleaning and rinsing.

To preserve appearance of fiberglass skylight panels, hose down periodically, removing accumulated, erosive dirt. At first signs of surface dullness, rinse panels clean, allow to dry, and apply a clear refinisher liquid. Neglected panels, showing exposed surface fibers and embedded dirt, may be substantially restored by cleaning with a stiff bristle brush or fine steel wool and water to remove fibers and discolored surface resin. After thorough drying, reseal panels with two coats of clear refinisher.

