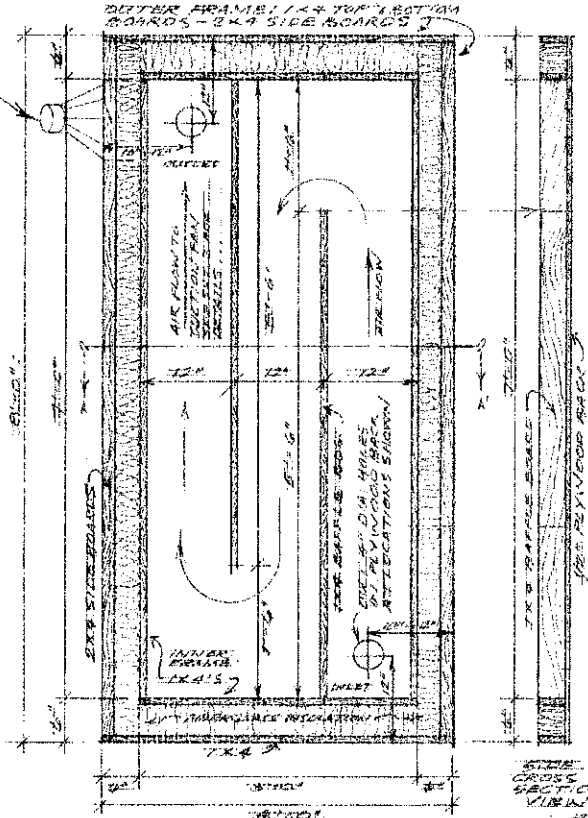
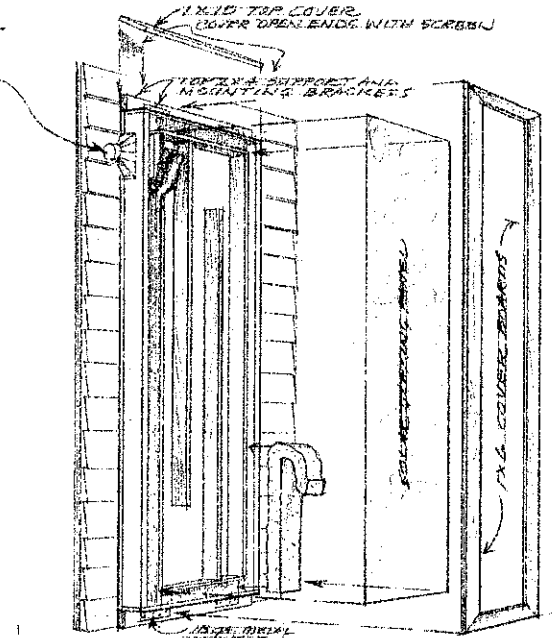
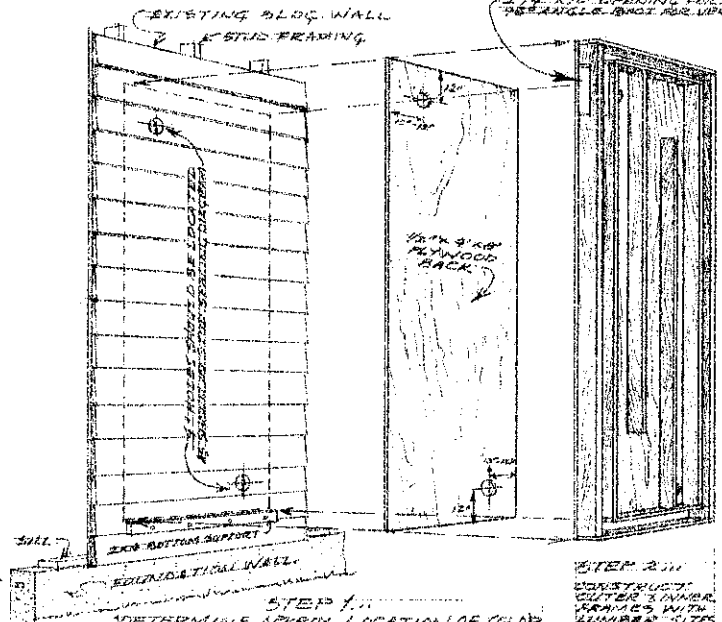


SUMMER WARM AIR VENT,
 DURING WINTER USE OF COLLECTOR,
 FILL VENT WITH INSULATION AND
 COVER BOARD WITH METAL CAP



NOTE: DRAWINGS BELOW DEPICT EACH STEP IN THE CONSTRUCTION AND FASTENING OF SOLAR UNIT TO BUILDING WALL.



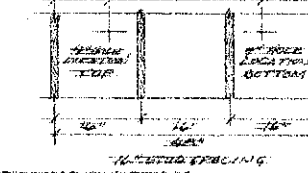
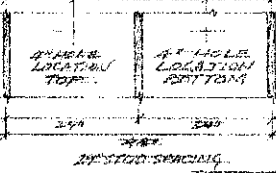
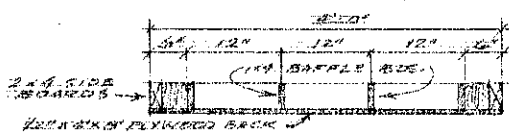
STEP 1
 DETERMINE APPROX. LOCATION OF SOLAR COLLECTOR ON SOUTH WALL OF BLDG. LOCATE STUDS IN WALL AND MARK THEIR LOCATION ON EXT. WALL SURFACE. SEE DIM. DRAWING BELOW FOR LOCATING 4 HOLES IN 1/2" AND 2" STUD SPACING IN WALL. CUT 4 HOLES IN PLYWOOD BACK PLATE. DRILL HOLES IN BRICK WALL AND MARK BRICKS CONTAINING BETWEEN WALL STUDS. MARK LOCATION OF 2x4 BOTTOM SUPPORT. FASTEN 2x4 WITH 3/4" BOLTS OR LAG SCREWS. TRIM ALL SURFACES OF LAMBER AND PLYWOOD WITH HEAT-RESISTANT WOOD PRIMER. CUT 4 HOLES IN BLDG. WALL, CHECK LONG. OF HOLES IN WALL WITH PLYWOOD BACKING.

STEP 2
 CONSTRUCT OUTER FRAME FRAMES WITH DIMENSIONAL SIZES SHOWN. DRILL HOLES WITH GALV. METAL MOUNTING BRACKETS AND ATTACH TO PLYWOOD WITH SCREWS AND OR GALV. NAILS. PAINT PRIMED SURFACES OF INNER FRAME, BRACKETS AND PLYWOOD WITH 2" WATER RESISTING PRIMER. BLACK PAPER.

STEP 3
 SET SOLAR PANEL IN PLACE AGAINST BLDG. WALL, RESTING ON BOTTOM 2x4 SUPPORT. ATTACH TOP 2x4 SUPPORT WITH 3/4" BOLTS TO WALL. ATTACH ADJUSTING BRACKETS TO 2x4 SUPPORTS, THEN FASTEN BRACKETS TO SOLAR COLLECTOR WITH 1/2" THIN METAL.

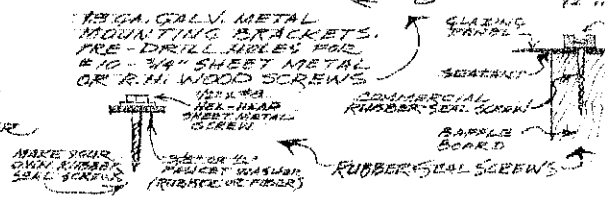
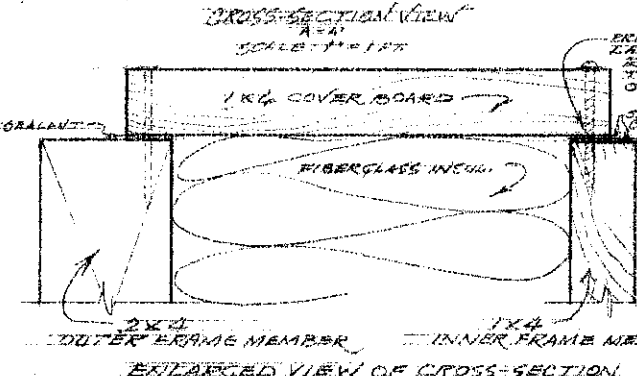
STEP 4
 APPLY A 1/2" BEND OF SEALANT ALONG FACE EDGE OF INNER FRAME AND BAFFLE BOARD. POSITION SOLAR GLAZING PANEL AGAINST INNER FRAME AND HOLD IN PLACE WITH 1/4" GALV. NAILS. ATTACH 1x4 COVER BOARD WITH NAILS AND SCREWS AS SHOWN IN ENLARGED CROSS SECTION VIEW. NOTICE THAT AN ADDITIONAL SCREW SHOULD BE LAID AS SHOWN.

FRONT VIEW OF 1x4 FRAMING



LIST OF MATERIALS FOR SINGLE SOLAR PANEL

- RECOMMENDED DIMENSIONS, TYPES AND QUANTITIES ARE LISTED. CHECK FOR ETC.
- 1 - 12" x 12" x 1/2" EXT. FRAME GRADE PLYWOOD (Plywood BACKING)
 - 2 - 12" x 4" x 1/2" SIDE FRAME AND TOP & BOTTOM SUPPORTS
 - 5 - 1 1/2" x 4" x 1/2" (OUTER AND INNER FRAME, AND BAFFLE)
 - 1 - 1 1/2" x 4" x 1/2" (PLYWOOD BOX)
 - 1 - 1 1/2" x 8" x 1/2" (PLYWOOD BOX COVER)
 - 1 - 1 1/2" x 10" x 1/2" (TOP COVER)
 - 5 - 1 1/2" x 10" x 1/2" (COVER BOARDS)
 - 1 - 12" x 10" x 1/2" 3/4" SURVILITE BRNF. FIBERGLASS GLAZING PANEL (OPTIONAL)
 - 2 - 1/2" x 1/2" x 1/2" TUBES OF 1/2" THICK SILICONE RUBBER SEALANT
 - 1 - 1/2" x 1/2" x 1/2" LONG, FIBERGLASS INSULATION (THERM-XCEL PANEL (DAVITA) # 20610)
 - 1 - 1/2" x 1/2" x 1/2" DRAIN DUCT PIPE
 - 1 - 1/2" x 1/2" x 1/2" 3/4" 90° ANGLE METAL BOLT (SUMMER VENT) 5 CAP
 - 1 - 1/2" x 1/2" x 1/2" ADJUSTING BRACKET'S, 1/2" SHEET METAL GALV.
 - 1 - 1/2" x 1/2" x 1/2" WOOD PRIMER, 1-1/2" x 1/2" x 1/2" HEAT BLOCK, TOP CONT. WOOD.
 - 5 - 1/2" x 1/2" x 1/2" BOLTS OR LAG SCREWS FOR FASTENING 2x4 SUPPORTS
 - 2 LBS. OF GALV. BOX AND FINISH NAILS
 - 2 LBS. OF 1/2" x 1/2" METAL SCREWS
 - 2 1/2" x 1/2" x 1/2" RUST-RESISTANT WOOD SCREWS (SPACED 12" O.C.)
 - 1/2" x 1/2" x 1/2" RUBBER SEALANT SCREWS (FASTEN SOLAR PANEL TO BAFFLE 12" O.C.)
 - 1/2" x 1/2" x 1/2" (IF AVAILABLE) OTHERWISE USE RUST-RESISTANT SCREWS 5/8" x 1/2" O.C.



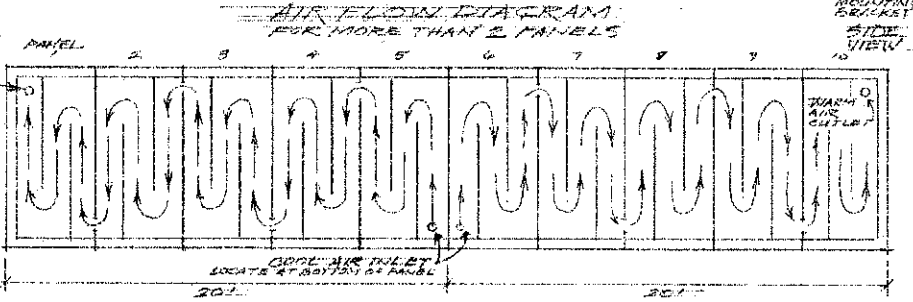
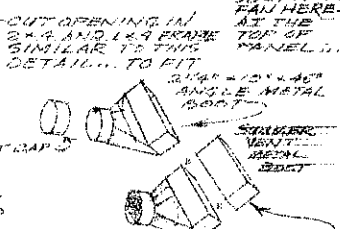
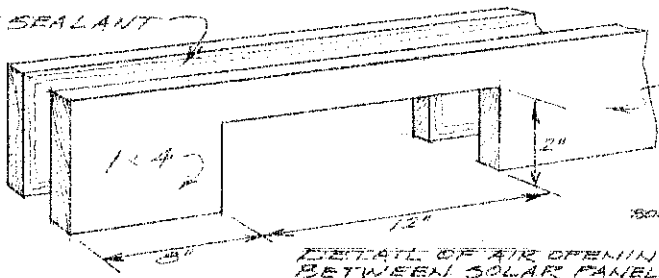
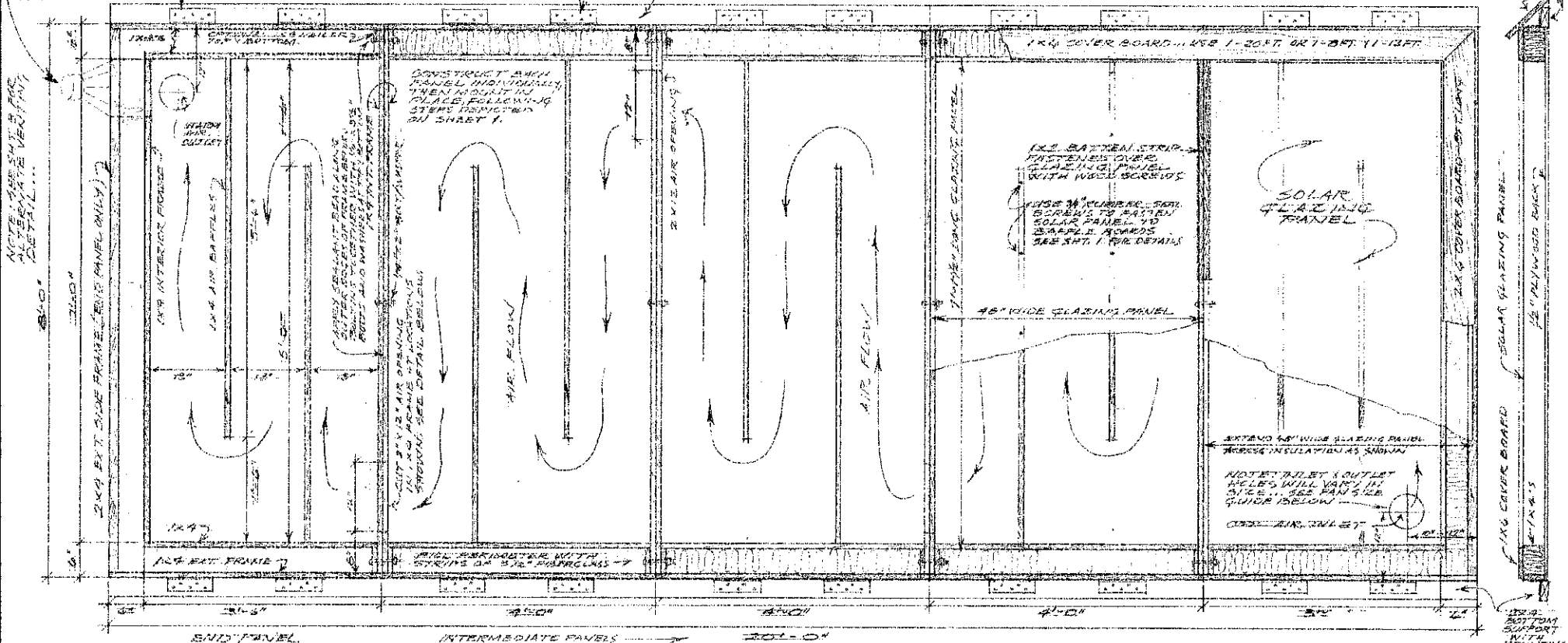
USE SCREWS WITH RUBBER WASHER WHEN ATTACHING GLAZING PANEL TO BAFFLE BOARD. DRILL HOLES IN GLAZING PANEL LARGER THAN SHANK OF SCREW. APPLY SEALANT UNDER THE FACE EDGE OF PANELS.

<p>2' x 8' SOLAR COLLECTOR SINGLE PANEL</p>			
<p>NO. PLAN # 819-B-2</p>		<p>SCALE</p>	<p>DRAWN BY R. COBBITTE</p>
<p>PREPARED BY NDSU EXTENSION AGR. ENG. DEPT.</p>			
<p>DATE APR. 81</p>	<p>APPROVED BY L. H. HINDING</p>	<p>DRAWING NUMBER SHT. 1 OF 3</p>	

SUMMER WARM AIR VENT OUT OPENING IN 2x4 AND 1x4 FRAME TO FIT 2x4 ANGLE BOOT. DURING WINTER USE, FILL WITH INSULATION AND COVER BOOT WITH METAL CAP.

NOTE: COLLECTOR SHOULD BE CHECKED ON HOT SUMMER DAYS TO MAKE SURE THAT SUMMER VENTILATION SYSTEM IS WORKING. A SUMMER COVER OF PLYWOOD OR CANVAS WOULD HELP TO KEEP COLLECTOR FROM OVER HEATING.

USE 20 FT LONG, 0.5 IN. 1x12 OR 1x12 BOARD



NOTE: A SINGLE 9'x8' SOLAR COLLECTOR PANEL MOUNTED ON SOUTH WALL WILL PROVIDE MAXIMUM HEAT OUTPUT OF 20,000 BTU PER DAY. EACH ADDITIONAL PANEL WILL ADD APPROX. 10,000 BTU PER DAY TO THE TOTAL OUTPUT.

CONSTRUCTION PROCEDURE IS DEPICTED STEP BY STEP, SHT. 1. REMEMBER TO PAINT ALL PLYWOOD AND LUMBER WITH AT LEAST 1 COAT OF WOOD PRIMER AND 1 COAT OF HEAT RESISTANT OR FIRE RETARDANT PAINT. GLUE AND NAIL ALL FRAMING MEMBERS TO PLYWOOD BACK. USE GOOD QUALITY SEALANT WHERE EVER SHOWN ON DRAWINGS.

NOTE: THERMOSTAT CONTROL SET TO START AT 80°F AND SHUT-OFF AT 75°F IS RECOMMENDED TO PREVENT HIGH TEMP. STAGNATION. CAUTION! LOCAL ELECT. CODES MUST BE FOLLOWED. SEE YOUR LOCAL ELECTRICAL SUPPLIER.

NOTE: ANY NUMBER OF PANELS CAN BE CONNECTED TOGETHER TO MEET DESIRED NEEDS. REMEMBER TO LOCATE WARM AIR OUTLET AT TOP OF PANEL AND COOL AIR INLET AT BOTTOM OF PANEL. CHANGE LOCATION OF AIR SAFFLES TO DIRECT AIR FLOW FROM INLET TO OUTLET AS SHOWN IN AIR FLOW DIAGRAM.

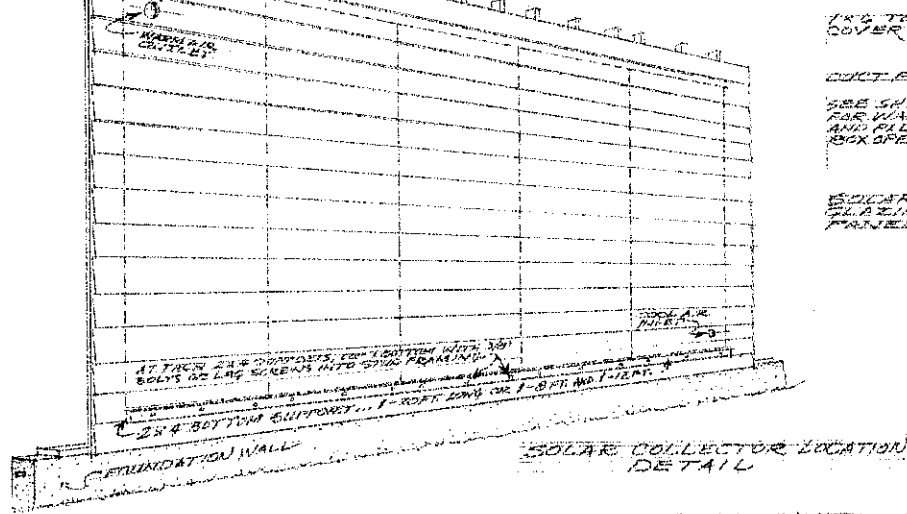
FAN SIZE GUIDE		BANTON'S S.F. RESERVE NOS.	
1 PANELS	140 CFM	# 20610	
2 TO 3 PANELS	180 CFM	# 40430	
4 TO 5 PANELS	220 CFM	# 2054T	

WALL MOUNTING		CEILING	
FAN SIZE INLET-OUTLET INCH.		FAN SIZE INLET-OUTLET INCH.	
140 CFM	4" x 4"	4"	4"
180 CFM	4" x 4"	4"	4"
220 CFM	6" x 6"	6"	6"

SOLAR COLLECTOR MULTIPLE PANELS		SCALE	DRAWN BY T. GUSSETT
NO. PLAN #819-8-2		REVISED	
PREPARED BY NDSU EXTENSION AG. ENGR. DEPT.			
DATE APR '81	APPROVED BY L. VOGEL & H. MURNING EXTENSION ENERGY SPEC.	DRAWING NUMBER SHT. 2 OF 3	

SEE STUD SPACING DIAGRAM ON SHEET 1 FOR LOCATING INLET AND OUTLET HOLES IN BLDG. WALL.

DETERMINE LOCATION OF SOLAR COLLECTOR ON SOUTH WALL OF BUILDING. FOLLOW THE 5-STEP PROCEDURE DEPICTED ON SHEET 1.



LIST OF MATERIALS FOR 5 PANEL UNIT
RECOMMENDED WOOD TYPES ARE REDWOOD, HEMLOCK OR FIR.

- 1. 1/2" x 4" x 8" EXTERIOR GRADE FLYWOOD (PANEL BACKING)
- 2. 2x4 x 8' (SIDE FRAME OF END PANELS)
- 3. 2x4 x 20' (TOP & BOTTOM SUPPORTS)
- 4. 1x2 x 8' x 18' (FRAMING, BASEFLS, PLENUM BOX)
- 5. 1x2 x 8' OR 1x2 x 4' PLENUM BOX COVERS, LENGTH VARIES WITH STUD SPACING
- 6. 1/2" x 10' x 20' (TOP COVER)
- 7. 1/2" x 6' x 8' AND 2... 1/2" x 6' x 20' (COVER BOARDS)
- 8. 1/2" x 1/2" GAL. TUBES OF HI-TEMP SILICONE RUBBER SEALANT
- 9. 1/2" x 1/2" x 1/4" x 1/4" GALV. FIBERGLASS INSULATION
- 10. 175 CFM FAN (GAYTON'S #2-CB4) SMALLER FAN FOR LESS NO. OF PANELS
- 11. 6" x 12" LONG, DUCT PIPE
- 12. 2" x 4" x 10" x 45" METAL BOOT Y CAP (SUMMER VENT, SEE ALT. SHEET 3)
- 13. 2" x 3" x 3" x 8" MOUNTING BRACKETS, 1/8" GALV. SHEET METAL
- 14. GALV. EACH OF WOOD PRIMER, HI-HEAT RESISTANT BLACK, Y. TOPCOAT FINISH
- 15. 3/8" x 3/4" BOLTS OR LAG SCREWS (LENGTH WILL DEPEND ON WALL THICKNESS)
- 16. 1/2" x 1/2" x 1/4" GALV. BOX OR FINISH NAILS
- 17. 1/2" x 1/2" x 1/4" SHEET METAL SCREWS
- 18. 1/2" x 1/2" x 1/4" RIVET-RESISTANT WOOD SCREWS (SPACED 12" O.C.)
- 19. 1/2" x 1/2" x 1/4" RIVET-RESISTANT WOOD SCREWS (FASTEN SOLAR PANEL TO RAFFERS, 12" O.C.)

NOTE: INFORMATION GIVEN HEREIN IS FOR EDUCATIONAL PURPOSES. REFERENCE TO COMMERCIAL PRODUCTS OR TRADE NAMES IS MADE WITH NO DISCRIMINATION INTENDED AND NO ENDORSEMENT BY THE AEC COOPERATIVE EXTENSION SERVICE OR AGRIC. DEPT. IS IMPLIED.

TYPES OF GLAZING MATERIALS AVAILABLE...

- 1/8" THICKNESS "SUN-LITE PREMIUM DRYBINF FIBERGLASS AVAILABLE ALL 36" x 48" WIDTH AND DESIRED LENGTH FROM KALWALL SOLAR DIVISION, BOX 237, MANCHESTER, NEW HAMPSHIRE, 03105. CATALOG AVAILABLE.
- 3/16" FLEXIGARD... ALL THICKNESS, CLEAR PROTECTIVE FILM...
- 1/8" FLEXON... 1/16" THICKNESS, FLEXIBLE PLASTIC.

TYPES OF HEAT RESISTANT PAINTS...

- 'RODUSTO' BARBECUE HEAT RESISTANT, BLACK, # H-49 (BRUSH-ON)
 - 'ROLLER DRYBINF' FAST DRY, HI-HEAT, BLACK (SPRAY CANS)
 - 'SOLAR KIT #D-SOLAR-2' CONTAINS PRIMER AND BLACK TOPCOAT.
- OTHER BRANDS ACCEPTABLE IF M.I.U. 275° F HEAT RESISTANCE IS INDICATED.
- SIZES 3 COATS OF MARINE VARNISH ALSO CAN BE USED SUCCESSFULLY FOR NATURAL WOOD FINISH. (HOWEVER, DO NOT USE ON OR AROUND COLLECTOR SURFACE)

START WITH SEALANT ALONG TOP EDGE OF 1x10 TOP COVER

USE SCREEN TO CLOSE OFF ENDS

1x6 TOP COVER

DUCT PIPE

SEE SHEET 2 FOR WALL AND PLENUM BOX OPENING

SPICAR GLAZING PANEL

WARM AIR

4x4 GRAB BOX RAILS AND FLUE

PLENUM BOX

CONSTRUCT BOX AND COVER AS SHOWN, THEN FOLLOW STEPS SHOWN HERE

APPLY SEALANT ALONG BACK EDGES OF BOX BEFORE INSTALLING

PASTE IN BOX AND COVER TO WALL STUDS WITH 2x4 GRAB BOX NAILS

CUT 4x8 1/2" DUCT PIPE AS SHOWN

STEP 1. MEASURE THICKNESS OF WALL & SOLAR PANEL OPENING AND CUT TO THIS DIMENSION FOR FLANGES.

DUCT PIPE INSTALLATION DETAIL

DUCT PIPE

DUCT PIPE INLET

CUT AND INSTALL DUCT PIPE AS SHOWN ABOVE

CONSTRUCT PLENUM BOX

INSTALL SCREEN AND FLEXIBLE DAMPER AS SHOWN HERE

APPLY SEALANT TO BOTH FRONT AND BACK EDGES TO PLENUM BOX

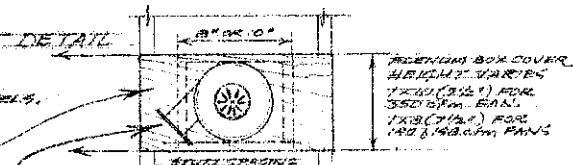
EXT WALL SIDING

SILL

ENLARGED CROSS SECTION SIDE VIEW

WIND TURBINE; GALV. STEEL WARRING BASE WITH ANTICORROSIVE DRAINAGE LOCATED ABOVE FAN. AN INLET SIZE SHOULD BE ADEQUATE. HOWEVER, SIZE NEEDED SHOULD BE GUIDED BY 100 CFM OF AIR DISPLACED IN BUILDING.

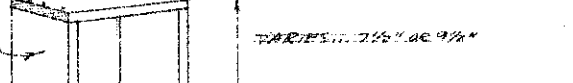
ALTERNATE SUMMER VENT DISCHARGE DETAIL



TURN FAN OUTLET TO DESIRED DIRECTION OF WARM AIR CIRCULATION

4x4 GRAB BOX RAILS AND FLUE

DUCT WALL STUD



CONSTRUCT BOX AND COVER AS SHOWN, THEN FOLLOW STEPS SHOWN HERE

APPLY SEALANT ALONG BACK EDGES OF BOX BEFORE INSTALLING

PASTE IN BOX AND COVER TO WALL STUDS WITH 2x4 GRAB BOX NAILS

CUT 4x8 1/2" DUCT PIPE AS SHOWN

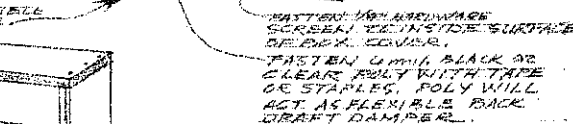
STEP 1. MEASURE THICKNESS OF WALL & SOLAR PANEL OPENING AND CUT TO THIS DIMENSION FOR FLANGES.

STEP 2. MAKE 1/2" CUTS INTO EACH END OF DUCT PIPE. INSERT PIPE INTO WALL OPENING.

STEP 3. APPLY SEALANT BOTH SIDES OF WALL AND PANEL OPENING. THEN FOLD BACK FLANGES. FASTEN FLANGES TO WALL AND FLYWOOD ON SOLAR PANEL WITH 3/8\"/>

FASTEN WOODWORK SCREEN TO INSIDE SURFACE OF BOX COVER.

FASTEN 1/4\"/>



SOLAR COLLECTOR CONSTRUCTION		SCALE	DESIGNED BY ROSE CHRISTA
N.D. PLAN # 219-82		REVISIONS	REVISED
PREPARED BY NDSU EXTENSION AGR. ENG. DEPT.			
DATE APR. 81	APPROVED BY L. J. ROSE & H. HIRSHING EXTENSION ENERGY SPEC.	DRAWING NUMBER SHT. 2 OF 5	