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Window Box Solar Collector Design

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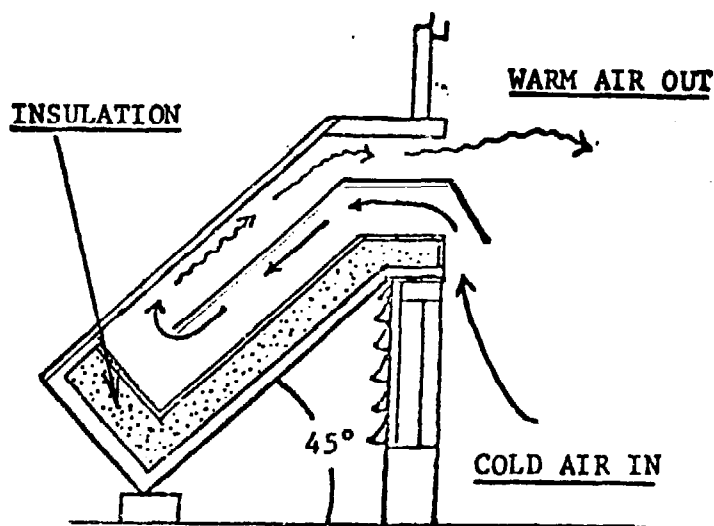
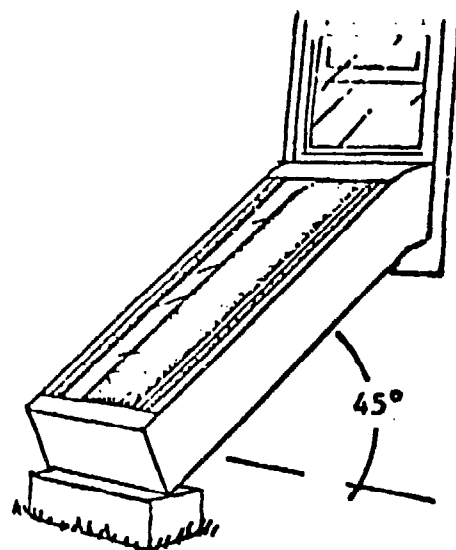
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WINDOW BOX SOLAR COLLECTOR  
DESIGN  
by the Small Farm Energy Project.  
P.O. Box 736  
Hartington, NE 68739

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The attached plans for the window box collector are the results of surveying several other designs by other organizations. The plans were used for constructing over a dozen of the window box units for cooperators of the Small Farm Energy Project, during a construction workshop. Therefore the plans attached resulted from consideration of best use of purchased materials and ease of construction, in addition to solar heating efficiency. Individuals building one unit may wish to use salvaged lumber and a storm window cover if available, in order to lower cost. Such a project may require modifications to the design as the builder sees fit. However, the basic air flow patterns should be used.

The attached plans are designed to use a full 4 X 8 ft. sheet of  $\frac{1}{2}$ " plywood. Use exterior plywood. The wire mesh in the warm air flow passage at top of collector plate is suggested for improved efficiency by improving heat transfer to the air flow and lowering reflection from collector plate. However, it is not necessary. The fiberboard or insulation board below the metal collector plate is very important. It acts as insulation between the two air flows to keep a temperature differential so that the warm top air flow keeps the system performing efficiently. The window box unit requires no fan to move the air. As the air in the collector is heated above the metal collector plate, the air rising into the room. This pulls cooler house air from the floor into the heater.



The plans attached show the complete assembly in addition to three sub-assemblies, cutting diagram and material list. It is suggested that the outer box be assembled, then the inner box, then the rear top sub-section. Then the sub-assemblies are combined. The sub-assemblies should be caulked using latex caulk on the inner corners and cracks. The outer box is caulked on the outside along cracks before painting. Place cover (Part 0) with insulation (CC) and insulation cover (W) on last.

Place latex caulk below the fiberglass cover. Caulk the top side of fiberglass next to wood and also caulk exposed nails on lower end of fiberglass using clear silicone caulk.

Fiberglass cover should be cleaned before locating, free of dust.

The following substitutions can be made for the window box design:

- Part "U" can be masonite or plywood above the insulation.
- The sides "I" can be 1 X 10's instead of plywood.
- The sides of the inner box could be 1 X 6, however the  $\frac{3}{4}$ " width of the 1 X 6 will restrict area for the 1" insulation of the sides.
- Sheet metal instead of press plate can be used for the collector plate. Aluminum press plate is available from printers and is inexpensive.
- Old storm window in place of the fiberglass cover.
- The size of collector can be modified to smaller or larger to fit window.
- The collector can be lengthened as space permits. Actually the longer the better for increased air flow and improved efficiency.

-Double glazing of two fiberglass layers with an air gap of  $\frac{1}{2}$ " can also be used with some efficiency improvement. Or one layer of fiberglass and one storm window might be used.

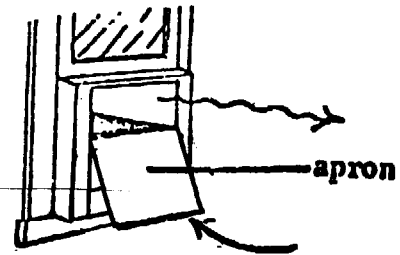
The fiberglass cover is available from Solar Components Division, Kalwall Corp., P.O. Box 237, Manchester, N.H. 03105. However the minimum size of sheet fiberglass is 4' X 10' ranging in price from 55¢ to about 75¢ per square foot, depending on grade. This size would be enough for 4 units.

Sears also has various types of fiberglass. Lumberyards have plexiglass for about \$2 per square foot. The cost of new construction materials is about \$40, when using Kalwall fiberglass.

The window box collector can be installed to a window by one of several options. For narrow windows, the unit can simply be located against the window frame. For wider windows, the unit will fit through the window frame directly into the living area. Windows can then be lowered down on the unit. Hooks or nails can be used to secure the unit. Caulking, foam seal, or additional lumber should be used to close cracks and gaps so that infiltration of cold outside air is not a problem.

The window box unit will not function properly when placed in a window that has a heating radiator below the window.

The collector must be well insulated. The metal collector plate should be extended into the room as shown to divide the air flows. At night the system is inactive as cold air settles to the bottom of the collector.



The collector unit will help heat a room during sunny days. It adds much additional heat to rooms with small windows. Rooms with large windows already have good collectors in the large windows, but should have heavy drapes from ceiling to floor or be insulated at night to conserve heat. A small fan can be used to move air in the window box.

Item	Quantity	Material List		Comment
		Material	Dimension	
	1	$\frac{1}{2}$ " plywood	4' X 8'	See Cutting Diagram P. 7 24ft. <sup>2</sup> actual, See Diagram P.8
	1	$\frac{1}{2}$ " or 5/8" Fiber Board	4' X 6'	
DD	1	1 X 2	54 3/4"	Center Support
K	1	1 X 4	26"	Rear Cover
L	2	1 X 4	5' or 60"	Side Cover
M	2	2 X 2	9 $\frac{1}{2}$ "	Rear End Cap
N	2	1 X 2	23"	
Y	1	2 X 2	26"	
Z	1	Wire Mesh	2' X 4'	Optional, or "wire lathe"
O	1	1 X 12	30"	Top Cover
P	2	2 X 4	11 3/4"	Bottom Frame Member
Q	1	Kalwall Sunlite Fiberglass Cover	2' X 5'	Old Storm Window Can Be Used
S	2	1" Styrofoam	1' X 6'	Beadboard, Approx., Cut to Fit
CC	1	1" Styrofoam	7" X 23"	Beadboard to Fit
R	1	3 $\frac{1}{2}$ " Fiberglass Batt Insulation	23 $\frac{1}{2}$ " X 5'	Position Vapor Barrier Up
T	2	Press Plate	23" X 35"	Or Similar Size or Metal Size, Total 66" long
		Nails	6	Galvanize
		Nails or staples	Small Finishing	For Metal Sheet
	1	Paint	Flat Black	For Metal
		Paint	Exterior	For Wood

# WINDOW BOX COLLECTOR

SFEP, 10/77, DLD

SCALE: 1/2" = 1', 1" = 1'

NOTE: BUILD AS SUBSECTIONS: OUTER BOX, INNER BOX, AND TOP REAR; THEN ASSEMBLE AND ADD METAL & COVER

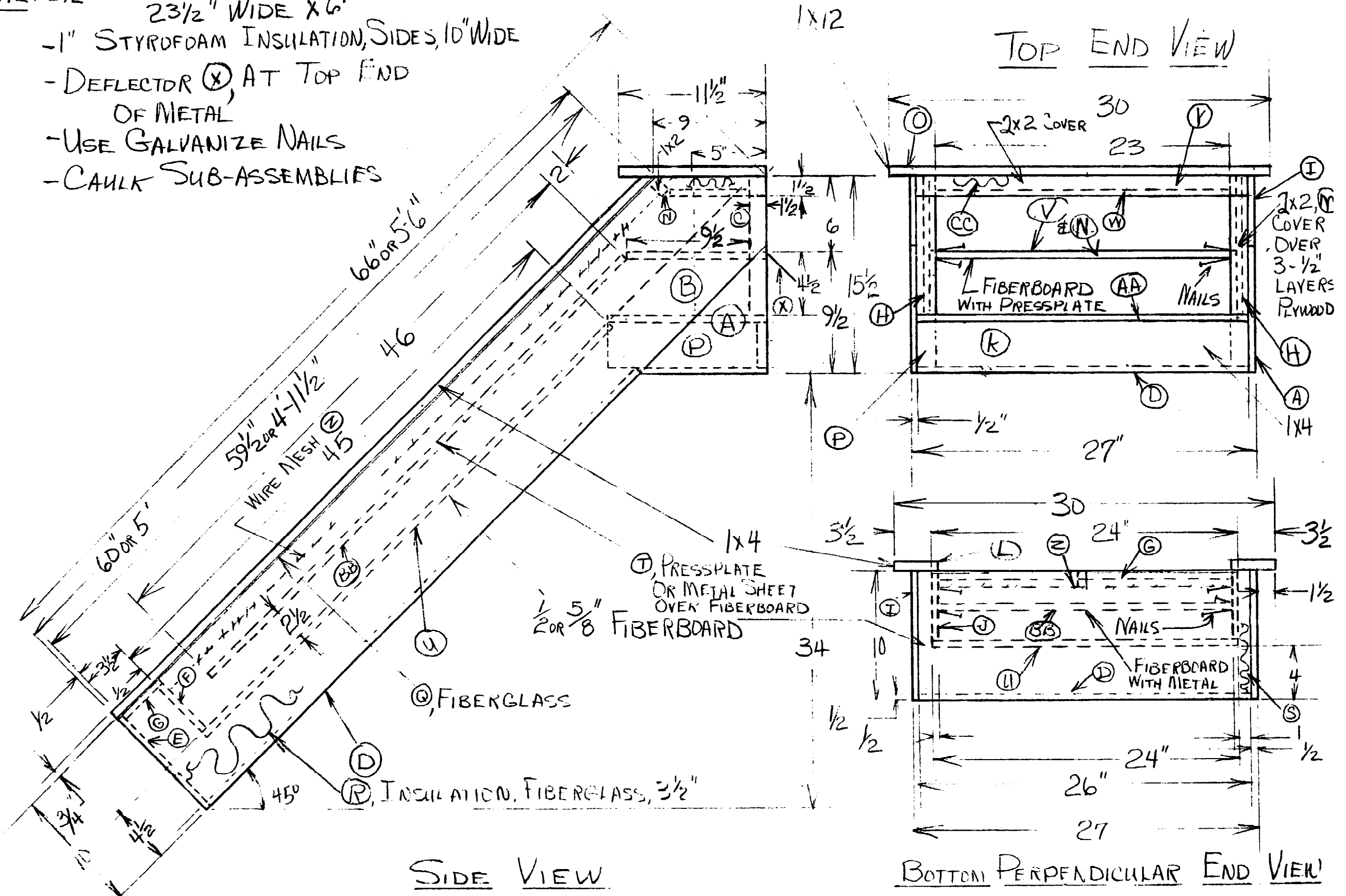
NOTE: 3 1/2" FIBERGLASS BATT INSULATION BOTTOM,  
23 1/2" WIDE X 6'

- 1" STYROFOAM INSULATION, SIDES, 10" WIDE

- DEFLECTOR (X) AT TOP END  
OF METAL

- USE GALVANIZE NAILS

- CAULK SUB-ASSEMBLIES



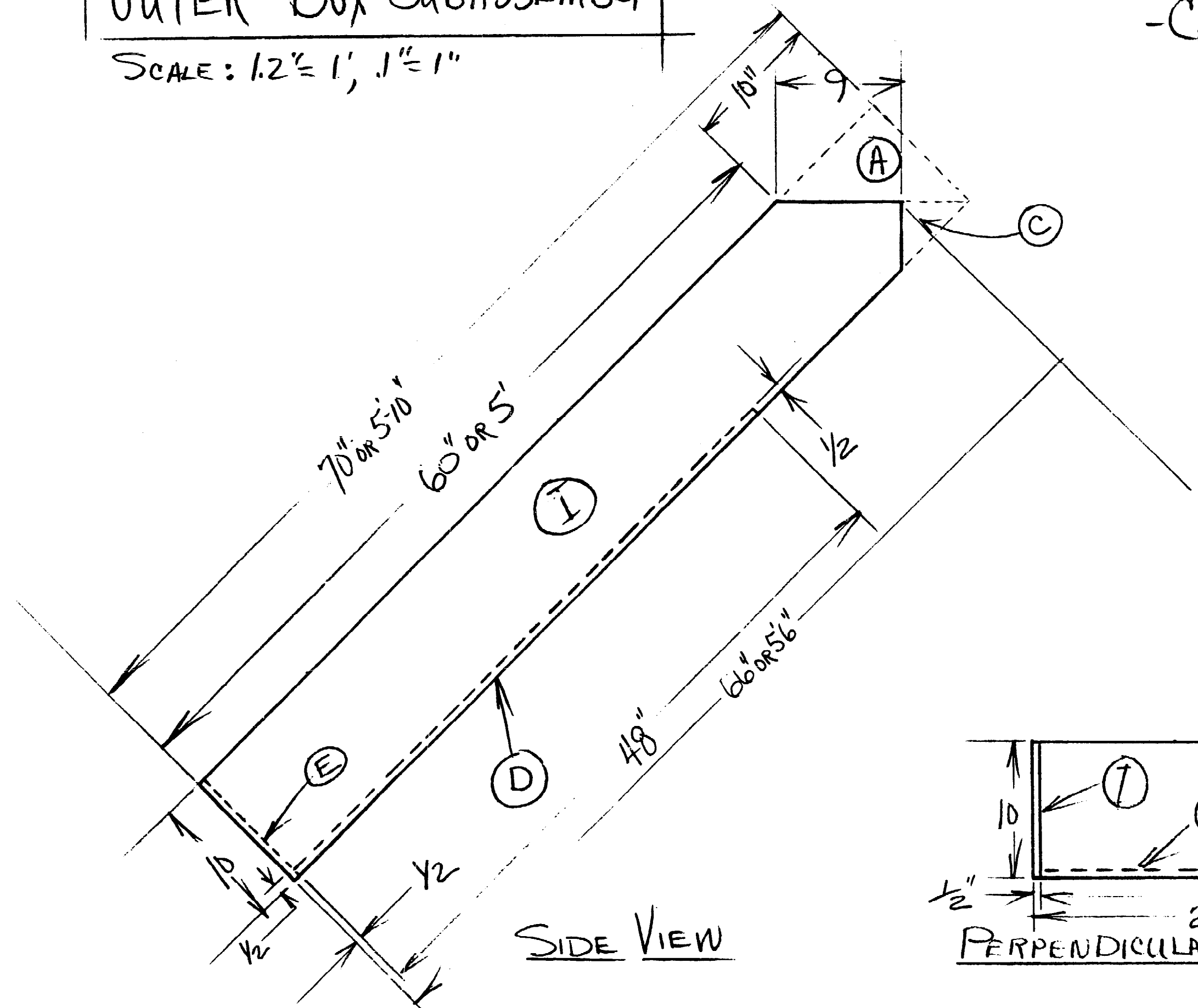
SIDE VIEW

BOTTOM PERPENDICULAR END VIEW

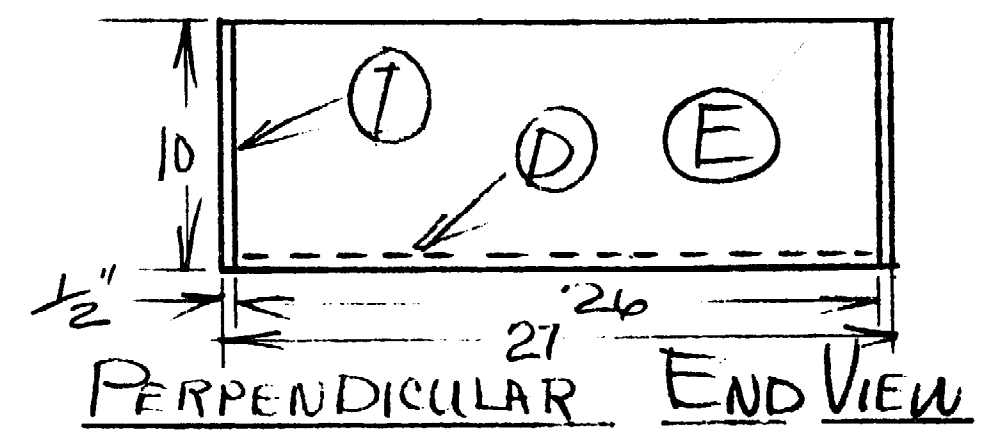
WINDOW BOX COLLECTOR  
 OUTER BOX SUBASSEMBLY

SCALE: 1/2" = 1', 1" = 1"

NOTE: USE GALVANIZED  
 NAILS  
 -CAULK INSIDE  
 CORNERS



SIDE VIEW

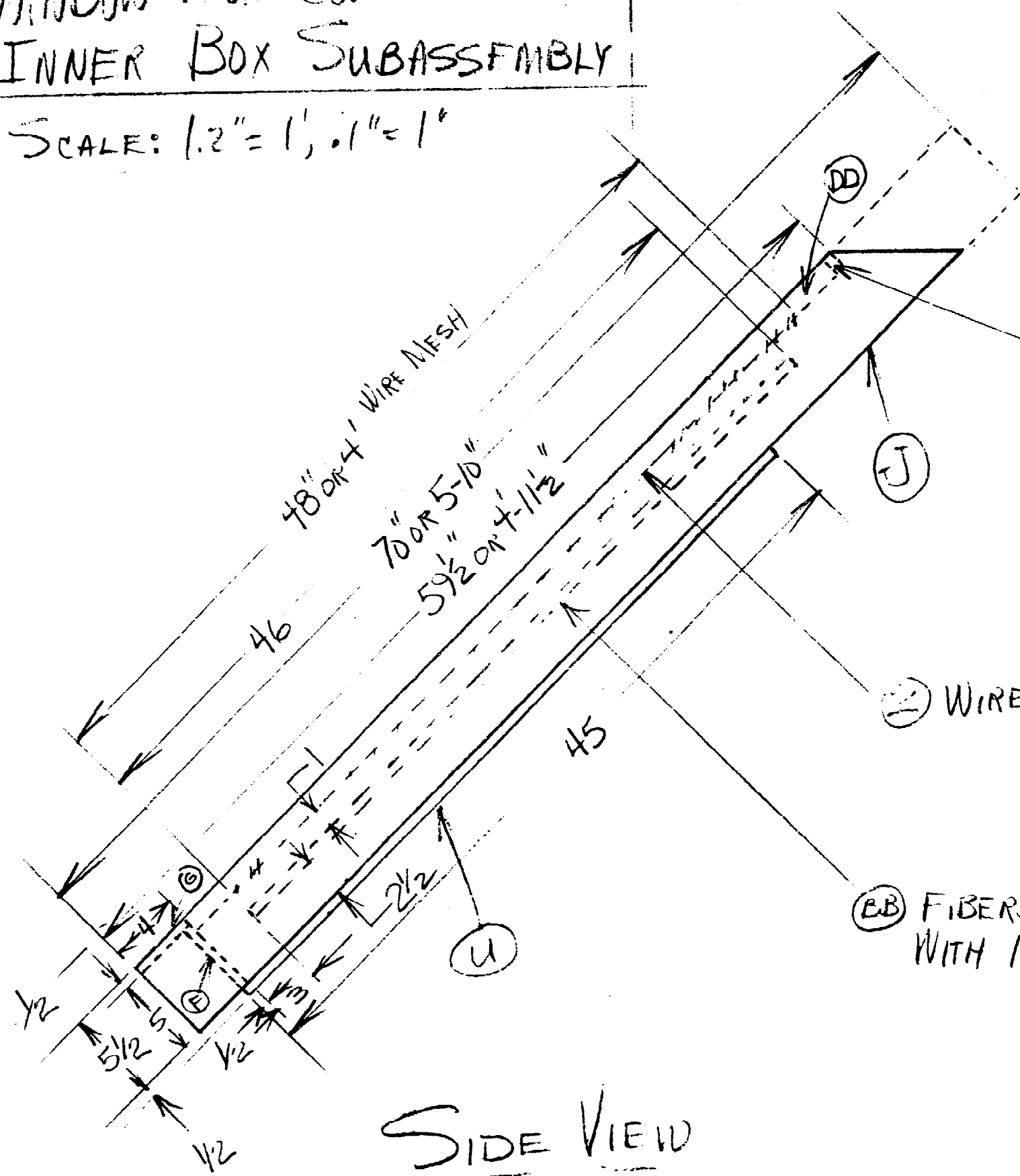


PERPENDICULAR END VIEW

# WINDOW BOX COLLECTOR INNER BOX SUBASSEMBLY

SCALE: 1/2" = 1', 1" = 1'

- NOTE:- CAULK INSIDE OF BOX CORNERS
- STAPLE METAL SHEET TO FIBERBOARD AT LOWER END
  - PAINT SHEET METAL FLAT BLACK
  - STEEPLE WIRE MESH BEFORE LOCATING (DD)
- (N), USE RING SHANK NAIL

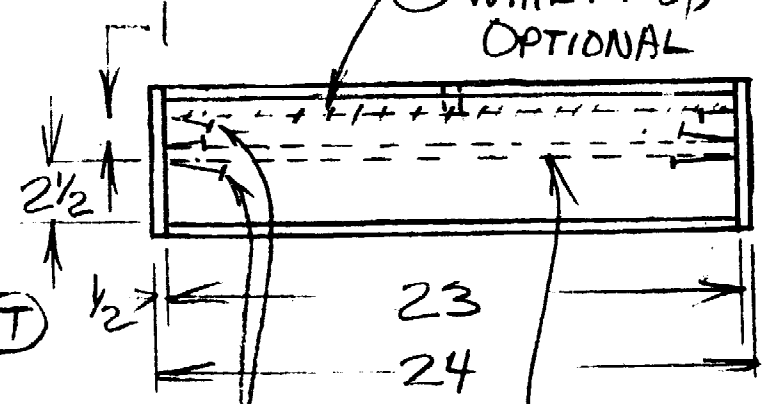


SIDE VIEW

(N) WIRE MESH - NAIL BOTTOM WITH STEEPLES INTO DD

(Z) WIRE MESH, OPTIONAL

(BB) FIBERBOARD WITH METAL (T)

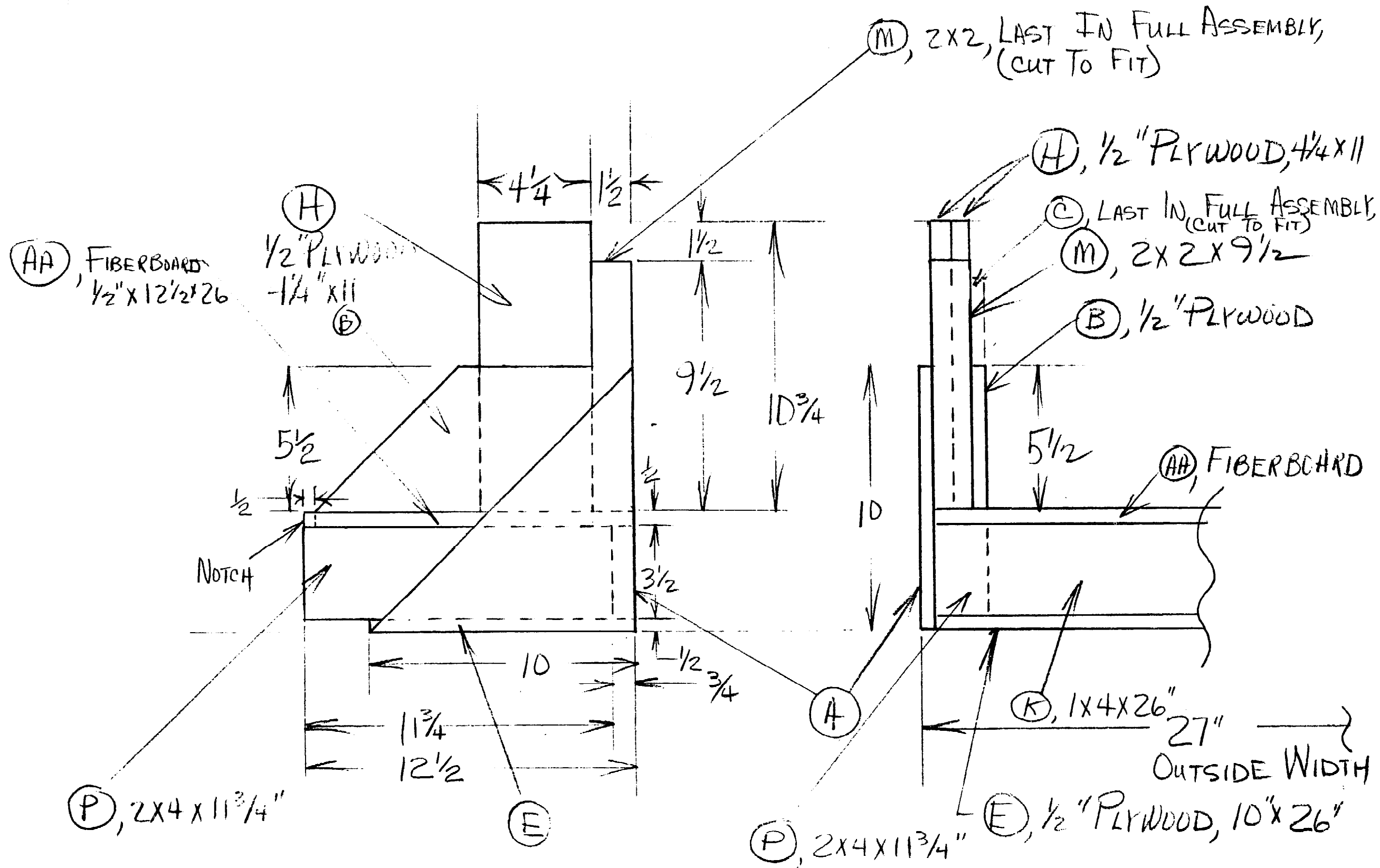


(BB) FIBERBOARD WITH METAL (T)  
NAILS, CAN ALSO NAIL FROM OUTSIDE TO KEEP FIBERBOARD FROM SLIDING DOWN

# WINDOW BOX COLLECTOR TOP REAR SUBASSEMBLY

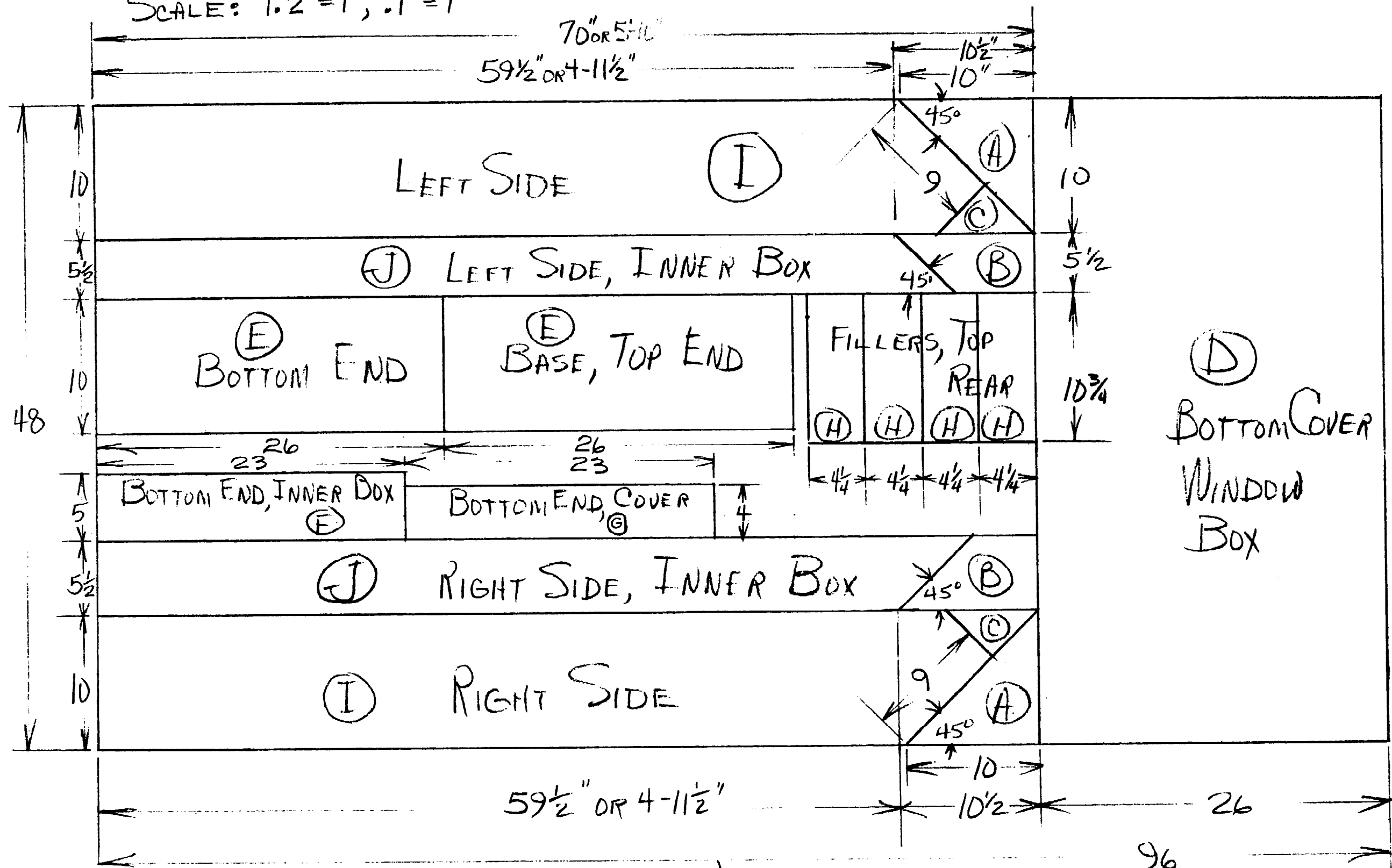
SCALE: .2" = 1"

NOTE: USE GALVANIZE NAILS



# WINDOW BOX COLLECTOR 1/2" PLYWOOD, 4'x8' SHEET CUTTING DIAGRAM

SCALE: 1.2" = 1', .1" = 1"



NOTE: 1/8" LOST PER SAW CUT  
MARK & CUT ONE PIECE AT A TIME



WINDOW BOX COLLECTOR  
 FIBER BOARD, 1/2" OR 5/8"  
 CUTTING DIAGRAM

SCALE: 1.2" = 1', .1" = 1"

