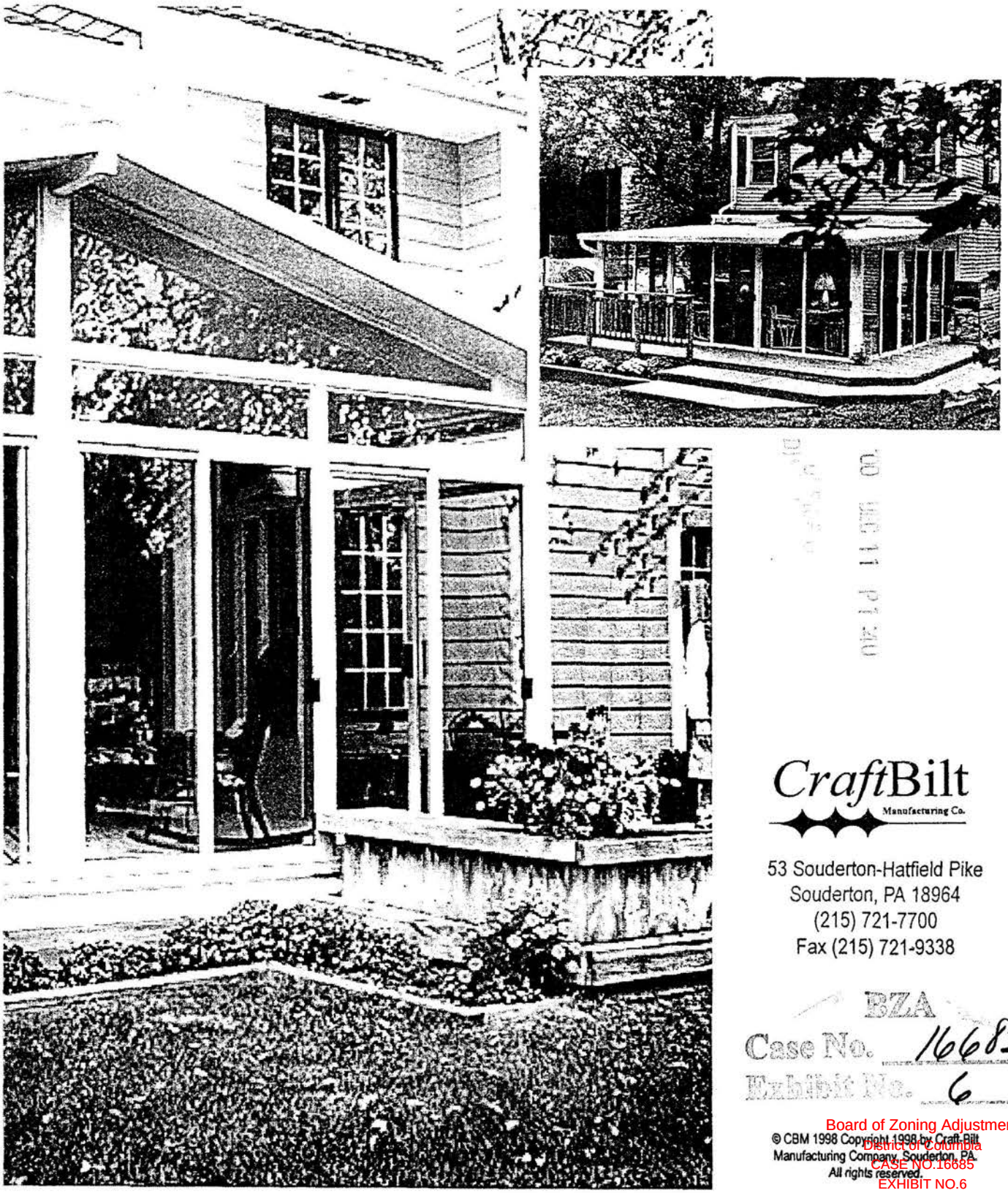
Building Permit Package



CraftBilt
Manufacturing Co.

53 Souderton-Hatfield Pike
Souderton, PA 18964
(215) 721-7700
Fax (215) 721-9338

BZA
Case No. 16685
Exhibit No. 6

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Board of Zoning Adjustment
District of Columbia
CASE NO.16685
EXHIBIT NO.6

This "Building Permit Package" includes information and drawings most often required to obtain building permits for Betterliving® Patio Rooms.

This package may be copied in accordance with any local building department provisions, to obtain building permits. For further information, refer to the Betterliving Patio Room Engineering *Manual*.

In this package you will find the following information:

Introduction and Certification

Honeycomb Panel Conformance Specifications

A-Frame Room Drawings

Studio Room Drawings

Fire Test Results

Connection Details

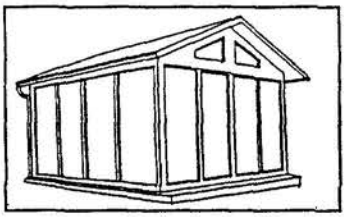
Please contact Craft-Bilt Manufacturing Co. for any additional information you may need.

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1-1 BACKGROUND

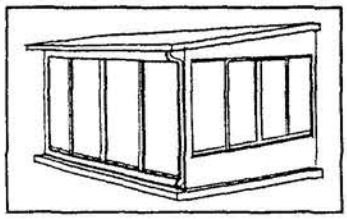
The patio rooms referenced in this package, known commercially as Betterliving® Patio Rooms, are manufactured and sold by Craft-Bilt Manufacturing Company of Souderton, PA. Craft-Bilt Manufacturing Company has manufactured a wide range of aluminum home-improvement products since 1946.

1-2 BETTERLIVING PATIO ROOM SYSTEMS



A-FRAME ROOM

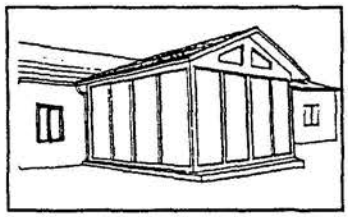
The gable or A-Frame roof construction features a structurally designed ridge beam of extruded aluminum alloy or glue laminated timber. The introduction of an independently supported ridge beam essentially eliminates all outward thrust at the eaves level.



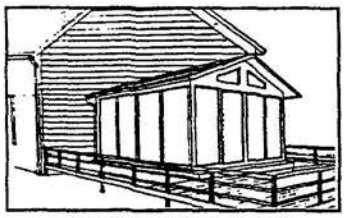
STUDIO ROOM

The mono-pitch or studio roof system features a pitched roof with a minimum slope of one inch per foot of projection. It is fastened to the existing structure by means of an extruded aluminum section.

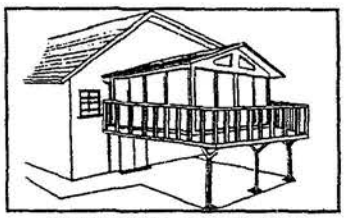
Betterliving Patio Rooms have been installed successfully in a variety of locations, as shown:



ROOM ON SLAB



ROOM ON DECK



ROOM ON BALCONY

1-3 STRUCTURAL PROPERTIES

Honeycomb and polystyrene panels were tested for load and deflection performance in accordance with the American Society for Testing and Materials (ASTM) method E72-80. Work was performed under the supervision of an independent testing and engineering laboratory. Span tables in this package show the allowable roof loads based on the testing performed.

1-4 FIRE RATINGS

Honeycomb and Polystyrene panels were tested for fire resistance by an independent testing laboratory. Based on the test results, the panels are classified as Type 5B Construction materials. Section 6 presents results of fire tests performed on both honeycomb and polystyrene panels.

1-5 CONNECTIONS

Fasteners required to connect structural components together in A-Frame rooms and Studio rooms are presented in Section 7. There is also information on room-house and room-deck attachments in Section 7.

1-6 WARRANTY

Properly installed productes are warranted by the manufacturer.

[redacted]

The following tables and figures have been reviewed and approved by a professional engineer.

Table #	Revision
21-1	703-1
21-2	703-1
62-1	603-1
70-1	603-1
73-1	507-1
73-2	507-1
75-1	501-1

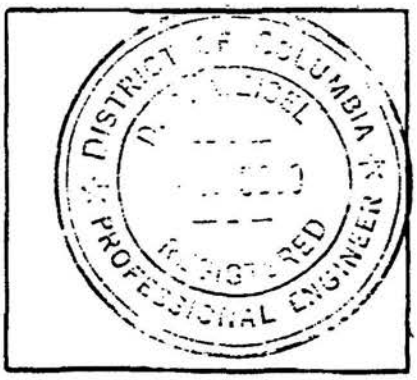
Figure #	Revision
40-1	710-1
40-2	710-1
50-1	710-1
50-2	710-1
73-1	603-1
73-2	603-1
75-1	603-1

Signature

Nov. 12, 1998

Date

Seal



NOTES FOR HONEYCOMB PANEL SPAN TABLES

1 a) • = Allowable loads for panel spans of 8', 10', 12', 14', 16' and 18', based upon ASTME-72-80 test results.

b) • = Allowable loads for panel spans of 9', 11', 13', 15' and 17', based upon interpolation of ASTME-72-80 test results.

c) 3" HC = 3" thick Honeycomb Panel

d) H = Thermally-broken H-stiffener

e) SKY = Skylight

f) CONFIG. = Configuration

g) PSF = Pounds per square foot

ROOF SPAN DESIGN TABLES (HONEYCOMB PANELS)[1] FOR LESSOR OF ULTIMATE LOAD/2.5 OR LOAD AT SPAN/120

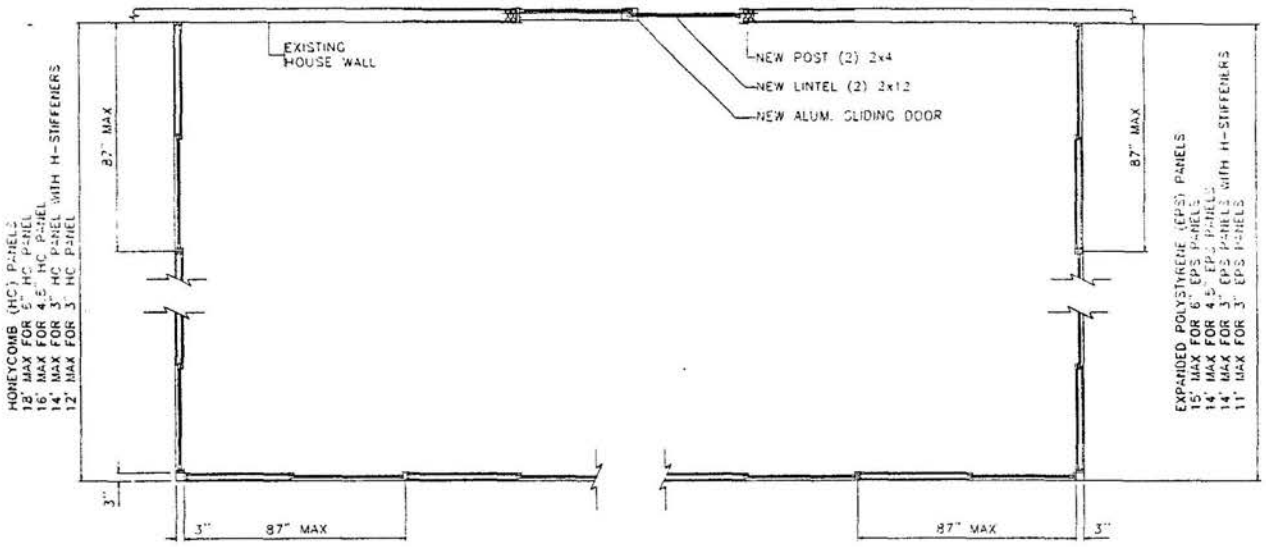
PANEL SPAN (ft)	PANEL CONFIG.	ALLOWABLE LIVE ROOF LOADS FOR HONEYCOMB (H/C) PANELS								
		20 (psf)	25 (psf)	30 (psf)	35 (psf)	40 (psf)	45 (psf)	50 (psf)	55 (psf)	60 (psf)
8	3" HC	•	•	•	•	•	•	•	•	•
8	3" HC + H	•	•	•	•	•	•	•	•	•
8	4.5" HC	•	•	•	•	•	•	•	•	•
8	4.5" HC + H	•	•	•	•	•	•	•	•	•
8	6" HC	•	•	•	•	•	•	•	•	•
8	6" HC + H	•	•	•	•	•	•	•	•	•
9	3" HC	•	•	•	•	•	•	•	•	
9	3" HC + H	•	•	•	•	•	•	•	•	•
9	4.5" HC	•	•	•	•	•	•	•	•	•
9	4.5" HC + H	•	•	•	•	•	•	•	•	•
9	6" HC	•	•	•	•	•	•	•	•	•
9	6" HC + H	•	•	•	•	•	•	•	•	•
10	3" HC	•	•	•	•	•	•	•		
10	3" HC + H + SKY	•	•	•						
10	3" HC + H	•	•	•	•	•	•	•	•	•
10	4.5" HC	•	•	•	•	•	•	•	•	•
10	4.5" HC + H	•	•	•	•	•	•	•	•	•
10	6" HC	•	•	•	•	•	•	•	•	•
10	6" HC + H	•	•	•	•	•	•	•	•	•
11	3" HC	•	•	•	•	•				
11	3" HC + H + SKY	•	•							
11	3" HC + H	•	•	•	•	•	•	•		
11	4.5" HC	•	•	•	•	•	•	•	•	
11	4.5" HC + H	•	•	•	•	•	•	•	•	•
11	6" HC	•	•	•	•	•	•	•	•	•
11	6" HC + H	•	•	•	•	•	•	•	•	•
12	3" HC	•	•	•						
12	3" HC + H + SKY	•								
12	3" HC + H	•	•	•	•	•				
12	4.5" HC	•	•	•	•	•	•	•		
12	4.5" HC + H	•	•	•	•	•	•	•	•	•
12	6" HC	•	•	•	•	•	•	•	•	•
12	6" HC + H	•	•	•	•	•	•	•	•	•

SEE NOTES ON PAGE 2.1.0

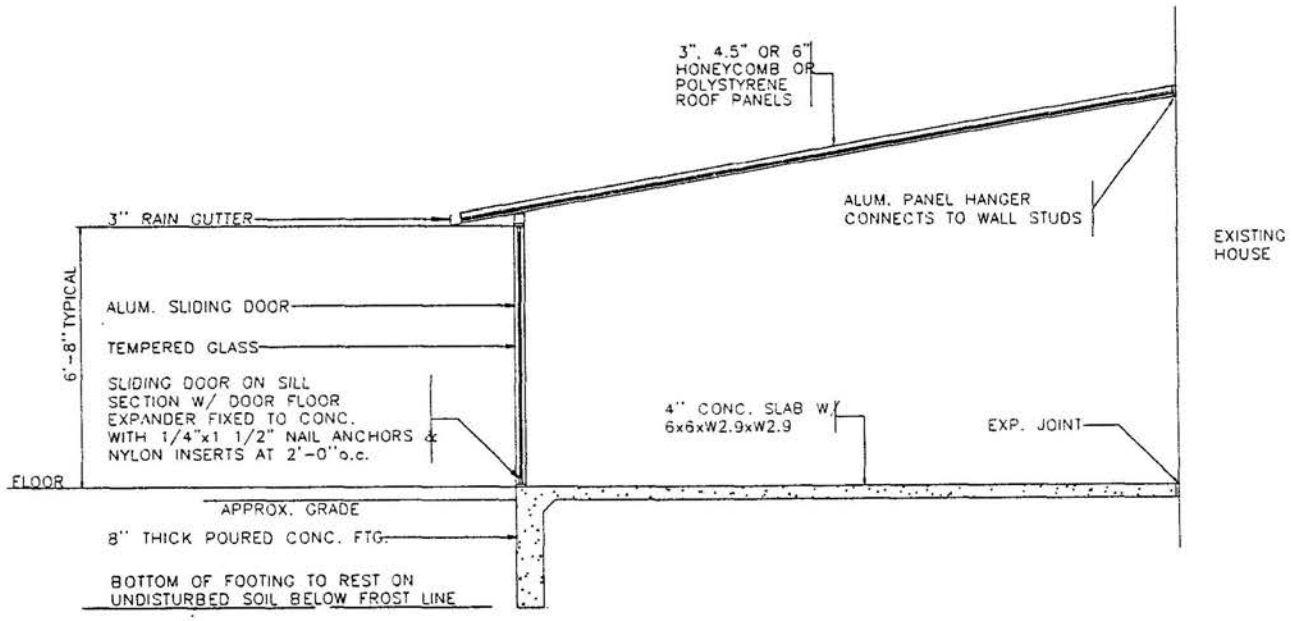
ROOF SPAN DESIGN TABLES (HONEYCOMB PANELS)[1] FOR LESSOR OF ULTIMATE LOAD/2.5 OR LOAD AT SPAN/120

PANEL SPAN (ft)	PANEL CONFIG.	ALLOWABLE LIVE ROOF LOADS FOR EXPANDED HONEYCOMB (H/C) PANELS 20 (psf)	25 (psf)	30 (psf)	35 (psf)	40 (psf)	45 (psf)	50 (psf)	55 (psf)	60 (psf)
13	3" HC	•	•							
13	3" HC + H	•	•	•						
13	4.5" HC	•	•	•	•	•	•			
13	4.5" HC + H	•	•	•	•	•	•	•	•	•
13	6" HC	•	•	•	•	•	•	•	•	•
13	6" HC + H	•	•	•	•	•	•	•	•	•
14	3" HC	•								
14	3" HC + H	•	•							
14	4.5" HC	•	•	•	•	•				
14	4.5" HC + H	•	•	•	•	•	•	•	•	•
14	6" HC	•	•	•	•	•	•	•	•	
14	6" HC + H	•	•	•	•	•	•	•	•	•
15	3" HC									
15	3" HC + H									
15	4.5" HC	•	•	•	•					
15	4.5" HC + H	•	•	•	•	•	•	•		
15	6" HC	•	•	•	•	•	•			
15	6" HC + H	•	•	•	•	•	•	•	•	•
16	3" HC									
16	3" HC + H									
16	4.5" HC	•	•	•						
16	4.5" HC + H	•	•	•	•	•				
16	6" HC	•	•	•	•	•				
16	6" HC + H	•	•	•	•	•	•	•	•	
17	3" HC									
17	3" HC + H									
17	4.5" HC	•								
17	4.5" HC + H	•	•	•	•					
17	6" HC	•	•	•	•					
17	6" HC + H	•	•	•	•	•	•	•		
18	3" HC									
18	3" HC + H									
18	4.5" HC									
18	4.5" HC + H	•	•	•						
18	6" HC	•	•	•	•					
18	6" HC + H	•	•	•	•	•	•			

SEE NOTES ON PAGE 2.1.0

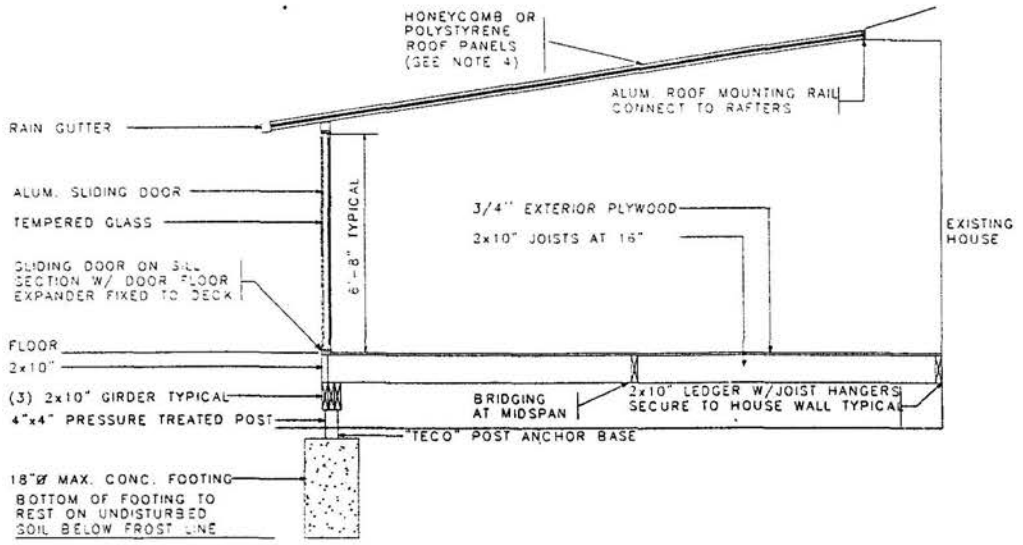


STUDIO ROOM FLOOR PLAN



STUDIO ROOM CROSS SECTION (CONCRETE SLAB)

Betterliving PATIO ROOMS



STUDIO ROOM CROSS SECTION (WOODEN DECK)

NOTES FOR FIGURE 50-1 and 50-2

1) Structural members shall comprise 6063 T6 aluminum extrusions supplied by Craft-Bilt Manufacturing Company.
2) Roof panels shall consist of 3", 4.5" or 6" aluminum panels with either honeycomb or polystyrene cores.
3) Maximum spans over door shall be 87"
4) Maximum roof panel spans are based upon the lessor of the ulitmate load / 2.5 or load at span / 120.
5) All structures shall be installed according to Craft-Bilt Manufacturing Company recommendations.
6) **Loadings:**

ROOF:

Snow load	30 PSF
Wind load	20 PSF
Dead load	2 PSF

DECK:

Live load	60 PSF
Estimated dead load	10 PSF

7) **Timber Design Stresses:**

Species Southern Pine No. 2

Bending stress Fb	1400 PSI (Repetitive)
Compression perpendicular to grain Fc	565 PSI
Shear parallel to grain Fv	90 PSI
Compression parellel to grain Fc	975 PSI
Modulus of elasticity E	1,600,000 PSI

All timbers shall be pressure treated

8) **Soil Bearing Capacity:**

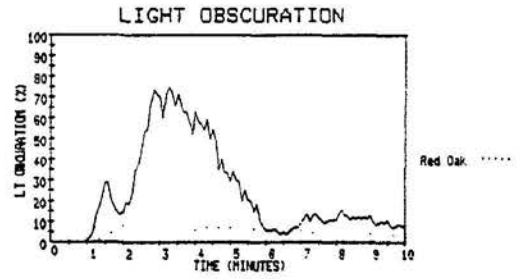
Footing should rest on soil having a minimum bearing capacity of 2,000 PSF.

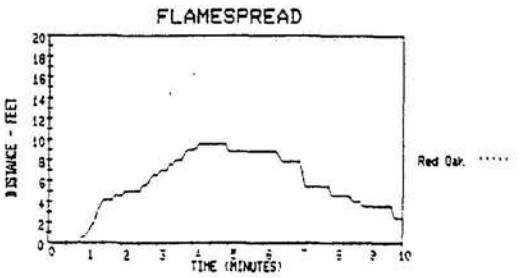
9) **Footings:**

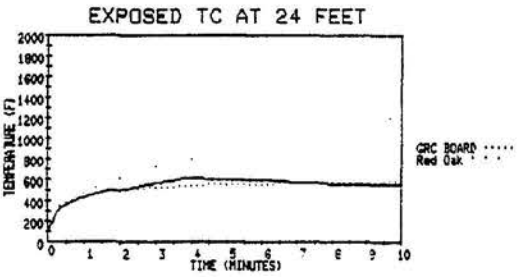
Footings shall be located below the frost line. Footings shall be sized according to the applied loads and local soil bearing capacity. Concrete is to have a minimum compressive strengthh of 3,000 PSI at 28 days.

ASTM E84 Test Results

HONEYCOMB PANELS WITH VINYL CLEATS







TEST MATERIALS

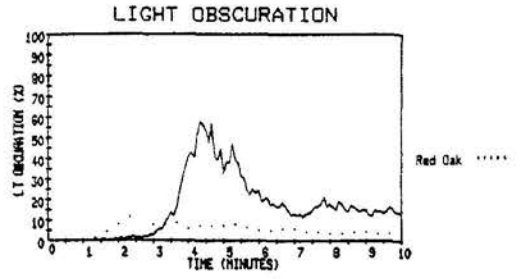
- Panel facing consisted 0.024" embossed aluminum
- Panel core consisted 99# 0.75" paper honeycomb
- Panel adhesive consisted moisture-curing urethane
- Panels joined with vinyl cleats

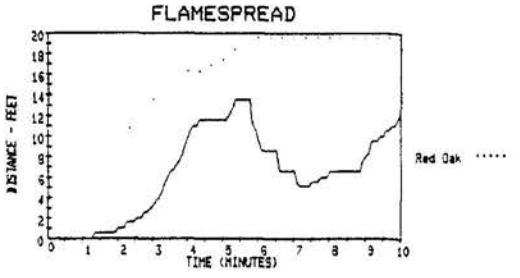
TEST RESULTS

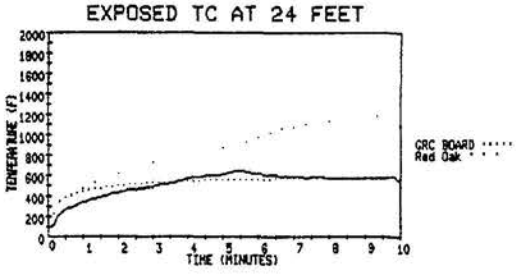
- Fire Tests performed by an independent fire testing laboratory yielded the following results:

	Flame Spread	Smoke Density
3" Honeycomb with vinyl cleats	40	335
Code Requirements	< 75	< 450

HONEYCOMB PANELS WITH AL H-STIFFENERS







TEST MATERIALS

- Panel facing consisted 0.024" embossed aluminum
- Panel core consisted 99# 0.75" paper honeycomb
- Panel adhesive consisted moisture-curing urethane
- Panels joined with H-Stiffeners

TEST RESULTS

- Fire Tests performed by an independent fire testing laboratory yielded the following results:

	Flame Spread	Smoke Density
3" Honeycomb with H-Stiffeners	45	230
Code Requirements	< 75	< 450

MANUFACTURER'S PERFORMANCE DATA

Performance Data - TEK Self Drilling Fasteners

PULLOUT VALUES (average lbs. ultimate)								
Fastener		Steel Gauge						
Dia.	Pt.	26	24	22	20	18	16	14
#6	2	120	183	248	296	471	679	847
#8	2	119	193	265	298	491	703	959
#10	2	131	214	272	368	547	784	1033

SHEET GAUGES								
Gauge No.	18	20	21	22	23	24	25	26
Alum. Decimal Equiv.	0.040"	0.032"	0.028"	0.025"	0.023"	0.020"	0.018"	0.018"
Steel Decimal Equiv.	0.048"	0.036"	0.034"	0.030"	0.027"	0.024"	0.021"	0.018"

FASTENER VALUES			
Fastener (dia-tpi) 120	Tensile (lbs. min.) 248	Shear (ave. lbs. ult.) 471	Torque (min. in. lbs.) 847
6 to 20	1285	750	25
8 to 18	1545	1000	42
10 to 16	1936	1400	61

SHEAR VALUES (average lbs. ultimate)						
Fastener		Steel Gauge (lapped)				
Dia.	Pt.	26/26	24/24	22/22	20/20	18/18
#6	2	278	466	526	758	845
#8	2	294	496	560	740	1060
#10	2	312	478	589	830	1206

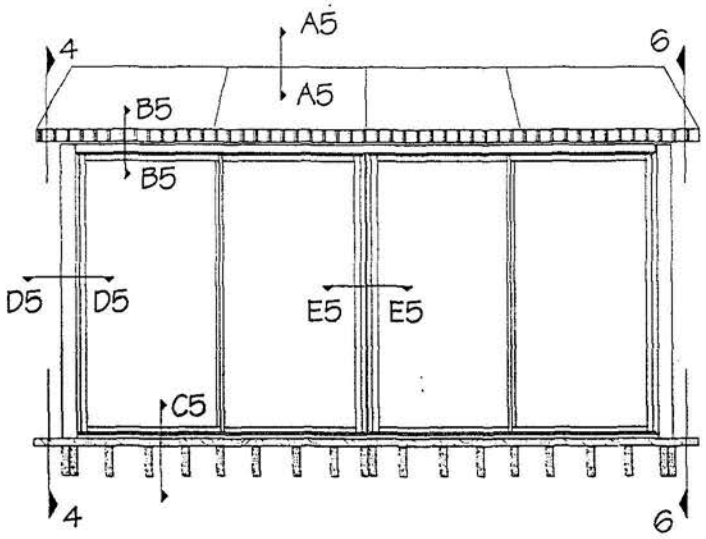
The values listed above, provided by the fastener manufacturer, are ultimate averages achieved under laboratory conditions.

Installation Guidelines

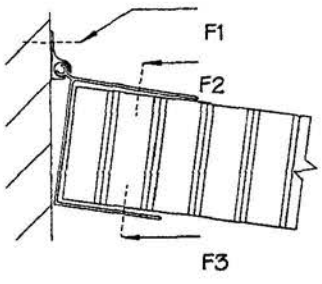
1) Spacing between fasteners shall always exceed 0.5 inches.
2) Clearance between fasteners and edge of sheet or shape shall always exceed 0.5 inches.
3) Use a standard screwgun with a depth sensitive nosepiece to install Teks. For optimal fastener performance, the screwgun should be a minimum of 4 amps and have a RPM range of 0-2000.
4) Adjust the screwgun nosepiece to properly seat the fastener.
5) Set new magnetic sockets correctly before use. Remove chip buildup as needed.
6) The fastener is fully seated when the head is flush with the work surface.
7) Overdriving may result in torsional failure of the fastener or stripout of the substrate.
8) The fastener must penetrate beyond the metal structure a minimum of 3 pitches of thread.

NOTES

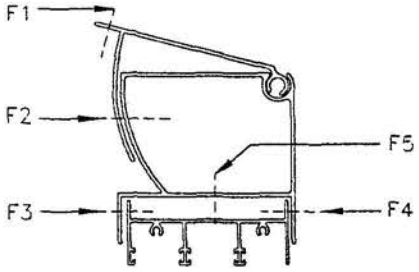
1) For calculation purposes (Table 72-1 through 76-1), assume:
   - Allowable pull out strength of 8-18 T2 in 0.024' aluminum sheet = 70 lb.
   - Silicone bonding transfers 25% of connection load.
   - Allowable shear strength of 8-18 T2 in 0.024" aluminum sheet = 170 lb.
   - Allowable bearing strength of 8-18 T2 in 0.065" aluminum sheet = 125 lb.



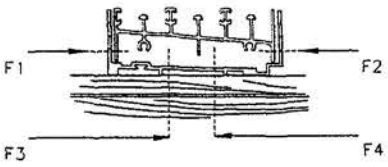
STUDIO ROOM FRONT WALL SECTION (5-5)



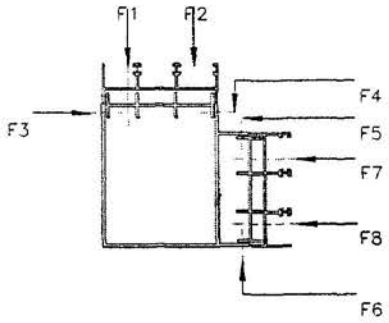
SECTION A-5



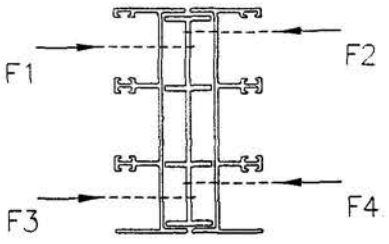
SECTION B-5



SECTION C-5



SECTION D-5



SECTION E-5

em75-1-55.dwg em75-1-A5.dwg em75-1-B5.dwg
em75-1-C5.dwg em75-1-D5.dwg em75-1-E5.dwg
permitpkg.p65 REV 9811

TABLE 75-1 STUDIO ROOM FRONT WALL CONNECTION 7.5.1t

FASTENER SPECIFICATIONS FOR STUDIO ROOM FRONT WALL

FASTENERS						SPAN	MAXIMUM SPACING BETWEEN FASTENERS (In)				
SECTION	FASTENER SET	DESIGNATION	SILICONE SEAL	CONNECT FROM	CONNECT TO	PANEL (ft)	UPLIFT 10 psf	UPLIFT 20psf	UPLIFT 30 psf	UPLIFT 40 psf	UPLIFT 50 psf
A-5	F1	# 14 x 2"-3" (Hex)	Yes	Hanger Support	Timber Wall	8'-18'	16"-24"	16"-24"	16"-20"	12"-16"	12"-16"
		1/4"x2 1/2" Lag Screw with Lag Shield	Yes	Hanger Support	Masonry Wall						
						8'	8"	8"	8"	8"	8"
	F2	# 8 x 1/2" (Tek)		Wall Hanger	Roof Panel	10'	8"	8"	8"	8"	8"
	F3	# 8 x 1/2" (Tek)		Wall Hanger	Roof Panel	12'	8"	8"	8"	8"	7"
						14'	8"	8"	8"	8"	6"
						16'	8"	8"	8"	7"	6"
						18'	8"	8"	8"	6"	5"
B-5						8'	8"	8"	7"	6"	4"
						10'	8"	8"	6"	5"	4"
	F1	# 8 x 1/2" (Tek)		Header Arm	Roof Panel	12'	8"	8"	5"	4"	3"
						14'	8"	7"	5"	4"	3"
						16'	8"	6"	4"	3"	2"
						18'	8"	6"	4"	3"	2"
						8'	30"	30"	18"	15"	12"
	F2	# 8 x 1/2" (Tek)		Header Arm	Header Support	10'	30"	24"	17"	13"	10"
	F3	# 8 x 1/2" (Tek)		Header Support	Door Header	12'	30"	18"	14"	11"	9"
	F4	# 8 x 1/2" (Tek)		Header Support	Door Header	14'	30"	18"	13"	9"	8"
						16'	30"	17"	11"	8"	7"
						18'	30"	15"	10"	8"	6"
	F5	# 8 x 3/4" (Tek)		Door Header	Header Support	8'-18'	24"	24"	24"	24"	24"
C-5	F1	# 8 x 1/2" (Tek)		D/F-Channel	Door Sill	8'-18'	12"	12"	12"	12"	12"
	F2	# 8 x 1/2" (Tek)		D/F-Channel	Door Sill						
	F3	#14 x 2"-3" (Hex)	Yes	D/F-Channel	Wooden Deck						
	F4	#14 x 2"-3" (Hex)	Yes	D/F-Channel	Wooden Deck	8'-18'	32"-48" +3/column	32"-48" +3/column	32"-48" +3/column	32"-48" +3/column	32"-48" +3/column
	F3	1/4"x1 1/2" Nail Anchor	Yes	D/F-Channel	Concrete Slab						
	F4	1/4"x1 1/2" Nail Anchor	Yes	D/F-Channel	Concrete Slab						
D-5	F1	# 8 x 3/4" (Tek)		Door Jamb	Mullion	8'-18'	24"	24"	20"	16"	16"
	F2	# 8 x 3/4" (Tek)		Door Jamb	Mullion						
	F3	# 8 x 1/2" (Tek)		Corner Column	Mullion						
	F4	# 8 x 1/2" (Tek)		Corner Column	Mullion						
	F5	# 8 x 1/2" (Tek)		Corner Column	Mullion						
	F6	# 8 x 1/2" (Tek)		Corner Column	Mullion						
	F7	# 8 x 3/4" (Tek)		Door Jamb	Mullion						
	F8	# 8 x 3/4" (Tek)		Door Jamb	Mullion						
E-5	F1	# 8 x 3/4" (Tek)		Door Jamb	Mullion	8'-18'	24"	24"	20"	16"	16"
	F2	# 8 x 3/4" (Tek)		Door Jamb	Mullion						
	F3	# 8 x 3/4" (Tek)		Door Jamb	Mullion						
	F4	# 8 x 3/4" (Tek)		Door Jamb	Mullion						

1) See Figure 75.1 and 75.1
2) See Table 70.1

Betterliving PATIO ROOMS

BOCA EVALUATION SERVICES, INC.

BOCA RESEARCH REPORT NO. 94-68

TM

A Participating Member of the NES, Inc.

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07420 - COMPOSITE PANELS

CRAFT-BILT BETTERLIVING SANDWICH PANEL

CRAFT-BILT MANUFACTURING COMPANY
53 SOUDERTON-HATFIELD PIKE
SOUDERTON, PA 18964

1.0 DESCRIPTION OF EVALUATION

The Craft-Bilt Betterliving (CBM) sandwich panel has been evaluated for its ability to resist transverse, racking and axial compression loads through a review of test data. The CBM sandwich panels have also been evaluated for flame spread and fire performance.

2.0 DESCRIPTION AND USE OF THE PRODUCT

The CBM sandwich panels are intended for use as structural components in patio enclosure construction and are available in either honeycomb or polystyrene core assemblies. Each core is covered with aluminum facings on both sides of the core. The facings are adhesively attached through the use of a one part, 100% solids, Type II urethane adhesive. The CBM panels are used as structural components of exterior walls, and for roof/ceiling assemblies. Allowable uniform, transverse and axial loads for the panels shall be in accordance with Tables 1 through 9 of this report.

The following is a description of the components used in the panel assembly:

2.1 ALUMINUM FACINGS

Width 37.2", thickness 0.024". The aluminum material shall comply with one of the following standards:

ASTM 3003 H194 - Minimum Ultimate Tensile Strength 27,000 psi

ASTM 3004 H374 - Minimum Ultimate Tensile Strength 35,000 psi

ASTM 3105 H194 - Minimum Ultimate Tensile Strength 32,000 psi

2.2 CORE

Honeycomb material - 99# Kraft paper, width 35", thickne 2.95", 4.45" or 5.95", cell size 0.75", density 1.7 pcf, minimu ultimate compressive strength (dry) 57 psi, minimum ultima compressive strength (wet) 20 psi.

Polystyrene material - An expanded polystyrene insulation th has a density of 1.5 lbs/ft³ and a thermal resistance (R) 4.7/inch of panel thickness. The insulation has a minimu compressive strength of 15 psi, minimum flexural strength of psi, minimum tensile strength of 18 psi and a minimum she strength of 26 psi. The polystyrene material is supplied by AF (See Research Report 94-65) (Bead supplier is Arco See NE 2.36).

2.3 ADHESIVE

Urethane adhesive, density 68.5 pcf, flexural yield streng adhered to honeycomb material 992 psi (longitudinal) and 5 psi (transverse), minimum flexural strength when adhered expanded polystyrene. (See NER-451). See Figures 1, 2 and

2.4 EXTRUSIONS

The extrusions that are used with the panels include A-fra support beams, panel hangers, H, U, C, and F channels, corn posts and thermally-broken H assemblies. The extrusions formed from aluminum that complies with ASTM 6063 T Typical wall connections are shown in Figures 4 and 5 of t report.

3.0 ANALYSIS OF SUBMITTED INFORMATION

The following data was submitted by the proponent for dem stration of compliance with the respective code sections lis above each item of information. The basis is the *BOCA Natio Building Code/1996*.

3.1 FLAME RESISTANCE

Code Section 2603.3 Surface-burning characteristics: T section specifies that all foam plastics shall have a flame spre rating not more than 75 and a smoke developed rating of more than 450 when tested in the maximum thickness inten for use in accordance with ASTM E84-95b.

Please contact BOCA Evaluation Services, Inc., with any questions you may have regarding this report. Additionally, please contact us if you have any information the performance of the product described herein which is contrary to this report. This report is subject to the limitations listed herein and to the specific product, data and reports submitted by the applicant requesting this report. Independent tests were not performed by BOCA Evaluation Services, Inc., and BOCA Evaluation Services, Inc., specific does not make any warranty, either expressed or implied, as to any findings or other matter in this report or as to any product covered by this report. Evaluation reports are n be construed as representing aesthetics or any other attributes not specifically addressed nor as an endorsement or recommendation for the use of the subject of the report. disclaimer includes, but is not limited to, merchantability.

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NFORMATION SUBMITTED:

3.1.1 See NER-236 which states that when the expanded polystyrene insulation is tested in accordance with ASTM E84 the flame spread is less than 25 and the smoke developed rating is less than 450.

3.1.2 Southwest Research Institute, SwRI Project No. 01-6739-073a, November 21, 1994.

The CBM sandwich panel (honeycomb core) with intersecting seam joined with vinyl cleats and end spliced with H-stiffeners was tested in accordance with ASTM E84. The flame spread of the panel was 40 and the smoke developed rating was 335.

3.1.3 Omega Point Laboratories, Reports 15623-100725, 15623-100726, 15623-100727, 15623-100728, dated November 12, 1996.

The CBM sandwich panel (polystyrene core) was tested in accordance with ASTM E84. Below is a table which describes the "worst-case" configuration of the assembly and the flame spread and smoke developed rating that these assemblies achieved:

ASSEMBLY TESTED	FLAME SPREAD	SMOKE DEVELOPED
6" HC with center seam joined using 6" thermally broken aluminum extrusion and joined at ends using 6" thermally broken aluminum extrusions.	35	145
6" HC with center seam joined using vinyl cleat and joined at ends using 6" thermally broken aluminum extrusions.	35	275
6" EPS with center seam joined with 6" thermally broken aluminum extrusions and joined at the ends using 6" thermally broken aluminum extrusions.	45	385
6" EPS joined at the ends using 6" thermally broken aluminum extrusions.	5	15

3.2 STRUCTURAL CAPABILITIES

Code Section 1710.3.1 Test procedure: This section requires that assemblies or components which are not capable of being tested in accordance with a referenced standard listed in Chapter 35, shall be evaluated by a test method which superimposes design loads for 24 hours. The test assembly will be considered successful if the assembly supports the super-imposed load without failure and recovers 75% of the maximum deflection within 24 hours after the removal of the load. The allowable superimposed design load shall be taken as the lesser of the load at the deflection not to exceed those prescribed in Code Section 1604.5; the failure load divided by 2.5; or the maximum load applied divided by 2.5.

INFORMATION SUBMITTED:

Ambric Engineering Inc., Ambric Report Number 95-05-01-S2, May 1, 1995, signed by Donald Meisel, P.E.

Ambric Engineering Inc., *Betterliving Patio Room Engineering Manual, Providing Engineering Design Loads*, prepared by Donald Meisel, P.E.

The following testing was completed on both the honeycomb and the polystyrene core CBM panels:

- Transverse Load Testing: Transverse load testing was completed on 3", 4.5" and 6" honeycomb panels, and 3", 4.5" and 6" polystyrene core panels. The test consisted of the panels being placed onto rollers that allowed rotation at one end and rotation and translation on the other end. Tables 1 through 6 were derived from these based on either the average ultimate load divided by 2.5 or the maximum deflection of l/120 (deflection recovery greater than 75% of the maximum deflection within 24 hours after the removal of the test load) whichever is less.

Additional transverse load testing was performed to demonstrate the consistency of load carrying capabilities of different specified aluminum skins. (Ambric Engineering test report dated October, 21, 1996).

Ambric Engineering test report dated July 25, 1997, demonstrated that the 6 inch thick panels would recover at least 75% of initial deflection after 24 hours.

Table 1
Allowable Uniform Loads For 3" Thick Simple-Span Honeycomb Panels

Span	Design Load
8'-0"	66.4 psf
10'-0"	51.0 psf
12'-0"	30.4 psf
14'-0"	20.9 psf

Table 2
Allowable Uniform Loads For 3" Thick Simple-Span Honeycomb Panels with 3"x3" H-stiffeners (See Figure 1)

Span	Design Load
10'-0"	66.0 psf
12'-0"	40.0 psf
14'-0"	27.0 psf

Table 3
Allowable Uniform Loads For 4.5" and 6" Thick Simple-Span Honeycomb Panels

Span	Thickness	Design Load
10'-0"	4.5"	67.0 psf
12'-0"	4.5"	53.8 psf
14'-0"	4.5"	42.4 psf
16'-0"	4.5"	31.0 psf
12'-0"	6"	76.0 psf
14'-0"	6"	56.0 psf
16'-0"	6"	43.0 psf
18'-0"	6"	35.0 psf

Table 3a
Allowable Uniform Loads For 4.5" and 6" Thick
Simple-Span Honeycomb Panels
with Thermally-Broken H-Stiffeners

Span	Thickness	Design Load
14'-0"	4.5"	60.0 psf
18'-0"	4.5"	30.0 psf
14'-0"	6"	75.0 psf
18'-0"	6"	46.0 psf

Table 4
Allowable Uniform Loads For 3" Thick
Simple-Span Polystyrene Core Panels

Span	Design Load
8'-0"	66.4 psf
10'-0"	37.3 psf
12'-0"	29.0 psf
14'-0"	18.7 psf

Table 5
Allowable Uniform Loads For 3" Thick Simple-Span
Polystyrene Panels with 2"x3" H-stiffeners
(See Figure 2)

Span	Design Load
10'-0"	50.0 psf
12'-0"	38.0 psf
14'-0"	25.0 psf

Table 6
Allowable Uniform Loads For 4.5" and 6" Thick
Simple-Span Polystyrene Panels

Span	Thickness	Design Load
10'-0"	4.5"	59.0 psf
12'-0"	4.5"	39.0 psf
14'-0"	4.5"	31.6 psf
16'-0"	4.5"	20.2 psf
12'-0"	6"	49.9 psf
14'-0"	6"	40.3 psf
16'-0"	6"	28.4 psf
18'-0"	6"	26.9 psf

Table 6a
Allowable Uniform Loads For 4.5" and 6" Thick
Simple-Span Polystyrene Panels
with Thermally-Broken H-Stiffeners

Span	Thickness	Design Load
12'-0"	4.5"	59.0 psf
16'-0"	4.5"	30.0 psf
14'-0"	6"	66.0 psf
18'-0"	6"	37.0 psf

-Racking Load Testing (ASTM E72) was completed for 3
honeycomb and polystyrene core panels.

The testing was completed on 8'-0" by 8'-0" panels that we
fastened to an aluminum U-channel extrusion (see Figure 3)
the bottom and an aluminum H-channel extrusion (See Figu
1) at the top using #8x1/2" screws placed 8" on center. The U
channel was attached to the base of the racking frame while th
H-channel was attached to a 4" by 4" wooden member at the to
of the racking frame. Failure of the panels occurre
progressively as the aluminum facing material began to yield
the fastener connections and in the bowing in the aluminu
extrusions.

Table 7
Allowable Lateral Load

Span	Core	Average Deflection; in	Design Load; lb	Failure Mode
8'-0"	HC	0.866	987	Connectic
8'-0"	EPS	1.307	1,387	Connectic

Table 8
24 hour load test

Span	Core	Thickness: in.	Avg. Deflection at 24 hours: in.	Avg. Load at 24 hours psf	Average Recovery Percentag
12'-0"	HC	3"	2.42"	62.40	93.91%
12'-0"	EPS	3"	2.45"	59.80	94.76%

- Axial Compression Load Test (ASTM E72) was completed
3" honeycomb and polystyrene core panels. The testing w
completed on 8'-0" by 8'-0" panels that were assembled so
that the bottom edges of the panel were held at least 1/2"
above the base of the sill. Four compressometers were attach
to the face of the assembly, one near each corner of the panel
measure the compression or shortening of the panel. T
deflectometers, one at each edge of the panel, were attached
measure the lateral deflection of the assembly. Loads w
applied in increments to generate the load-compression and l
deflection curves until failure was noted.

Table 9
Allowable Axial Compression Loads
For 3" Thick Panels

Description of Panel	Maximum Axial Load	Axial Load/foot	Desig Loa
8'-0", 3" Thick Honeycomb Panel	9,933 lbs	1,242 plf	497 p
8'-0", 3" Thick Expanded Polystyrene Panel	9,933 lbs	1,242 plf	497 p

3.3 THERMAL BARRIER PERFORMANCE

Code Section 2603.8 Alternative approval: Foam plas
not required to comply with the requirements listed in Se
2603.4 (thermal barrier requirements) through 2603.7
foam plastic material has been tested in accordance wi
1715, FM 4880, or UL Subject 1040.

FORMATION SUBMITTED:

outhwest Research Institute, SwRI Project No. 01-6740-202 ated February 1995.

he CBM panel consisted of 3" polystyrene core and a U and H hannel. The panels were able to resist the fire exposure and assed the criteria set forth in UL 1715.

3.4 LABELING

Code Section 1705.2 Inspection of fabricators: Fabricators of structural assemblies are required to maintain a third-party quality control agency to conduct in-plant inspections.

INFORMATION SUBMITTED:

3.4.1 See BOCA Evaluation Services, Inc., Research Report #94-65.

3.4.2 Craft-Bilt Manufacturing Co., Quality Control Manual dated May 22, 1995.

The quality control manual includes a description of the inspections done for production, product performance, random selection process, labeling certificate, and appropriate forms for the quality control program. The manual also includes a description of the manufacturing facilities, process and inspection flow chart.

INSTRUCTIONS TO THE CODE OFFICIAL

The CBM sandwich panels have been evaluated for compliance with the 1996 editions of the *BOCA National Codes*. This report is limited to the applications and products as stated herein. This evaluation is based solely on information provided to BOCA Evaluation Services, Inc., by Craft-Bilt Manufacturing and has not been independently verified. BOCA Evaluation Services, Inc., intends that this report be used by the code official to determine that the CBM sandwich panels comply with the code requirements specifically addressed in Section 3.0 of this report, provided that this product is installed in accordance with the following limitations:

Limitations

4.1 This report is subject to annual certification. Reports that are not certified shall not be used or referred to. In order to determine the status of certification of this report, contact BOCA Evaluation Services, Inc., or consult the latest edition of the *National Product Evaluation Listing* published periodically in the BOCA magazine.

4.2 The roof pitch of the panel shall be limited to a 4:12 pitch.

4.3 The CBM roof and wall sandwich panels are limited to use in buildings of Type 5B construction and Use Group R-3.

4.4 The evaluation of penetrations into the CBM sandwich panels is beyond the scope of this report.

4.5 The CBM panels have not been evaluated as a component of a fireresistance rated assembly, therefore the panels are limited to applications where the fire separation distance is greater than 5 feet.

4.6 The CBM panels were not evaluated as a component of a classified roof assembly.

4.7 The CBM panels are limited to use where the design loads do not exceed those given in Tables 1 through 9 included in Section 3.2 of this report. Interpolation between spans shall not be permitted.

4.8 The CBM panels incorporating polystyrene as the core material shall be limited to a maximum thickness of 6".

5.0 INFORMATION REQUIRED ON CONSTRUCTION DOCUMENTS

To aid in the use of this report, the following represents the minimum level of information to be reflected on the construction documents in order to determine compliance with this research report. Additional sections of the applicable codes and standards may apply based on the resulting design and configuration.

5.1 The language "See BOCA Evaluation Services, Inc., Research Report No. 94-68."

5.2 Span thickness and core type of the CBM panel.

5.3 Minimum design loads.

6.0 IDENTIFICATION

All CBM sandwich panels manufactured in accordance with this report shall be identified by a certificate bearing the manufacturer's name and model number, the label of the Quality Control Agency, Ambric Engineering, and the identifying language "See BOCA Evaluation Services, Inc., Research Report No. 94-68." In addition, numbers stamped on the side of the panel cores provide direct traceability to manufacturing production records.

Reference to this report is limited to the identification as described herein.

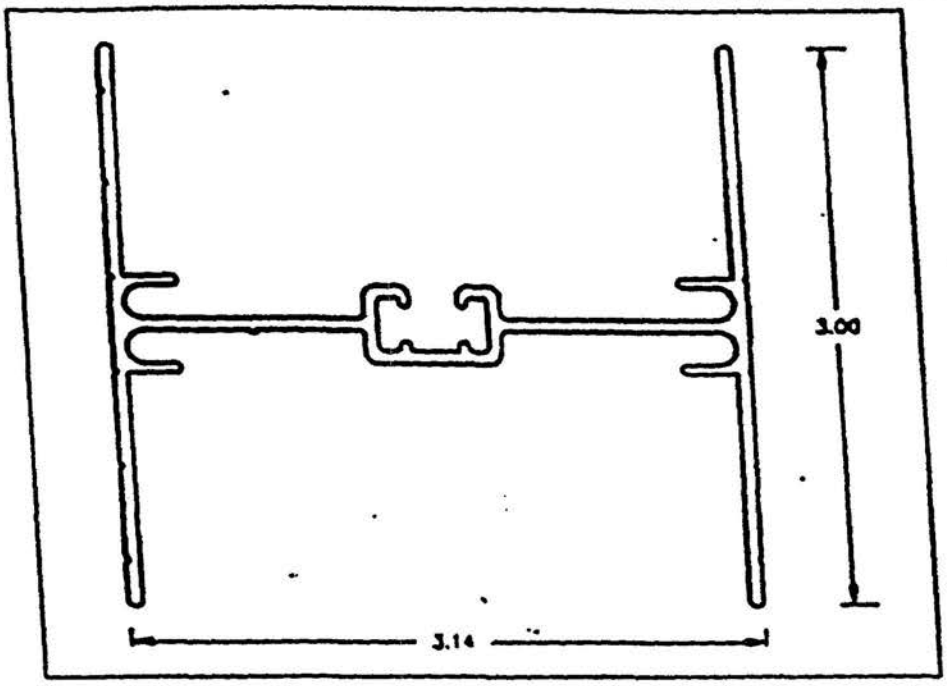


Figure 1*
3 x 3 H Stiffeners

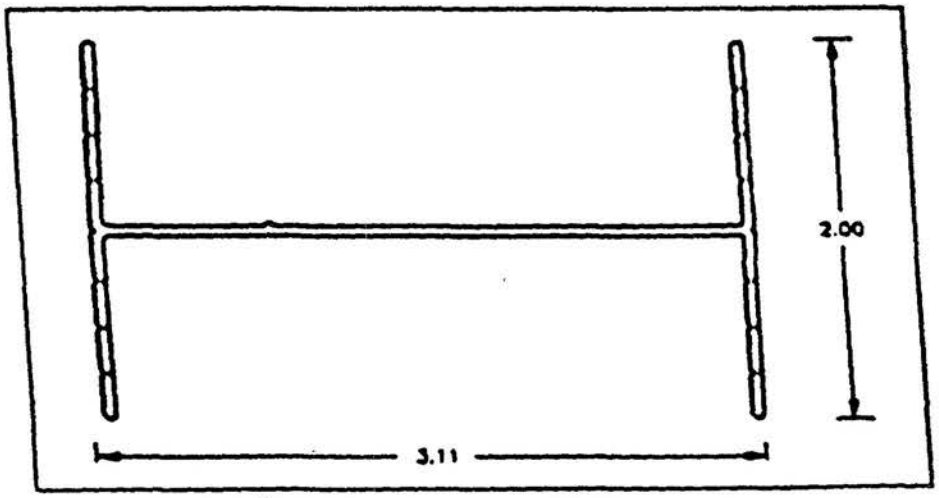


Figure 2*
2 x 3 H Stiffeners

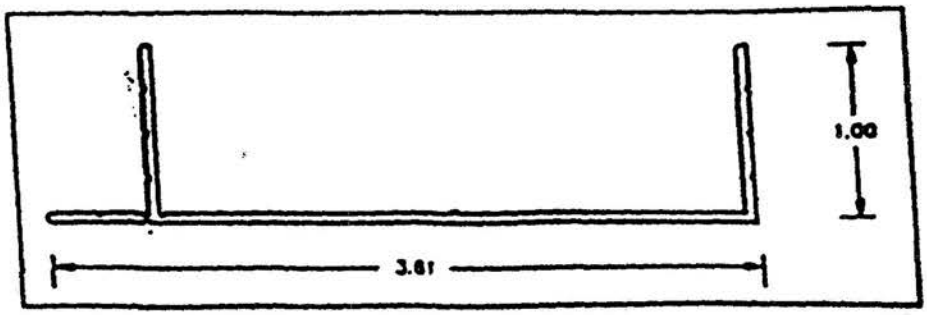
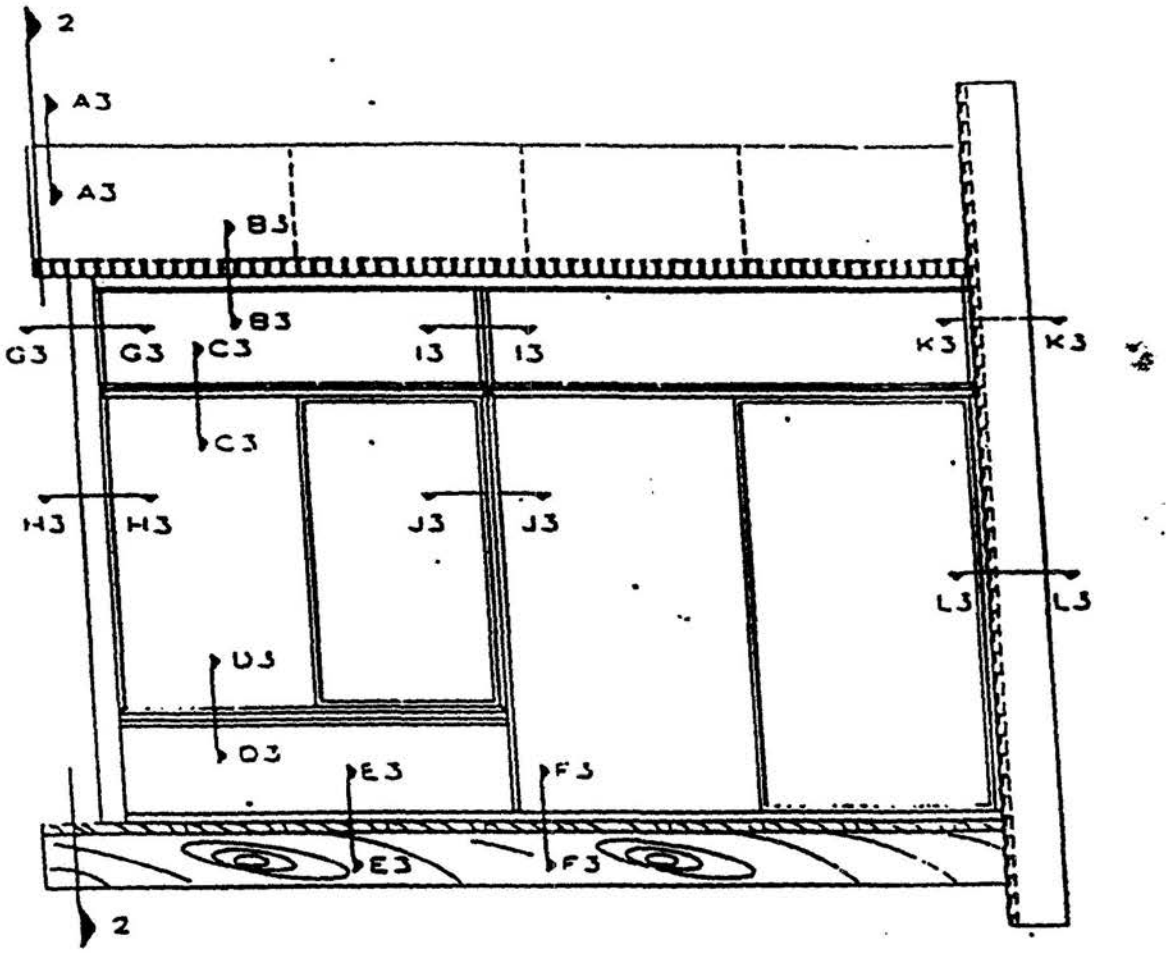
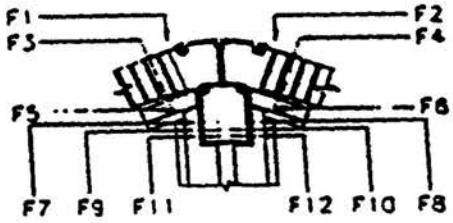


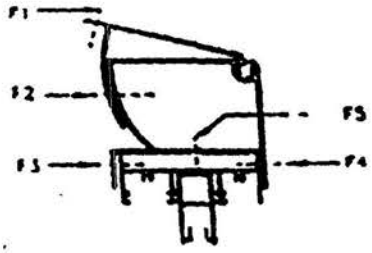
Figure 3*
U - Channel



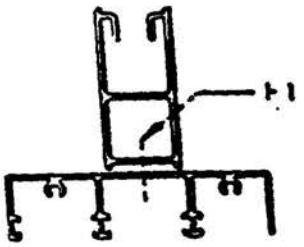
A FRAME ROOM SIDE WALL SECTION (3-3)



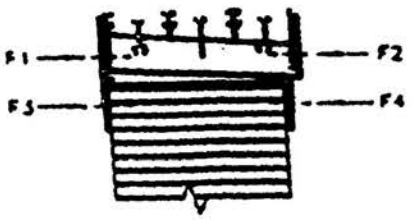
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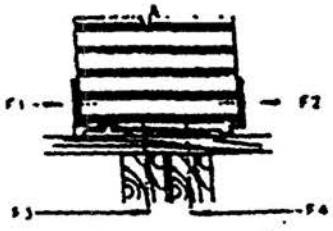
SECTION B-3



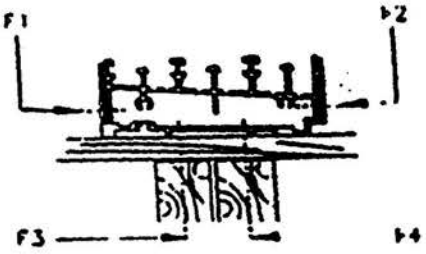
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SECTION D-3

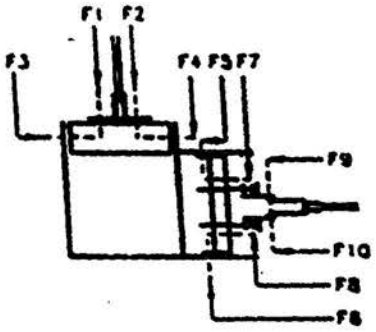


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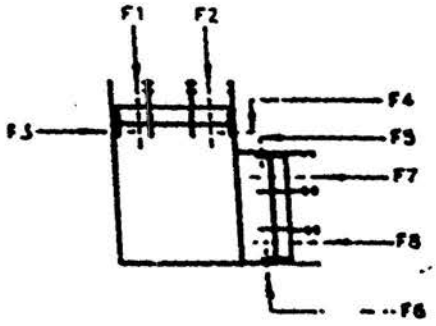


SECTION F-3

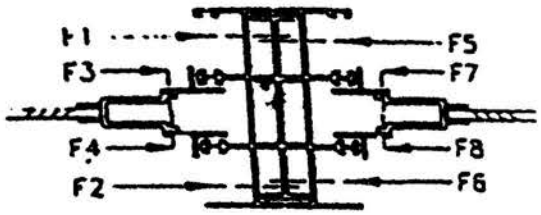
Figure 4*



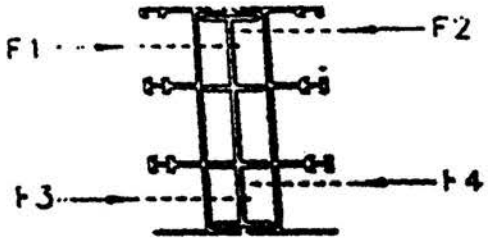
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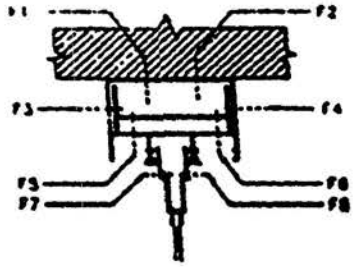
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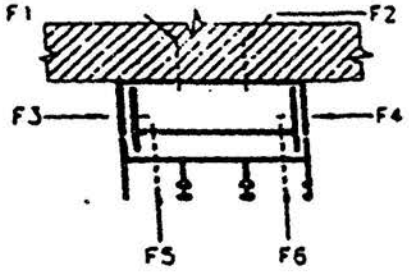
SECTION I-3



SECTION J-3



SECTION K-3



SECTION L-3

Figure 5*

*THESE DRAWINGS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY ARE NOT INTENDED FOR USE AS CONSTRUCT DOCUMENTS FOR THE PURPOSE OF DESIGN, FABRICATION OR ERECTION.