DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Housing - Federal Housing Commissioner	STRUCTURAL ENGINEERING BULLETIN NO. 1130 Rev. 1 (Supersedes issue dated March 13, 2002)
TO: DIRECTORS, SINGLE FAMILY HOCs DIRECTORS, MULTIFAMILY HUBs	ISSUE DATE June 12, 2007
	REVIEW DATE June 12, 2010

SUBJECT: 1. **Item Description** Jager Super I (JSI) - Joist

2. **Name and address of Manufacturer** Jager Building Systems, Inc.
142, 12143 40th Street S.E.
Calgary, Alberta, Canada T2Z 4E6

This Structural Engineering Bulletin (SEB) should be filed with other SEBs and related Bulletins on materials or products as required by prescribed procedures.

The technical description, requirements and limitations expressed herein do not constitute an endorsement or approval by the Department of housing and Urban Development (HUD) of the subject matter, and any statement or representation, however made, indicating approval or endorsement by HUD is unauthorized and false, and will be considered a violation of the United States Criminal Code, 18 U.S.C. 709.

NOTICE: THIS BULLETIN APPLIES TO DWELLING UNITS BUILT UNDER HUD HOUSING PROGRAMS. NON-HUD-INSURED UNITS MAY OR MAY NOT BE IN CONFORMINTY WITH THE REQUIREMENTS OF THE HUD MINIMUM PROPERTY STANDARDS.

Any reproduction of this Bulletin must be in its entirety and any use of all or any part of this Bulletin in sales promotion or advertising is prohibited.

1. General:

This Bulletin sets forth specific requirements under the Technical Suitability of Products Program for determining the eligibility of housing to be constructed under HUD mortgage insurance, or other HUD housing programs.

2. Scope:

This Bulletin applies only to the structural features of this method of construction. Final determination of eligibility is made by the appropriate HUD Field Office. Other factors considered by the Field Office will be valuation, location, architectural planning and appeal, mechanical equipment, thermal characteristics, and market acceptance. Consideration is also necessary to determine whether a specific property will qualify under the specific HUD program, when constructed according to the method outlined in this Bulletin, and where the structure is to be located.

3. Minimum Property Standards (MPS):

Compliance with HUD MPS will be determined by the HUD Field Office or Homeownership Center on the same basis as submissions involving conventional construction, except for the special features described in this Bulletin.

4. Inspection:

The appropriate HUD Field Office or Homeownership Center shall furnish a copy of a HUD field inspection report to Headquarters, FHA Standards, Office of Manufactured Housing Programs, when there is:

a. Evidence of noncompliance with portions of the system of construction described in this Bulletin.

b. Faulty shop fabrication, including significant surface defects.

c. Damage to shop fabricated items or materials due to improper transportation, storage, handling or assembly.

d. Unsatisfactory field workmanship or performance of the product or system.

e. Any significant degradation or deterioration of the product or evidence of lack of durability or performance.

Periodic plant inspections will be made by HUD Field Office, Homeownership Center, State Agency personnel, or a HUD designated representative in accordance with their prescribed procedures. Factory inspection reports shall be submitted to HUD Headquarters, upon request.

5. Certification:

The manufacturer named in this Bulletin shall furnish the builder with a written certification stating that the product has been manufactured in compliance with the HUD Minimum Property Standards (MPS), except as modified by this Bulletin. The Builder shall endorse the certification with a statement that the product has been erected in compliance with the HUD MPS except as modified by this Bulletin, and that the manufacturer's certification does not relieve the Builder, in any way, of responsibility under the terms of the Builder's Warranty required by the National Housing Act, or under any provisions applicable to any other housing program. This certification shall be furnished to the HUD Field Office upon completion of the property.

OUTLINE DESCRIPTION, CATEGORY II CONSTRUCTION GENERAL:

This Bulletin provides for the use of Jager Super I (JSI) Joists, manufactured by Jager Building Systems for floor and roof spans up to 46 feet.

PRODUCT DESCRIPTION:

JSI Joists are prefabricated wood I-joists having solid sawn lumber flanges and wood structural panel webs. The top and bottom flanges are parallel, forming a constant depth I-joist. The 8 or 9 foot lengths of web panels are spliced using a V-shaped tongue-and-grooved butt joints, glued to form a continuous web. The web-to-flange connection is a patented tongue-and-groove glued joint. See Figure 1 of this report for a typical cross section of the JSI Joists.

JSI 2000 and JSI 3000 Series joists are fabricated with solid sawn Spruce-Pine-Fir (SPF) flanges, having a minimum size of 1-1/2 by 2-1/2 inches and an oriented strand board (OSB) web. Design properties for the JSI 2000 and JSI 3000 Series joists have been analytically determined in accordance with ASTM D 5055. The joists vary in depth from 9-1/4 to 16 inches and are produced in lengths ranging from 8 to 52 feet.

JSI 4000 and JSI 4400 Series joists are fabricated solid sawn SPF lumber flanges having a minimum size of 1-1/2 by 3-1/2 inches and OSB web. Design properties for the JSI 4000, and 4400 Series joists have been analytically determined in accordance with ASTM D 5055. The JSI 4000 and JSI 4400 Series joists vary in depth from 9-1/4 inches to 20 inches. The joists are produced in lengths ranging from 8 feet to 52 feet.

All flange material is solid sawn Machine Stress Rated (MSR). 1650 – 1.5E MSR grade is used for the JSI 2000 Series joists. MSR 2100-1.8E for JSI 3000 and JSI 4000 Series joists. Flange material for the JSI 4400 Series joists is MSR 2400-2.0E. Flanges are end joined using finger jointing to NLGA SPS 4. Standard. Each finger joined flange is tension proof tested by a full length tester as outlined in the Jager's Quality Control manual.

Web material is minimum 3/8 inch OSB for JSI Series 2000, 3000, 4000, and 4400 joists. The OSB webs are rated Exposure 1 in accordance with DOC Voluntary Product Standard PS 2.

All joints are made with an exterior grade phenol-resorcinol resin adhesive conforming with ASTM D 2559, qualified in accordance with Jager's Quality Control manual. The mixing, handling, and curing of the adhesives are in accordance with Jager's Quality Control manual.

The moisture content of all flange stock and web stock at the time of fabrication shall be between 7 and 19 percent.

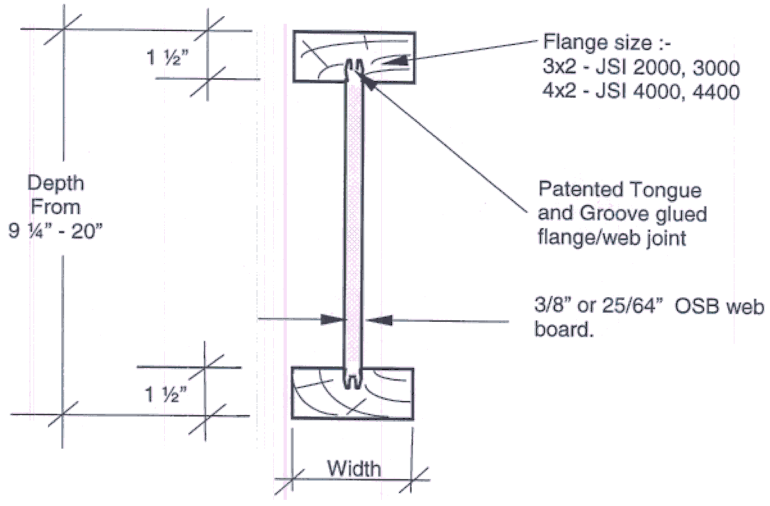


Figure No. 1 - Typical JSI® Joist Cross - Section

DESIGN AND INSTALLATION:

The design and installation of JSI Joists shall comply with the requirements of this Bulletin. JSI Joists shall be designed by a professional engineer in accordance with the requirements of this Bulletin, the applicable code, and ANSI/AF&PA NDS-05 *National design Specification for Wood Construction* (NDS). Plans shall show the design loads, spans, joist sizes, framing, stiffeners, bracing, bridging, connections, and cutting. Holes and openings cut into the webs shall be shown on the plans. Design calculations shall accompany the plans.

Installation details shall comply with this report, the construction documents, and the manufacturer's installation manual entitled *"JSI User Guide"*, date code Ver 060731.

ALLOWABLE CAPACITY:

Table 1 of this report specifies allowable moments, shears, joist stiffness *(EI)* and reactions based on specified minimum bearing lengths.

FASTENERS:

Allowable capacities and spacing of nails in the flanges shall be determined in accordance with the NDS.

WEB STIFFENERS:

Minimum bearing lengths and related requirements for web stiffeners at reactions and concentrated loads are outlined in Table 1.

LATERAL SUPPORT:

The compression flange shall be continuously laterally supported and the ends of the joists restrained to prevent rollover. This may be provided by attaching the sheathing or diaphragm to the top flange and to an end wall or shear transfer panel, or by blocking or cross-bracing capable of transferring the larger of 50 pounds per foot (730 N/m) or the required shear force due to wind, seismic or soil conditions. Bridging, as required by the Minimum Property Standards (MPS) for wood frame construction, is not required in JSI floor and roof joist applications.

HOLES IN WEBS:

The Table 2 of this report sets forth allowable sizes and location of round and rectangular holes permitted in the webs of JSI joists.

DURATION OF LOAD:

Adjustments for duration of load, as permitted by the applicable code, apply to JSI Joists and their fastenings.

IN-SERVICE MOISTURE CONDITIONS:

JSI joist properties and allowable loads in this Bulletin are limited to covered installations with dry conditions of use. Dry conditions of use are those environmental conditions represented by sawn lumber in which the moisture content is less than 16 percent.

REPETITIVE-MEMBER USE:

When employed in repetitive member uses, the allowable bending moment for JSI joists shall be multiplied by the repetitive member factor, Cr = 1.0 (ref. NDS 2005 Sec 7.3.6).

MEMBER SPANS:

The span of JSI joists shall be taken as the distance from face to face of supports, plus one-half the required bearing length at each end except that for cantilever and continuous spans, the span shall be taken as the distance between centers of bearings on supports over which the joist is continuous. Vertical shear load calculations shall include all loads within the distance from face to face of supports.

DEFLECTION:

I-joist deflection calculations shall account for deflections from both bending and shear. Bending deflections are calculated using standard engineering formulae. Shear deflection in JSI joists shall be taken as 8M/K. For example:

For a uniformly distributed load,	$= 5WL^4/384EI + 8M/K$	$= 5WL^4/384EI + WL^2/K$
For a concentrated load at mid-span,	$= PL^3/48EI + 8M/K$	$= PL^3/48EI + 2PL/K$

where:
D= Deflection in inches.
W = Uniform load in pounds per linear inch.
L = Effective span in inches.
EI = Moment of inertia times modulus of elasticity (from Table 1).
K = Shear deflection coefficient (from Table 1).
M = Bending moment in inch-pounds.
P = Concentrated load in pounds.

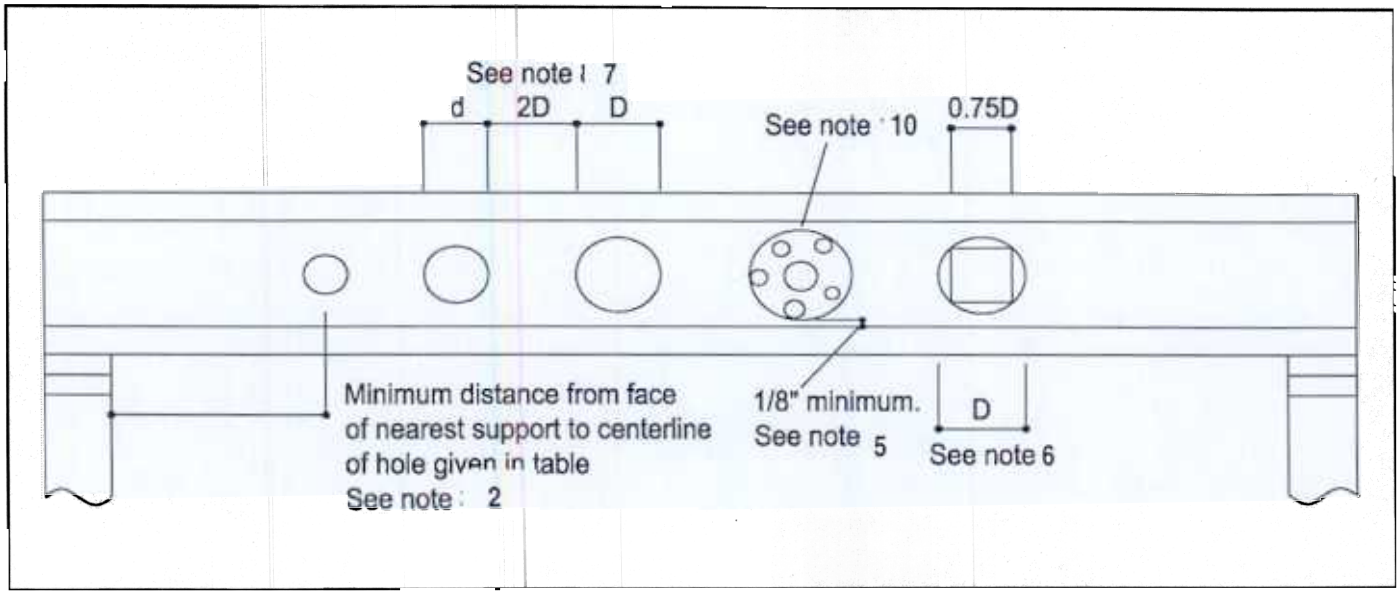
Table 1 – Allowable Design values for JSI -Joists

Joist Depth (in.)	Joist Series	Self Weight (lb / ft)	EI [5] (10^6lb-in.^{2})	Moment [7] (lb-ft)	Shear (lb)	Intermediate Reaction [4] (lb)	End Reaction [2] (lb)		K [6] (lb x 10^6)
							1-1/2 in. Bearing	1-3/4 in. Bearing	
9-1/4	JSI 2000	2.49	181	2,675	1,080	2,120	1,060	1,065	4.81
	JSI 3000	2.59	216	3,665	1,080	2,120	1,060	1,065	4.81
	JSI 4000	3.34	301	5,190	1,080	2,435	1,060	1,065	4.81
9-1/2	JSI 2000	2.52	193	2,735	1,120	2,160	1,070	1,080	4.94
	JSI 3000	2.62	231	3,780	1,120	2,160	1,070	1,080	4.94
	JSI 4000	3.37	320	5,355	1,120	2,470	1,070	1,080	4.94
11-1/4	JSI 2000	2.71	289	3,360	1,340	2,410	1,145	1,165	5.85
	JSI 3000	2.81	344	4,605	1,340	2,410	1,145	1,165	5.85
	JSI 4000	3.56	478	6,525	1,340	2,680	1,145	1,165	5.85
11-7/8	JSI 2000	2.78	330	3,545	1,420	2,500	1,160	1,200	6.18
	JSI 3000	2.88	396	4,900	1,420	2,500	1,160	1,200	6.18
	JSI 4000	3.63	547	6,940	1,420	2,760	1,200	1,280	6.18
	JSI 4400	3.76	600	8,485	1,420	2,760	1,200	1,280	6.18
14	JSI 2000	3.02	482	4,270	1,710	2,500	1,160	1,200	7.28
	JSI 3000	3.11	584	5,895	1,710	2,500	1,160	1,200	7.28
	JSI 4000	3.87	802	8,360	1,710	3,020	1,200	1,280	7.28
	JSI 4400	4.00	876	10,215	1,710	3,020	1,200	1,280	7.28
16	JSI 2000	3.24	657	4,950	1,970	2,500	1,160	1,200	8.32
	JSI 3000	3.34	799	6,835	1,970	2,500	1,160	1,200	8.32
	JSI 4000	4.09	1,092	9,690	1,970	3,020	1,200	1,280	8.32
	JSI 4400	4.22	1,186	11,845	1,970	3,020	1,200	1,280	8.32
18	JSI 4000	4.31	1,398	10,960	2,230	3,020	1,700 [3]	1,990 [3]	9.36
	JSI 4400	4.44	1,546	13,390	2,230	3,020	1,700 [3]	1,990 [3]	9.36
20	JSI 4000	4.53	1,771	12,130	2,490	3,020	1,700 [3]	1,990 [3]	10.40
	JSI 4400	4.66	1,956	14,825	2,490	3,020	1,700 [3]	1,990 [3]	10.40

For SI: 1 inch = 25.4 mm, 1 pound = 4.4482 N, 1 lb-ft = 1.3558 N-m, 1 lb-in^2 = 2.8698 kN-mm^2, 1 lb/ft = 14.594 N/m.

1. Allowable design values, except El and K, may be adjusted for the appropriate load duration factor as permitted by the applicable code.
2. Allowable end reactions of joists with a bearing length of $1^1/_2$ inches (38 mm) or $1^3/_4$ inches (44 mm) are for l-joists without bearing stiffeners; except as shown in shaded area. For a bearing length of 4 inches (102 mm), the allowable end reaction may be set equal to the tabulated allowable shear value. Interpolation of allowable end reactions between the $1^1/_2$-inch (38 mm) and 4-inch (102 mm) bearing lengths is permitted. For end reaction values over 1550 lb (6.89 kN), bearing stiffeners are required.
3. For the 18- and 20-inch (457 and 508 mm) joist depths, bearing stiffeners must be used at end reactions.
4. Allowable intermediate reactions are for l-joists without bearing stiffeners, and a minimum intermediate reaction bearing length of 31/2 inches (89mm). For the 18- and 20-inch (457 and 508 mm) joist depths, the allowable intermediate may be set equal to 3980 lb (17.7 kN) where bearing stiffeners are used.
5. Bending stiffness (El) for the I-Joist.
6. Coefficient of shear deflection (K) for the I-Joist.
7. Repetitive member use factor is equal to 1.00.

Table 2 Allowable Location of Round Holes in JSI -Joists (See Notes Below)



Joist Depth (in.)	Joist Series	Minimum Distance from Inside Face of Any Support to Centre of Round Hole Diameter (in.)														
		2	3	4	5	6	6-1/4	7	8	8-5/8	9	10	10-3/4	11	12	12-3/4
9-1/4	JSI 2000	1'-0"	2'-6"	3'-6"	5'-0"	6'-6"										
	JSI 3000	2'-6"	4'-0"	5'-6"	7'-0"	8'-6"										
	JSI 4000	3'-6"	5'-0"	6'-6"	8'-0"	10'-0"										
9-1/2	JSI 2000	1'-0"	2'-0"	3'-6"	5'-0"	6'-6"	6'-6"									
	JSI 3000	2'-6"	4'-0"	5'-0"	6'-6"	8'-0"	8'-6"									
	JSI 4000	3'-6"	5'-0"	6'-6"	8'-0"	9'-6"	10'-0"									
11-1/4	JSI 2000	0'-6"	1'-0"	2'-0"	3'-6"	5'-0"	5'-0"	6'-6"	8'-0"							
	JSI 3000	1'-6"	3'-0"	4'-0"	5'-6"	7'-0"	7'-0"	8'-6"	10'-6"							
	JSI 4000	3'-0"	4'-0"	5'-6"	7'-0"	8'-6"	9'-0"	10'-6"	12'-6"							
11-7/8	JSI 2000	0'-6"	0'-6"	1'-6"	3'-0"	4'-6"	4'-6"	5'-6"	7'-0"	8'-6"						
	JSI 3000	1'-0"	2'-6"	3'-6"	5'-0"	6'-6"	6'-6"	8'-0"	9'-6"	11'-0"						
	JSI 4000	2'-6"	4'-0"	5'-0"	6'-6"	8'-0"	8'-6"	10'-0"	12'-0"	13'-0"						
	JSI 4400	2'-6"	4'-0"	5'-0"	6'-6"	8'-6"	9'-0"	10'-6"	12'-6"	13'-6"						
14	JSI 2000	0'-6"	0'-6"	0'-6"	1'-0"	2'-6"	2'-6"	3'-6"	5'-0"	6'-0"	6'-6"	**8'-0"**	**10'-0"**			
	JSI 3000	0'-6"	0'-6"	1'-0"	2'-0"	3'-6"	4'-0"	5'-6"	7'-0"	8'-0"	9'-0"	**11'-0"**	**13'-0"**			
	JSI 4000	1'-0"	2'-6"	3'-6"	5'-0"	6'-6"	6'-6"	8'-0"	10'-0"	11'-0"	12'-0"	**14'-0"**	**15'-6"**			
	JSI 4400	1'-0"	2'-6"	3'-6"	5'-0"	7'-0"	7'-6"	8'-6"	10'-6"	11'-6"	12'-6"	**14'-6"**	**16'-0"**			
16	JSI 2000	0'-6"	0'-6"	0'-6"	0'-6"	0'-6"	1'-0"	2'-0"	3'-6"	4'-0"	4'-6"	**6'-0"**	7'-0"	7'-6"	9'-6"	**11'-6"**
	JSI 3000	0'-6"	0'-6"	0'-6"	0'-6"	0'-6"	1'-0"	2'-6"	4'-0"	5'-0"	5'-6"	**8'-0"**	9'-6"	10'-0"	12'-6"	**15'-0"**
	JSI 4000	0'-6"	0'-6"	1'-0"	2'-6"	4'-0"	4'-6"	6'-0"	7'-6"	8'-6"	9'-6"	11'-0"	13'-0"	13'-6"	16'-0"	**18'-0"**
	JSI 4400	0'-6"	0'-6"	1'-0"	2'-6"	4'-0"	4'-6"	6'-0"	7'-6"	9'-0"	9'-6"	12'-0"	13'-6"	14'-0"	17'-0"	**18'-6"**
18	JSI 4000	0'-6"	0'-6"	2'-0"	3'-0"	4'-6"	5'-0"	6'-0"	7'-0"	8'-0"	8'-6"	10'-0"	11'-0"	11'-6"	13'-6"	**15'-0"**
	JSI 4400	0'-6"	2'-0"	3'-0"	4'-6"	6'-0"	6'-0"	7'-0"	8'-6"	9'-6"	10'-0"	11'-6"	13'-0"	13'-0"	15'-0"	**16'-6"**
20	JSI 4000	0'-6"	0'-6"	0'-6"	1'-6"	3'-0"	3'-0"	4'-0"	5'-6"	6'-6"	7'-0"	8'-0"	9'-6"	**9'-6"**	**11'-0"**	**12'-6"**
	JSI 4400	0'-6"	0'-6"	0'-6"	2'-0"	3'-0"	3'-6"	4'-6"	6'-0"	7'-0"	7'-6"	**9'-6"**			**13'-0"**	**14'-6"**

BLOCKING PANELS:

Joists located beneath bearing walls in which the walls are perpendicular to the joists shall be provided with full-depth blocking panels to transfer gravity loads above the floor system to the wall or foundation below.

MANUFACTURING PLANTS:

JSI Joists covered under this Bulletin shall be produced at the following locations:

Jager Engineered Wood Products (Plants #C1 and #C2)
Wood Products Division
6839 44 Street SE
Calgary, Alberta, Canada T2C 2C9
(403) 236-1588

Les Industries Jager, Inc./Jager Building Systems, Inc.(Plant #Q1)
Division Quebec
80 Boul. de la Seigneurie
Blainville, PQ, Canada J7C 4N1
(450) 430-7939

Jager Engineered Wood Products. (Plant #B1)
Wood Products Division
44 Simpson Road
Bolton, Ontario, Canada L7E 1Y4
(905) 951-9141

The appropriate HUD Field Office or Homeownership Center in whose jurisdiction the manufacturing plant is located, or HUD designated representative will inspect these plants in accordance with prescribed procedures.

QUALITY CONTROL:

The appropriate HUD Field Office or Homeownership Center in whose jurisdiction the manufacturing plants are, or the State Agency (in Category III states) shall review and approve plant fabrication procedures and quality control program, and shall report to Headquarters in accordance with outstanding instructions. APA The Engineered Wood Association, Jager Engineered Wood product's third party inspection agency, shall validate Jager's certification that JSI Joists meet the requirements of this Bulletin.

IDENTIFICATION:

Figure No. 2 Typical JSI® MARKINGS
(Stamped on the web board @ 8 ft. spacing)

JSI joists are identified by a stamp indicating the product designation (the JSI Series), the number of this Bulletin (SEB 1130), the manufacturer's name (Jager), the plant number, a five digit registration number which represents the production date, and the name and/or logo of the third party quality assurance agency (APA AWS.)

RECORD OF PROPERTIES:

The manufacturer shall provide HUD a list of the first ten properties in which the component or system described in this Bulletin is used. The list shall include the complete address, or description of location, and approximate date of installation or erection. Failure of the manufacturer to provide HUD with the above information may result in cancellation of this Bulletin.

NOTICE OF CHANGES:

The manufacturer shall inform HUD in advance of changes in production facilities, transportation, field erection procedures, design, or materials used in this product. Further, the manufacturer must inform HUD of any revision to corporate structure, change of address or change in name or affiliation of the prime manufacturer. Failure of the manufacturer to notify HUD of any of the above changes may result in cancellation of this Bulletin.

EVALUATION:

This SEB is valid for a period of three years from the date of initial issuance or most recent renewal or revision, whichever is later. The holder of this SEB shall apply for a renewal or revision 90 days prior to the Review Date printed on this SEB. Submittals for renewal or revision shall be sent to:

U. S. Department of Housing and Urban Development
FHA Standard, Office of Manufactured Housing Programs
451 Seventh Street, SW, Room 9168
Washington, DC 20410-8000

Appropriate User Fee shall be sent to:

U. S. Department of Housing and Urban Development
Miscellaneous Income – Technical Suitability of Products Fees
Bank of America
P. O. Box 198762
Atlanta, GA 30384-8762

The holder of this SEB may apply for revision at any time prior to the Review Date. Minor revisions may be in the form a supplement.

If the Department determines that a proposed renewal or supplement constitutes a revision, the appropriate User Fee for a revision will need to be submitted in accordance with Code of Federal Regulations 24 CFR 200.934, "User Fee System for the Technical Suitability of Products Program", and current User Fee Schedule.

CANCELLATION:

Failure to apply for a renewal or revision shall constitute a basis for cancellation of the SEB. HUD will notify the manufacturer that the SEB may be canceled when:

1 conditions under which the document was issued have changed so as to affect production of, or to compromise the integrity of the accepted material, product, or system,

2. the manufacturer has changed its organizational form without notifying HUD, or

3. the manufacturer has not complied with responsibilities it assumed as a condition of HUD's acceptance.

However, before cancellation, HUD will give the manufacturer a written notice of the specific reasons for cancellation, and the opportunity to present views on why the SEB should not be canceled. No refund of fees will be made on a canceled document. This Structural Engineering Bulletin is issued solely for the captioned firm and is not transferable to any person or successor entity.

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