



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, Pennsylvania 17815

January 31, 2018

Re: 201720-1 (APP-012049), Kalender Residence at 19 Balfour Street Staten Island, NY in Richmond County
NY DOS No. : M080-2017-215

Dear Mr. Behrent,

Issued with this letter in response to your application received December 27, 2017 for approval of a new Individual Model (as referenced above) is the Factory Manufactured Approval as Authorized under Part 1209 of Title 19 NYCRR, Division of the Code Enforcement and Administration.

The approval is indicated by the PFS Corporation Stamp of Approval placed on the set of plans accompanying this letter dated January 31, 2018 is valid for 2 years from the date of this letter. This approval is in compliance with the Uniform Fire Prevention and Building Code which incorporates the 2015 International Residential Code as modified by New York State, 2017 Uniform Code Supplement and 2015 National Electrical Code.

The design limitations for this approval are as follows :

1. Occupancy : Two Family Dwelling and Construction Type : Wood Frame Protected
2. Number of Stories : Three
3. Ground Snow Load : 20 psf
4. Seismic Design Category : B
5. Basic Wind Speed and Exposure Category : 115 V-ult mph and B
6. Building Sprinkler System: NFPA 13 2013

The factory installed sprinkler system design excludes all required site completed connections and site required designs. The site required design and connections must be reviewed, inspected and approved by the local authority having jurisdiction.

7. Climate Category : 4
8. Other: **All materials and designs for the foundation, including the support columns and connections, all required construction/fire ratings due to any site location specific restrictions (below the first floor framing), all materials for the Porch (roof shipped as part of the modules) and Deck including all access to grade, hose bibbs, exterior GFCI grade accessible WP recepts, all appliances, ceiling fans, exterior siding completion, exterior trim boards, gutters and downspouts, ridge vent and shingle completion, HVAC system completion, gas line installation, exhaust fan completion, electrical, sprinkler system, plumbing and vent connections, floor insulation, energy compliance completion and all site connections are to be completed on-site by others, to be reviewed, inspected and approved by the local authority having jurisdiction.**

Prior to shipment from the factory each factory manufactured home, model and/or component shall have securely attached thereto a NYS Insignia as stipulated in Part 1209 of Title 19 NYCRR, paragraph 1209.5. The Insignia of Approval Order Form is available from NYSDOS.

This is a file copy for your records. Should you have any questions, please feel free to call this office at any time.

Sincerely,
D. Renee Moist
Staff Plan Reviewer
Northeast Regional Office
renee.moist@pfsteco.com

Enc: PDF Approved plan set
Cc: Donald Thomas, AIA (DOS)
Daryl Andreades, RA (DOS)



Building Standards and Codes

New York State
Department of State
Division of Building Standards
and Codes
One Commerce Plaza
99 Washington Avenue, Suite 1160
Albany, NY 12231-0001
(518) 474-4073
Fax: (518) 486-4487
www.dos.ny.gov

Application for Plan Approval of a Factory Manufactured Building (Modular)

All fields must be completed in order for this form to be submitted.

MANUFACTURER: Modular Steel Systems, Inc. Manufacturer No: **M** 080
Address: 11 Edwards Drive, Bloomsburg, PA 17815 Phone: (570) 520-4228
Contact Person: Alan Behrent Email: alan@steelmodularsystems.com

QUALITY CONTROL MANUAL LAST APPROVAL DATE: 8/15/2016
Prepared By/Contact Person: Alan Behrent Phone: (570) 520-4228
Email: alan@steelmodularsystems.com

INDEPENDENT THIRD PARTY INSPECTION AGENCY: PFS Corporation
Address: 2877 Skatetown Road, Bloomsburg, PA 17815 Phone: (570) 784-8396
Contact Person: Richard Wenner Email: rick.wenner@pfsteco.com

FACTORY MANUFACTURED BUILDING IDENTIFICATION

Project Name/Client/Customer: Gary Allen Modular Homes, LLC / Kalender Project County: Richmond
Model: Three Story / #201720-1 Occupancy Class Detached Two Family Dwelling
Project Address: 19 Balfour Street, Staten Island, NY 10305

Application pertains to: (check one)

- ☒ New Individual Model (unique/custom/manufactured once for a specific site)
☐ New Initial Individual Model (planned to be built repeatedly - per these guidelines*)
☐ New System of Models
☐ Modification of an Approved Model or System: **M** _____ (provide prior approval number)
☐ Renewal of an Approved Model or System: **M** _____ (provide prior approval number)

* initial model means a specific design of factory manufactured home to include options which do not change the quality control manual and which in the determination of the Division, do not materially affect the structural, plumbing, mechanical or electrical systems.

FILING DOCUMENTATION AND FEES

Provide 1 set of necessary drawings, specifications, calculations and updated QA Manual (if more than 2 years since last approval) as a hard copy and pdf files on a CD-Rom, thumb-drive, web-transfer or e-mail. Please provide a non-refundable filing fee of \$50.00. A plan checking fee in accordance with 9 NYCRR 1281.4 is required upon approval, payable to: NYSDOS, Division of Building Standards and Codes. Send submission and payment to: NYS Dept. of State, Division of Building Standards and Codes, One Commerce Plaza, 99 Washington Avenue, Suite 1160, Albany, NY 12231.

SIGNATURES:

Registered Architect - Professional Engineer**

Name: Anthony Shulde

License No: 096197

Signature: 

** New York State Education Law and Department of State Regulation require architect or professional engineer signature and seal affixed to all drawings and specifications submitted to public officials certifying compliance with health and safety regulations and conformance with current codes.

PFS NY SUBMITTAL INDEX

Section Description	# Pages
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NY Checklist	14
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ATC Ground Snow Load	1
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Structural Calculations	39
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Ceiling Joist Connection	2
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Electric Load Calculation	1
Hydrant Flow Test Letter	1
Sprinkler Calculations	6
Sprinkler Head Specifications	25
Heating/Cooling Calculation	4
Fujitsu 36RLXFZH Data Sheet	2
Fujitsu ASU7RLF1 Data Sheet	2
Fujitsu ASU12RLF1 Data Sheet	2
Navien NPE Specification	2
Drawings	27
Cragolin Review Letter	1
NYC DOB Approved Plans	17
Total	183





NEW YORK DEPARTMENT OF STATE
DIVISION OF CODE ENFORCEMENT AND ADMINISTRATION

Third Party Modular Review
Submission Development Worksheet
Based upon the 2016 Residential Code of New York State

For Codes Division Use Only

Application number assigned by DOS Codes Division M080-2017-215
Date Received: 12/27/2017
Date Reviewed: 1/04/2018
Date Approval Issued: 1/31/2018
DOS Reviewer: _____

TO BE COMPLETED BY THE MANUFACTURER

Manufacturer: Modular Steel Systems, Inc. - 11 Edwards Drive, Bloomsburg, PA 17815
Project Name & Project Number: 201720-1 - Kalender
Address: 19 Balfour Street
City/Town/Village: Staten Island, NY
Zip Code: 10306

This worksheet is based upon the **Submission Instructions** prepared for the **Residential Third Party Modular Review**. This completed worksheet shall accompany each project submitted as part of the Residential Modular Pilot Program. This worksheet is provided for general guidance in preparing a satisfactory application for approval only. This is not intended to serve as a complete checklist leading to compliance with the Uniform Fire Prevention and Building Code. Note that the worksheets are in a tabular format and are divided into five columns as shown below. A description of each column is given in the second row, below the column header

Reference to Instructions	Code Section	Submission Requirement	Response	Drawings Sheet or page number where requirement is addressed
This column references the Submission Instructions. The submission instructions shall be followed in the development of the project submission for approval	This column contains the relevant code section(s) that support the submission requirement	This column identifies a specific code requirement that must be addressed within the submission documents.	This column is where the manufacturer, design professional, quality assurance agency identifies that the submission requirement has been addressed, is not applicable to the project, or is a component to be addressed with the site constructed portion of the project. See note 2, below.	This is where the manufacturer or design professional identifies exactly where in the submission the submission requirement has been met. For example, what drawing sheet has the window schedule?



The design professional shall complete the response column by checking the appropriate box. The response three options to check are:

- ☐ Completed
- ☐ N/A (Meaning that the requirement is not applicable to the project.)
- ☐ S (Meaning that the requirement is to be completed as part of the site construction)

Section A - General Requirements Worksheet				
Reference to Instructions	Code Section	Submission Requirement	Response	Drawing sheet or page number where requirement is addressed
A7	N/A	A complete calculations manual	☒ Completed ☐ N/A ☐ S	Structural Calcs Pages 1 thru 44
A6	N/A	Drawings indicate the location of the insignia of approval	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
A5	N/A	Drawing organization	☒ Completed ☐ N/A ☐ S	Submittal Index
A4a	N/A	Cover Sheet identifies the design professional's name, address and contact information.	☒ Completed ☐ N/A ☐ S	Drawing 1
A4b	N/A	Cover sheet has an index for the drawings set	☒ Completed ☐ N/A ☐ S	Drawing 1
A4c	N/A	Cover sheet indicates the project name and address	☒ Completed ☐ N/A ☐ S	Drawing 1
A4d	N/A	Cover sheet identifies the use and occupancy classification	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a	N/A	Cover sheet identifies the seismic design category	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a	N/A	Cover sheet identifies the ground snow load	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a	N/A	Cover sheet identifies the basic wind speed	☒ Completed ☐ N/A ☐ S	Drawing 1
A3	N/A	3"x6" clear space box provided for DOS approval stamp	☒ Completed ☐ N/A ☐ S	All Drawings
A2	N/A	Manufacturer's information provided	☒ Completed ☐ N/A ☐ S	All Drawings

A1	N/A	All documents sealed by design professional	☒ Completed ☐ N/A ☐ S	
A1	N/A	Third party approval granted	☒ Completed ☐ N/A ☐ S	
A1	N/A	Submission ready documents in triplicate	☒ Completed ☐ N/A ☐ S	

Section B - Required Drawing Details				
Reference to Instructions	Code Section	Submission Requirement	Response	Drawing sheet or page number where requirement is addressed
B1a	R101.2	Type of Structure circle one: One Family <u>Two Family</u> Townhouse	☒ Completed ☐ N/A ☐ S	
		Number of Stories = <u>3</u> The attic is defined as an unfinished space. Note that sprinklers are not required in any building having two stories above a basement, whether the basement is below grade or considered a story above grade.	☒ Completed ☐ N/A ☐ S	
		Height of Building (ft.) = <u>38'-6 9/16"</u>	☒ Completed ☐ N/A ☐ S	Drawing 5
B1b		Floor Plan(s)	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R303	Light and ventilation Identify this information on the window schedule, when appropriate.	☒ Completed ☐ N/A ☐ S	Drawing 4
	R303.6	Stairway illumination	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	R304	Room size One room a min. of 120 s.f. 70 s.f. for other rooms 7 foot min. horizontal dimension	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R305.1	Ceiling Height Identify the ceiling height on a section or elevation view. Show compliant dimensions when using exceptions.	☒ Completed ☐ N/A ☐ S	Drawings 5, 5a, 5b, 5c, 10 and 10a
	R306 Ch. 27	Fixture requirements	☒ Completed ☐ N/A ☐ S	

	R307	Fixture spacing	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
B1c		Cross Sections	☒ Completed ☐ N/A ☐ S	Drawing 10 and 10a
B1d B1g	R702	Finishes	☒ Completed ☐ N/A ☐ S	Drawing 4
	R702.3.5	Gypsum	☒ Completed ☐ N/A ☐ S	Drawing 10
	R315	Flame spread classification not greater than 200	☒ Completed ☐ N/A ☐ S	Drawing 1
B1f	R703	Exterior Finish	☐ Completed ☐ N/A ☒ S	Drawings 5, 5a, 5b and 5c
	R806.2	Attic ventilation	☒ Completed ☐ N/A ☐ S	Drawing 10
B1e	R807	Attic access	☒ Completed ☐ N/A ☐ S	Drawing 3a
B1h	R308 R310 R311	Door and Window Schedule Notes: 1. Window pressure and Wind borne debris are separate requirements. 2. Show dimensions complying with emergency escape and rescue requirements. 3. 1 exit per dwelling unit, side hinged, & 3'x6'-8"	☒ Completed ☐ N/A ☐ S	Drawing 4
	R308.4	Safety glazing locations	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R308.6	Skylights / sloped glazing	☐ Completed ☒ N/A ☐ S	
	R613	Exterior windows and glass doors	☒ Completed ☐ N/A ☐ S	Drawing 4
	R613.2	Performance of windows	☒ Completed ☐ N/A ☐ S	Drawing 4
	R613.3	Testing and labeling	☒ Completed ☐ N/A ☐ S	Drawing 4
	R613.6	Wind-borne debris	☐ Completed ☒ N/A ☐ S	
	R613.7	Anchorage	☒ Completed ☐ N/A ☐ S	Drawing 4
	R613.8	Mullions	☐ Completed ☒ N/A ☐ S	

B3a	R309	Garage Separation Identify wall construction. Identify opening protectives	☐ Completed ☒ N/A ☐ S	
	R311.4.3 R311.5.4	Landings	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R311.6	Ramps	☐ Completed ☒ N/A ☐ S	
	R311.5	Stairs	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R311.5.1	36" clear width	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R311.5.3.2	Min. Tread depth = 9"	☒ Completed ☐ N/A ☐ S	Drawings 10a
	R311.5.3.1	Max. riser height = 8 1/4"	☒ Completed ☐ N/A ☐ S	Drawings 10a
	R311.5.2	Min. = 6'-8"	☒ Completed ☐ N/A ☐ S	Drawings 10a
	R314.5	Spirals (not permitted to the only means of egress from a story)	☐ Completed ☒ N/A ☐ S	
	R311.5.6	Handrails	☐ Completed ☒ N/A ☐ S	Drawings 3 and 3a
	R311.5.6.1	Height 34" to 38" with 4 or more risers	☐ Completed ☒ N/A ☐ S	Drawings 3 and 3a
	R312	Guards	☒ Completed ☐ N/A ☐ S	Drawings 1, 3 and 3a
	R312.1	Floor surfaces more than 30" above floor below	☒ Completed ☐ N/A ☐ S	Drawings 3 and 3a
	R312.2	Size of openings	☒ Completed ☐ N/A ☐ S	Drawings 1, 3 and 3a
	R313	Smoke Alarms Show locations on drawings	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	R313	Carbon Monoxide Alarms Show locations on drawings	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	R313.5	Automatic Sprinkler Systems (Three story structures)	☒ Completed ☐ N/A ☐ S	Drawings 12, 12a and 12b
		Provide hydraulic calculations	☒ Completed ☐ N/A ☐ S	Sprinkler Calcs Pages 1 thru 6

		Provide layout of sprinkler heads	☒ Completed ☐ N/A ☐ S	Drawings 12 and 12a
		Provide complete system diagram	☒ Completed ☐ N/A ☐ S	Drawings 12, 12a and 12b
		Submit equipment specifications	☒ Completed ☐ N/A ☐ S	Sprinkler Specs Pages 1 thru 25
	R314	Foam Plastic Insulation	☐ Completed ☒ N/A ☐ S	
B1a	R317	Dwelling Unit Separation	☒ Completed ☐ N/A ☐ S	Drawings 10, 10a and 10b
	R317.1	One hour for two-family structure (½ hr. with sprinkler system)	☒ Completed ☐ N/A ☐ S	Drawings 10, 10a and 10b
	R317.2	Townhouses	☐ Completed ☒ N/A ☐ S	
		One-hour separation per R302 (2 hour common wall exception)	☐ Completed ☒ N/A ☐ S	
	R317.2.2	Parapet construction	☐ Completed ☒ N/A ☐ S	
	R317.2.4	Structural independence	☐ Completed ☒ N/A ☐ S	
	Ch. 13	General mechanical systems	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	M1303	Labeling of appliances	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	M1305	Appliance access	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	M1306	Clearances from combustible construction	☒ Completed ☐ N/A ☐ S	Drawing 1
	Ch. 14	Heating & cooling equipment	☒ Completed ☐ N/A ☐ S	Heat/Cool Calcs Pages 1 thru 4 and Drawings 4, 7 and 7a
	Ch. 15	Exhaust systems	☐ Completed ☐ N/A ☒ S	
	M1502	Clothes dryer exhaust	☐ Completed ☐ N/A ☒ S	Drawings 3 and 3a
	M1503	Range hoods	☐ Completed ☐ N/A ☒ S	Drawings 3 and 3a

	M1505	Overhead exhaust hoods	☐ Completed ☒ N/A ☐ S	
	M1506	Exhaust ducts	☐ Completed ☒ N/A ☐ S	
	M1507	Mechanical ventilation	☐ Completed ☐ N/A ☒ S	Drawings 6 and 6a
	Ch. 16	Duct systems	☐ Completed ☒ N/A ☐ S	
	M1601	Duct construction	☐ Completed ☒ N/A ☐ S	
	M1602	Return air	☐ Completed ☒ N/A ☐ S	
	Ch. 17	Combustion air	☐ Completed ☐ N/A ☒ S	Drawings 7 and 7a
	M1701	General	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	M1702	All air from inside	☐ Completed ☒ N/A ☐ S	
	M1703	All air from outside	☐ Completed ☐ N/A ☒ S	Drawings 7 and 7a
	Ch. 24	Fuel gas	☐ Completed ☐ N/A ☒ S	Drawings 1, 7 and 7a
	G2406	Appliance location	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	G2407	Combustion, ventilation and dilution air	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	G2408	Equipment & appliance installation	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
	G2413	Pipe sizing	☐ Completed ☒ N/A ☐ S	
	G24143	Piping materials	☐ Completed ☒ N/A ☐ S	
	G2420	Gas shutoff valves	☐ Completed ☒ N/A ☐ S	
B6a		Plumbing system drawings See Chapter 25 through Chapter 32	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b

B6b	P2904 P3002	Identify plumbing materials	☒ Completed ☐ N/A ☐ S	Drawing 8
B6c B6d		Drawings of the plumbing system.	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	Ch. 26	General requirements	☒ Completed ☐ N/A ☐ S	Drawing 8
	P2603.2	Drilling and notching	☒ Completed ☐ N/A ☐ S	Drawing 8
	P2605	Piping support	☒ Completed ☐ N/A ☐ S	Drawing 8
	P2706	Waste receptors	☐ Completed ☒ N/A ☐ S	
	Ch. 28	Water heaters	☒ Completed ☐ N/A ☐ S	Drawing 9
	P2802.2	Temperature Control	☐ Completed ☒ N/A ☐ S	
	R306.4	Water supply	☒ Completed ☐ N/A ☐ S	Drawing 9
	P2903	Fixture units, size of water supply piping	☒ Completed ☐ N/A ☐ S	Drawing 9
	P2903.7	3/4" min	☒ Completed ☐ N/A ☐ S	Drawing 9
	P2904	Identify pipe materials	☒ Completed ☐ N/A ☐ S	Drawing 8
	R306.3	Sanitary drainage	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	P3003	Piping materials	☒ Completed ☐ N/A ☐ S	Drawing 8
	P3005	Cleanouts	☐ Completed ☒ N/A ☐ S	
	CH. 31	Vents	☒ Completed ☐ N/A ☐ S	
	P3103.1	Roof extension	☐ Completed ☐ N/A ☒ S	Drawings 9 and 9b

	P3103.2	Frost closure	☐ Completed ☒ N/A ☐ S	
	P3103.3	Flashing & sealing	☐ Completed ☐ N/A ☒ S	Drawing 9
	P3108	Wet venting	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	P3109	Waste stack vent	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	P3110	Circuit venting	☐ Completed ☒ N/A ☐ S	
	P3111	Combination waste and vent system	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	P3112	Island fixture venting	☐ Completed ☒ N/A ☐ S	
	P3113	Size of venting system	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	P3114	Air admittance valves	☐ Completed ☒ N/A ☐ S	
	P3201	Traps	☒ Completed ☐ N/A ☐ S	Drawings 9, 9a and 9b
	Ch. 10	Fireplaces & stoves	☐ Completed ☒ N/A ☐ S	
	R1001.9 R1001.10	Hearth & hearth extension	☐ Completed ☒ N/A ☐ S	
	R1006	Exterior air supply.	☐ Completed ☒ N/A ☐ S	
	R1004	Factory-built fireplaces	☐ Completed ☒ N/A ☐ S	
	R1004.2	Hearth extension	☐ Completed ☒ N/A ☐ S	
	R1004.3	Decorative shrouds	☐ Completed ☒ N/A ☐ S	
	R1004.4	Unvented gas log heaters	☐ Completed ☒ N/A ☐ S	

		Chimneys & vents (Chapters 10, 18 & 24)	☐ Completed ☒ N/A ☐ S	
	R1005	Factory-built chimneys	☐ Completed ☒ N/A ☐ S	
	R1801.2	Draft requirements	☐ Completed ☒ N/A ☐ S	
	R602.8	Fire Blocking	☒ Completed ☐ N/A ☐ S	Drawing 10
	M1801.11	Multiple-appliance venting	☐ Completed ☒ N/A ☐ S	
	G2425	Chimneys & vents	☐ Completed ☒ N/A ☐ S	
	G2426	Vents	☐ Completed ☒ N/A ☐ S	
	G2427	Venting of equipment	☐ Completed ☒ N/A ☐ S	
		Electrical Requirements (Chapters 33 through 42)	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	E3801.2.1	Receptacle placement	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	E3802	GFCI	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
	E3803	Switch locations	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B6d		Electrical equipment/appliance locations Floor plans	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B7a		Service equipment	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B7b		Means of grounding	☒ Completed ☐ N/A ☐ S	
B7c		Load calculations	☒ Completed ☐ N/A ☐ S	Electric Load Calc Page 1
B7d		Size of conductors	☒ Completed ☐ N/A ☐ S	Drawing 6 and 6a
B7e		Main disconnect & over current protection	☐ Completed ☐ N/A ☒ S	Drawings 6 and 6a

B7f		Locations of equipment	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B7g		Single line diagram	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B7h		Lighting plan	☒ Completed ☐ N/A ☐ S	Drawings 6 and 6a
B8		Energy Code State compliance path used REScheck	☒ Completed ☐ N/A ☐ S	REScheck
		Forced Hot Air Furnace, 78 AFUE min. Make and model number _____	☐ Completed ☒ N/A ☐ S	
		Electric Central Air, 10 SEER min. Make and model number _____ -	☐ Completed ☒ N/A ☐ S	
		Boiler, 80 AFUE Min. Make and model number _____ -	☐ Completed ☒ N/A ☐ S	
		Air leakage Identify how joints, penetrations and openings in the building envelope are sealed.	☒ Completed ☐ N/A ☐ S	
		Recessed lights shall be IC rated and installed with no penetrations, or Type IC or non-IC rated installed inside an appropriate air-tight assembly with a 0.5" clearance from combustible materials and 3" clearance from insulation.	☐ Completed ☒ N/A ☐ S	
		Vapor Retarder Installed on the warm-in-winter side of all non-vented framed ceilings, walls and floors.	☒ Completed ☐ N/A ☐ S	Drawing 10
		Materials Identification Installation shall be per the manufacturer's instructions. Materials must be identified so that compliance can be determined. Insulation R values and glazing U factors must be clearly marked on the building plans or specifications.	☒ Completed ☐ N/A ☐ S	Drawing 1



		Duct Insulation Supply ducts in unconditioned attics or outside the building must be insulated to R-8 or R-11. Return ducts in unconditioned attics or outside the building must be insulated to R-4 or R-6. Supply ducts in unconditioned spaces must be insulated to R-8 or R-11. Return ducts in unconditioned spaces must be insulated to R-2. Insulation is not required on ducts in basements within the thermal envelope.	☐ Completed ☒ N/A ☐ S	
		Duct Construction All joints, seams, and connections must be securely fastened with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric, or tapes. Duct tape is not permitted. Ducts shall be supported every 10 feet or in accordance with the manufacturer's instructions. Cooling ducts with exterior insulation must be covered with a vapor retarder. Air filters are required in the return air system. The HVAC system must provide a means for balancing air and water systems.	☐ Completed ☒ N/A ☐ S	
		Temperature Controls Each dwelling unit has at least one thermostat capable of automatically adjusting the space temperature set point of the largest zone.	☒ Completed ☐ N/A ☐ S	Drawings 7 and 7a
		Electric Systems Separate electric meters are required for each dwelling unit.	☐ Completed ☒ N/A ☐ S	
		Fireplaces Fireplaces must be installed with tight fitting, non-combustible doors.	☐ Completed ☒ N/A ☐ S	
		Service Water Heating Water heaters with vertical pipe risers must have a heat trap on both the inlet and outlet unless the water heater has an integral heat trap or is part of a circulating system. Identify on the drawings the insulation R value(s) for circulating hot water pipes and HVAC piping.	☐ Completed ☒ N/A ☐ S	
	Ch. 9	Roof Exterior Coverings	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
	R902	Classification	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
	R903	Weather protection	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a

	R905.1	General requirements	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
	R905.2	Asphalt	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
		Structural design	☒ Completed ☐ N/A ☐ S	Pages 30 thru 72
		Identify codes and referenced standards used in design on a separate sheet bound with the structural calculations	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a1		Dead Loads	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a2		Live Loads	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a3		Ground Snow Load	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a4		Seismic Design Category and Assumed Soil Site Class	☒ Completed ☐ N/A ☐ S	Drawing 1
B4a5		Wind Speed and Exposure Category	☒ Completed ☐ N/A ☐ S	Drawing 1
B4b1		Engineered design	☒ Completed ☐ N/A ☐ S	Structural Calcs Pages 1 thru 44
B4b2		Prescriptive design	☒ Completed ☐ N/A ☐ S	Drawing 1
B4c		Specifications of materials	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
B4d1		Engineered roof details incorporated	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
B4d2		Truss specifications data sheet provided	☐ Completed ☒ N/A ☐ S	
B4d3		Truss (rafter) uplift connections provided	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
B4d4		Ice shield underlayment provided	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
B4d5		Attachment of roof covering and underlayment provided	☒ Completed ☐ N/A ☐ S	Drawing 11
B4d6		Braced wall lines identified on plans	☒ Completed ☐ N/A ☐ S	Drawings 3b and 3c

B4d7		Specifications for shear walls provided	☒ Completed ☐ N/A ☐ S	Drawings 3b and 3c
B4d8		Structural adequacy of shear walls confirmed	☒ Completed ☐ N/A ☐ S	Wind Calcs Pages 1 thru 2
B4d9		Location and specifications for holddown devices provided	☒ Completed ☐ N/A ☐ S	Drawings 2, 3b and 3c
B4d10		Column (post) schedule provided	☒ Completed ☐ N/A ☐ S	Structural Calcs Pages 1 thru 44
B4d11		Header (beam) schedule provided	☒ Completed ☐ N/A ☐ S	Structural Calcs Pages 1 thru 44
B4d12		Continuity of uplift resistance confirmed	☒ Completed ☐ N/A ☐ S	Drawings 2, 3b and 3c
B4d13		Details of module integration (at ridge, mating line, story-to-story) provided	☒ Completed ☐ N/A ☐ S	Drawings 10 and 10a
B4d14		Wind-borne debris protection applicable	☐ Completed ☒ N/A ☐ S	
B4d15		Wind-borne debris protection addressed	☐ Completed ☒ N/A ☐ S	
B4e1		Location and specifications for holddown devices provided	☒ Completed ☐ N/A ☐ S	Drawings 2, 3b and 3c
B4e2		Location, size, and spacing of sillplate anchor bolts provided	☐ Completed ☒ N/A ☐ S	
B4e3		Location and spacing of columns provided	☒ Completed ☐ N/A ☐ S	Drawing 2
B4f1		Uniformly distributed loads identified	☒ Completed ☐ N/A ☐ S	Drawing 2
B4f2		Concentrated loads identified	☒ Completed ☐ N/A ☐ S	Drawing 2
B4f3		Horizontal loads vectors identified	☐ Completed ☒ N/A ☐ S	





Compliance Certificate

Project Kalender Residence

Energy Code: **2015 IECC**
Location: **New York, New York**
Construction Type: **Single-family**
Project Type: **New Construction**
Conditioned Floor Area: **2,848 ft²**
Glazing Area: **13%**
Climate Zone: **4 (5362 HDD)**
Permit Date:
Permit Number:



Construction Site:
19 Balfour Street
Staten Island, NY 10305

Owner/Agent:
Gary Allen Modular Homes, LLC
8304 13th Avenue
Brooklyn, NY 11228
(347) 915-7551

Designer/Contractor:
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815
(570) 520-4062

Compliance: Passes using UA trade-off

Compliance: **11.2% Better Than Code** Maximum UA: **394** Your UA: **350** Maximum SHGC: **0.40** Your SHGC: **0.28**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1,434	38.0	0.0	0.030	43
Wall 1 1st Floor: Wood Frame, 16" o.c.	1,481	21.0	0.0	0.057	72
Window 1: Vinyl/Fiberglass Frame:Double Pane with Low-E SHGC: 0.28	182			0.300	55
Door 1: Solid	40			0.160	6
Wall 2 2nd Floor: Wood Frame, 16" o.c.	1,260	21.0	0.0	0.057	61
Window 2: Vinyl/Fiberglass Frame:Double Pane with Low-E SHGC: 0.28	182			0.300	55
Floor Band 2nd Floor: Wood Frame, 16" o.c.	121	10.0	0.0	0.090	11
Floor 1: All-Wood Joist/Truss:Over Outside Air	1,434	30.0	0.0	0.033	47

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2015 IECC requirements in REScheck Version 4.6.4 and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

Alan Behrent - Director of Engineering
Name - Title

Alan Behrent
Signature

1/24/2018
Date



Inspection Checklist

Energy Code: 2015 IECC

Requirements: 0.0% were addressed directly in the REScheck software

Text in the "Comments/Assumptions" column is provided by the user in the REScheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Pre-Inspection/Plan Review	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
103.1, 103.2 [PR1] ¹ 	Construction drawings and documentation demonstrate energy code compliance for the building envelope. Thermal envelope represented on construction documents.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
103.1, 103.2, 403.7 [PR3] ¹ 	Construction drawings and documentation demonstrate energy code compliance for lighting and mechanical systems. Systems serving multiple dwelling units must demonstrate compliance with the IECC Commercial Provisions.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
302.1, 403.7 [PR2] ² 	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr _____ Cooling: Btu/hr _____	Heating: Btu/hr _____ Cooling: Btu/hr _____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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Section # & Req.ID	Foundation Inspection	Complies?	Comments/Assumptions
303.2.1 [FO11] ² 	A protective covering is installed to protect exposed exterior insulation and extends a minimum of 6 in. below grade.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.9 [FO12] ² 	Snow- and ice-melting system controls installed.	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:



1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
402.1.1, 402.3.4 [FR1] ¹	Door U-factor.	U- ____	U- ____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Envelope Assemblies table for values.
402.1.1, 402.3.1, 402.3.3, 402.3.6, 402.5 [FR2] ¹	Glazing U-factor (area-weighted average).	U- ____	U- ____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Envelope Assemblies table for values.
303.1.3 [FR4] ¹	U-factors of fenestration products are determined in accordance with the NFRC test procedure or taken from the default table.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.4.1.1 [FR23] ¹	Air barrier and thermal barrier installed per manufacturer's instructions.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.4.3 [FR20] ¹	Fenestration that is not site built is listed and labeled as meeting AAMA /WDMA/CSA 101/I.S.2/A440 or has infiltration rates per NFRC 400 that do not exceed code limits.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.4.5 [FR16] ²	IC-rated recessed lighting fixtures sealed at housing/interior finish and labeled to indicate ≤2.0 cfm leakage at 75 Pa.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.2.1 [FR12] ¹	Supply and return ducts in attics insulated ≥ R-8 where duct is ≥ 3 inches in diameter and ≥ R-6 where < 3 inches. Supply and return ducts in other portions of the building insulated ≥ R-6 for diameter ≥ 3 inches and R-4.2 for < 3 inches in diameter.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.3.3.5 [FR15] ³	Building cavities are not used as ducts or plenums.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.4 [FR17] ²	HVAC piping conveying fluids above 105 °F or chilled fluids below 55 °F are insulated to ≥ R-3.	R- ____	R- ____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.4.1 [FR24] ¹	Protection of insulation on HVAC piping.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.3 [FR18] ²	Hot water pipes are insulated to ≥ R-3.	R- ____	R- ____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.6 [FR19] ²	Automatic or gravity dampers are installed on all outdoor air intakes and exhausts.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	



1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Additional Comments/Assumptions:



1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1 [IN13] ²	All installed insulation is labeled or the installed R-values provided.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.1.1, 402.2.6 [IN1] ¹	Floor insulation R-value.	R-_____ ☐ Wood ☐ Steel	R-_____ ☐ Wood ☐ Steel	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Envelope Assemblies table for values.
303.2, 402.2.7 [IN2] ¹	Floor insulation installed per manufacturer's instructions and in substantial contact with the underside of the subfloor, or floor framing cavity insulation is in contact with the top side of sheathing, or continuous insulation is installed on the underside of floor framing and extends from the bottom to the top of all perimeter floor framing members.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.1.1, 402.2.5, 402.2.6 [IN3] ¹	Wall insulation R-value. If this is a mass wall with at least ½ of the wall insulation on the wall exterior, the exterior insulation requirement applies (FR10).	R-_____ ☐ Wood ☐ Mass ☐ Steel	R-_____ ☐ Wood ☐ Mass ☐ Steel	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Envelope Assemblies table for values.
303.2 [IN4] ¹	Wall insulation is installed per manufacturer's instructions.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:



1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
402.1.1, 402.2.1, 402.2.2, 402.2.6 [FI1] ¹	Ceiling insulation R-value.	R-____ ☐ Wood ☐ Steel	R-____ ☐ Wood ☐ Steel	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	See the Envelope Assemblies table for values.
303.1.1.1, 303.2 [FI2] ¹	Ceiling insulation installed per manufacturer's instructions. Blown insulation marked every 300 ft ² .			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.2.3 [FI22] ²	Vented attics with air permeable insulation include baffle adjacent to soffit and eave vents that extends over insulation.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.2.4 [FI3] ¹	Attic access hatch and door insulation ≥ R-value of the adjacent assembly.	R-____	R-____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
402.4.1.2 [FI17] ¹	Blower door test @ 50 Pa. ≤ 5 ach in Climate Zones 1-2, and ≤ 3 ach in Climate Zones 3-8.	ACH 50 = ____	ACH 50 = ____	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.2.3 [FI4] ¹	Duct tightness test result of ≤ 4 cfm/100 ft ² across the system or ≤ 3 cfm/100 ft ² without air handler @ 25 Pa. For rough-in tests, verification may need to occur during Framing Inspection.	____ cfm/100 ft ²	____ cfm/100 ft ²	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.3.2 [FI27] ¹	Ducts are pressure tested to determine air leakage with either: Rough-in test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the system including the manufacturer's air handler enclosure if installed at time of test. Postconstruction test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the entire system including the manufacturer's air handler enclosure.	____ cfm/100 ft ²	____ cfm/100 ft ²	☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.3.2.1 [FI24] ¹	Air handler leakage designated by manufacturer at ≤ 2% of design air flow.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.1.1 [FI9] ²	Programmable thermostats installed for control of primary heating and cooling systems and initially set by manufacturer to code specifications.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.1.2 [FI10] ²	Heat pump thermostat installed on heat pumps.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.1 [FI11] ²	Circulating service hot water systems have automatic or accessible manual controls.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	



1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.6.1 [FI25] ²	All mechanical ventilation system fans not part of tested and listed HVAC equipment meet efficacy and air flow limits.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.2 [FI26] ²	Hot water boilers supplying heat through one- or two-pipe heating systems have outdoor setback control to lower boiler water temperature based on outdoor temperature.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.1.1 [FI28] ²	Heated water circulation systems have a circulation pump. The system return pipe is a dedicated return pipe or a cold water supply pipe. Gravity and thermos-syphon circulation systems are not present. Controls for circulating hot water system pumps start the pump with signal for hot water demand within the occupancy. Controls automatically turn off the pump when water is in circulation loop is at set-point temperature and no demand for hot water exists.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.1.2 [FI29] ²	Electric heat trace systems comply with IEEE 515.1 or UL 515. Controls automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.2 [FI30] ²	Water distribution systems that have recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe have a demand recirculation water system. Pumps have controls that manage operation of the pump and limit the temperature of the water entering the cold water piping to 104°F.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
403.5.4 [FI31] ²	Drain water heat recovery units tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units < 3 psi for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units < 2 psi for individual units connected to three or more showers.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
404.1 [FI6] ¹	75% of lamps in permanent fixtures or 75% of permanent fixtures have high efficacy lamps. Does not apply to low-voltage lighting.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
404.1.1 [FI23] ³	Fuel gas lighting systems have no continuous pilot light.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	



1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
401.3 [FI7] ²	Compliance certificate posted.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	
303.3 [FI18] ³	Manufacturer manuals for mechanical and water heating systems have been provided.			☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:



1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)
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2015 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Above-Grade Wall	21.00
Below-Grade Wall	0.00
Floor	30.00
Ceiling / Roof	38.00
Ductwork (unconditioned spaces):	_____

Glass & Door Rating	U-Factor	SHGC
Window	0.30	0.28
Door	0.16	

Heating & Cooling Equipment	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____

Name: _____ Date: _____

Comments



Search Result

Elevation Limitation: ASCE 7* Ground Snow Load

Query Date: September 28, 2017

Address: 19 Balfour Street, Staten Island, NY 10305

Latitude: 40.5922257

Longitude: -74.0695068

Elevation: 8.3 Feet

Any elevation: Ground Snow Load is 20 psf

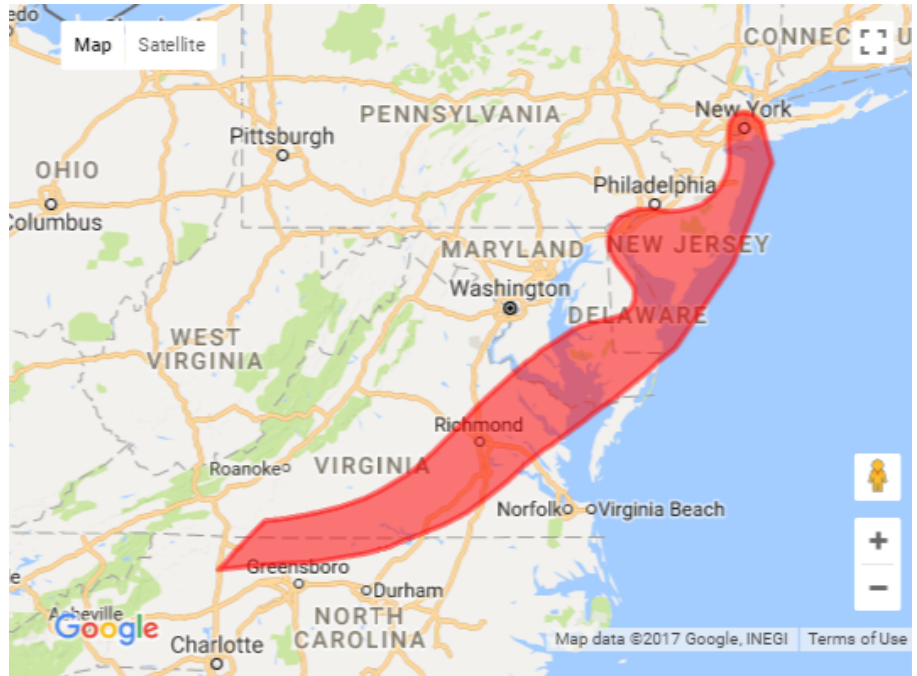
All loading data is in pounds per square foot.

For a site-specific case study area, a case study is required to establish ground snow loads.

*Based on Figure 7-1 Ground Snow Loads printed in ASCE 7-95 through ASCE 7-10.

Users should consult with local building officials to determine if there are community-specific snow load requirements that govern.

Red shaded area is the load specific boundaries. Any darker red area is the overlapping load specific boundary.



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[ASCE 7 Windspeed](#) [ASCE 7 Ground Snow Load](#) [Related Resources](#) [Sponsors](#) [About ATC](#) [Contact](#)

Search Results

Query Date: Thu Sep 28 2017

Latitude: 40.5922

Longitude: -74.0695

ASCE 7-10 Windspeeds
(3-sec peak gust in mph*):

Risk Category I: 105

Risk Category II: 115

Risk Category III-IV: 122

MRI 10-Year:** 76

MRI 25-Year:** 85

MRI 50-Year:** 90

MRI 100-Year:** 96

ASCE 7-05 Windspeed:

105 (3-sec peak gust in mph)

ASCE 7-93 Windspeed:

81 (fastest mile in mph)



*Miles per hour

**Mean Recurrence Interval

Users should consult with local building officials to determine if there are community-specific wind speed requirements that govern.



[Print your results](#)



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Project: 19 Balfour Street

Location: Main Roof Rafter

Roof Rafter

[2015 International Residential Code(2015 NDS)]

1.5 IN x 5.5 IN x 15.292 FT (6.3 + 8 + 1) @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 108.1%

Controlling Factor: Moment



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

page

of

StruCalc Version 10.0.1.4

12/12/2017 1:29:27 PM

DEFLECTIONS	Left	Center	Right
Live Load	0.03 IN L/2677	0.08 IN L/1472	0.01 IN 2L/3136
Dead Load	0.01 in	0.05 in	0.00 in
Total Load	0.04 IN L/2120	0.12 IN L/905	0.00 IN 2L/Infinity
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180			

REACTIONS	A	B	C
Live Load	75 lb	241 lb	121 lb
Dead Load	49 lb	207 lb	98 lb
Total Load	124 lb	448 lb	219 lb
Bearing Length	0.19 in	0.70 in	0.34 in

SUPPORT LOADS	A	B	C
Live Load	56 plf	181 plf	91 plf
Dead Load	37 plf	155 plf	74 plf
Total Load	93 plf	336 plf	164 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Bending Stress:	Fb = 875 psi Cd=1.15 Cl=0.72 CF=1.30 Cr=1.15	Fb' = 1084 psi
Shear Stress:	Fv = 135 psi Cd=1.15	Fv' = 155 psi
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Comp. ⊥ to Grain:	Fc ⊥ = 425 psi	Fc ⊥ = 425 psi

Controlling Moment: -328 ft-lb

6.288 Ft from left support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear: 206 lb

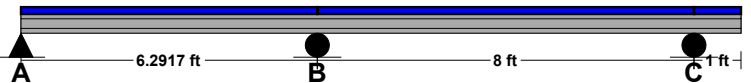
At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	3.63 in ³	7.56 in ³
Area (Shear):	1.99 in ²	8.25 in ²
Moment of Inertia (deflection):	4.13 in ⁴	20.8 in ⁴
Moment:	-328 ft-lb	683 ft-lb
Shear:	206 lb	854 lb

NOTES

LOADING DIAGRAM



RAFTER DATA

	Left	Interior	Eave
Span Length	6.29 ft	8 ft	1 ft
Rafter Pitch	7	:12	
Roof sheathing applied to top of joists-top of rafters fully braced.			
Roof Duration Factor	1.15		
Peak Notch Depth	0.00		
Base Notch Depth	0.00		

RAFTER LOADING

Uniform Roof Loading

Roof Live Load:	LL =	20 psf
Roof Dead Load:	DL =	15 psf

Slope Adjusted Spans And Loads

Left Span:	L-adj =	7.28 ft
Interior Span:	L-adj =	9.26 ft
Eave Span:	L-Eave-adj =	1.16 ft
Left Live Load:	wL-adj =	20 plf
Interior Live Load:	wL-adj =	20 plf
Eave Live Load:	wL-Eave-adj =	20 plf
Left Dead Load:	wD-adj =	17 plf
Interior Dead Load:	wD-adj =	17 plf
Eave Dead Load:	wD-Eave-adj =	17 plf
Left Total Load:	wT-adj =	37 plf
Interior Total Load:	wT-adj =	37 plf
Eave Total Load:	wT-Eave-adj =	37 plf



Project: 19 Balfour Street

Location: Side Roof Rafter

Roof Rafter

[2015 International Residential Code(2015 NDS)]

1.5 IN x 5.5 IN x 14.167 FT (5.2 + 8 + 1) @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 124.9%

Controlling Factor: Moment



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

	Left	Center	Right
Live Load	-0.02 IN L/4064	0.07 IN L/1536	0.01 IN 2L/4364
Dead Load	0.00 in	0.05 in	0.00 in
Total Load	-0.02 IN L/3504	0.12 IN L/902	0.00 IN 2L/Infinity
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180			

REACTIONS

	A	B	C
Live Load	63 lb	228 lb	119 lb
Dead Load	33 lb	195 lb	100 lb
Total Load	96 lb	423 lb	219 lb
Uplift (1.5 F.S)	-3 lb	0 lb	0 lb
Bearing Length	0.15 in	0.66 in	0.34 in

SUPPORT LOADS

	A	B	C
Live Load	47 plf	171 plf	89 plf
Dead Load	25 plf	146 plf	75 plf
Total Load	72 plf	317 plf	164 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Bending Stress:	Fb = 875 psi Cd=1.15 Cl=0.72 CF=1.30 Cr=1.15	Fb' = 1084 psi
Shear Stress:	Fv = 135 psi Cd=1.15	Fv' = 155 psi
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 425 psi	Fc $\perp$ = 425 psi

Controlling Moment:

-304 ft-lb

5.165 Ft from left support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear:

204 lb

At left support of span 2 (Center Span)

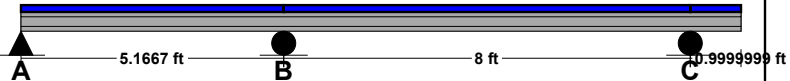
Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	3.36 in ³	7.56 in ³
Area (Shear):	1.97 in ²	8.25 in ²
Moment of Inertia (deflection):	4.15 in ⁴	20.8 in ⁴
Moment:	-304 ft-lb	683 ft-lb
Shear:	204 lb	854 lb

NOTES

LOADING DIAGRAM



RAFTER DATA

	Left	Interior	Eave
Span Length	5.17 ft	8 ft	1 ft
Rafter Pitch	7	:12	
Roof sheathing applied to top of joists-top of rafters fully braced.			
Roof Duration Factor	1.15		
Peak Notch Depth	0.00		
Base Notch Depth	0.00		

RAFTER LOADING

Uniform Roof Loading

Roof Live Load:	LL =	20 psf
Roof Dead Load:	DL =	15 psf

Slope Adjusted Spans And Loads

Left Span:	L-adj =	5.98 ft
Interior Span:	L-adj =	9.26 ft
Eave Span:	L-Eave-adj =	1.16 ft
Left Live Load:	wL-adj =	20 plf
Interior Live Load:	wL-adj =	20 plf
Eave Live Load:	wL-Eave-adj =	20 plf
Left Dead Load:	wD-adj =	17 plf
Interior Dead Load:	wD-adj =	17 plf
Eave Dead Load:	wD-Eave-adj =	17 plf
Left Total Load:	wT-adj =	37 plf
Interior Total Load:	wT-adj =	37 plf
Eave Total Load:	wT-Eave-adj =	37 plf



Project: 19 Balfour Street

Location: Roof Rafter Flipback

Roof Rafter

[2015 International Residential Code(2015 NDS)]

1.5 IN x 3.5 IN x 4.583 FT @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 249.0%

Controlling Factor: Moment



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.04 IN L/1439

Dead Load 0.03 in

Total Load 0.08 IN L/794

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

A

B

Live Load 61 lb 61 lb

Dead Load 50 lb 50 lb

Total Load 111 lb 111 lb

Bearing Length 0.17 in 0.17 in

SUPPORT LOADS

A

B

Live Load 46 plf 46 plf

Dead Load 38 plf 38 plf

Total Load 83 plf 83 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: $F_b = 875$ psi $F_b' = 1736$ psi

$C_d=1.15$ $C_F=1.50$ $C_r=1.15$

Shear Stress: $F_v = 135$ psi $F_v' = 155$ psi

$C_d=1.15$

Modulus of Elasticity: $E = 1400$ ksi $E' = 1400$ ksi

Comp. $\perp$ to Grain: $F_c - \perp = 425$ psi $F_c - \perp' = 425$ psi

Controlling Moment: 127 ft-lb

2.289 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -102 lb

4.615 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 0.88 in³ 3.06 in³

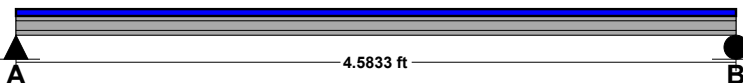
Area (Shear): 0.99 in² 5.25 in²

Moment of Inertia (deflection): 1.22 in⁴ 5.36 in⁴

Moment: 127 ft-lb 443 ft-lb

Shear: -102 lb 543 lb

LOADING DIAGRAM



RAFTER DATA

Interior

Span Length 4.58 ft

Rafter Pitch 5 :12

Roof sheathing applied to top of joists-top of rafters fully braced.

Roof Duration Factor 1.15

Peak Notch Depth 0.00

Base Notch Depth 0.00

RAFTER LOADING

Uniform Roof Loading

Roof Live Load: LL = 20 psf

Roof Dead Load: DL = 15 psf

Slope Adjusted Spans And Loads

Interior Span: L-adj = 4.97 ft

Eave Span: L-Eave-adj = 0 ft

Interior Live Load: wL-adj = 23 plf

Eave Live Load: wL-Eave-adj = NaN plf

Interior Dead Load: wD-adj = 18 plf

Eave Dead Load: wD-Eave-adj = NaN plf

Interior Total Load: wT-adj = 41 plf

Eave Total Load: wT-Eave-adj = NaN plf

NOTES



APPROVED

DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: Roof Rafter Knee Wall

Column

[2015 International Residential Code(2015 NDS)]

1.5 IN x 3.5 IN x 4.583 FT @ 16 O.C.

Stud - Spruce-Pine-Fir - Dry Use

Section Adequate By: 86.8%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 241 lb
Dead Load: Vert-DL-Rxn = 211 lb
Total Load: Vert-TL-Rxn = 452 lb

COLUMN DATA

Total Column Length: 4.58 ft
Unbraced Length (X-Axis) Lx: 4.58 ft
Unbraced Length (Y-Axis) Ly: 0 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

STUD PROPERTIES

Stud - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 725 psi	Fc' = 655 psi
	Cd=1.00 Cf=1.05 Cp=0.86	
Bending Stress (X-X Axis):	Fbx = 675 psi	Fbx' = 854 psi
	Cd=1.00 CF=1.10 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 675 psi	Fby' = 854 psi
	Cd=1.00 CF=1.10 Cr=1.15	
Modulus of Elasticity:	E = 1200 ksi	E' = 1200 ksi

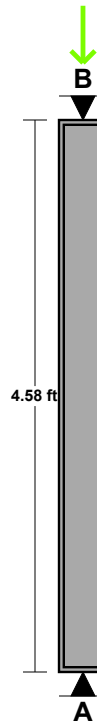
Stud Section (X-X Axis):	dx =	3.5 in
Stud Section (Y-Y Axis):	dy =	1.5 in
Area:	A =	5.25 in ²
Section Modulus (X-X Axis):	Sx =	3.06 in ³
Section Modulus (Y-Y Axis):	Sy =	1.31 in ³
Slenderness Ratio:	Lex/dx =	15.71
	Ley/dy =	0

Stud Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	86 psi
Allowable Compressive Stress:	Fc' =	655 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	854 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	854 psi
Combined Stress Factor:	CSF =	0.13

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	181 plf
Dead Load:	PD =	155 plf
Column Self Weight:	CSW =	4 plf
Total Axial Load:	PT =	340 plf

NOTES



Project: 19 Balfour Street

Location: Attic Floor Joist at Main Roof Rafter

Floor Joist

[2015 International Residential Code(2015 NDS)]

1.5 IN x 11.25 IN x 14.25 FT @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 3.4%

Controlling Factor: Moment



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.17 IN L/1015

Dead Load 0.16 in

Total Load 0.33 IN L/519

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

A

B

Live Load 296 lb 219 lb

Dead Load 262 lb 235 lb

Total Load 558 lb 454 lb

Bearing Length 0.87 in 0.71 in

SUPPORT LOADS

A

B

Live Load 222 plf 164 plf

Dead Load 197 plf 176 plf

Total Load 419 plf 341 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: $F_b = 875$ psi $F_b' = 1006$ psi

$C_d=1.00$ $C_F=1.00$ $C_r=1.15$

Shear Stress: $F_v = 135$ psi $F_v' = 135$ psi

$C_d=1.00$

Modulus of Elasticity: $E = 1400$ ksi $E' = 1400$ ksi

Comp. $\perp$ to Grain: $F_c - \perp = 425$ psi $F_c - \perp' = 425$ psi

Controlling Moment: 2566 ft-lb

6.27 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 557 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 30.6 in³ 31.64 in³

Area (Shear): 6.19 in² 16.88 in²

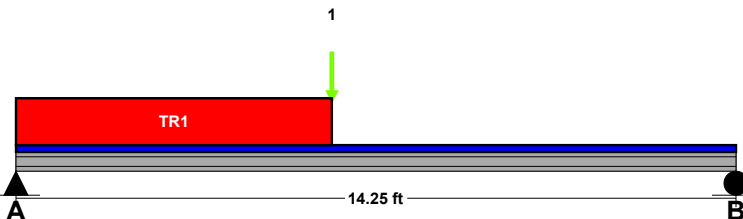
Moment of Inertia (deflection): 123.56 in⁴ 177.98 in⁴

Moment: 2566 ft-lb 2653 ft-lb

Shear: 557 lb 1519 lb

NOTES

LOADING DIAGRAM



JOIST DATA

Center

Span Length 14.25 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Floor Duration Factor 1.00

JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 10 psf

Dead Load DL = 15 psf

Total Load TL = 25 psf

TL Adj. For Joist Spacing wT = 33.3 plf

Wall Loading

Wall One

Live Load ($\perp$ to Joists): L1 = 181 plf

Dead Load ($\perp$ to Joists): D1 = 159 plf

Load Location X1 = 6.25 ft

Partially Distributed Loading

Live Load LL = 10 psf

Dead Load DL = 0 psf

Load Start A = 0 ft

Load End B = 6.25 ft

Load Length C = 6.25 ft

PFS **APPROVED**
DATE 1/31/18
PFS CORPORATION
Bloomsburg, PA



Project: 19 Balfour Street

Location: Attic Floor Joist at Side Roof Rafter

Floor Joist

[2015 International Residential Code(2015 NDS)]

1.5 IN x 11.25 IN x 8.667 FT @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 177.1%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.01 IN L/8780

Dead Load 0.01 in

Total Load 0.03 IN L/3945

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

A

B

Live Load 277 lb 76 lb

Dead Load 271 lb 102 lb

Total Load 548 lb 178 lb

Bearing Length 0.86 in 0.28 in

SUPPORT LOADS

A

B

Live Load 208 plf 57 plf

Dead Load 203 plf 77 plf

Total Load 411 plf 134 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: $F_b = 875$ psi $F_b' = 1006$ psi

$C_d = 1.00$ $C_F = 1.00$ $C_r = 1.15$

Shear Stress: $F_v = 135$ psi $F_v' = 135$ psi

$C_d = 1.00$

Modulus of Elasticity: $E = 1400$ ksi $E' = 1400$ ksi

Comp. $\perp$ to Grain: $F_c \perp = 425$ psi $F_c \perp' = 425$ psi

Controlling Moment: 474 ft-lb

3.29 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 548 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 5.65 in³ 31.64 in³

Area (Shear): 6.09 in² 16.88 in²

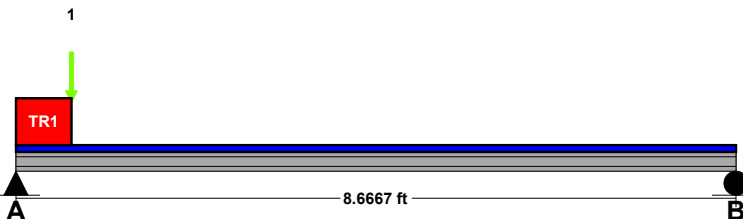
Moment of Inertia (deflection): 16.24 in⁴ 177.98 in⁴

Moment: 474 ft-lb 2653 ft-lb

Shear: 548 lb 1519 lb

NOTES

LOADING DIAGRAM



JOIST DATA

Center

Span Length 8.67 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Floor Duration Factor 1.00

JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 10 psf

Dead Load DL = 15 psf

Total Load TL = 25 psf

TL Adj. For Joist Spacing wT = 33.3 plf

Wall Loading

Wall One

Live Load ($\perp$ to Joists): L1 = 171 plf

Dead Load ($\perp$ to Joists): D1 = 150 plf

Load Location X1 = 0.67 ft

Partially Distributed Loading

Live Load LL = 10 psf

Dead Load DL = 0 psf

Load Start A = 0 ft

Load End B = 0.67 ft

Load Length C = 0.67 ft



DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: BM1 - Second Flr BR1 Ceiling Beam
Multi-Loaded Multi-Span Beam
[2015 International Residential Code(2015 NDS)]
(2) 1.5 IN x 11.25 IN x 12.417 FT
2.0 Rigidlam LVL - Roseburg Forest Products
Section Adequate By: 93.4%
Controlling Factor: Deflection



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.17 IN L/894
Dead Load 0.15 in
Total Load 0.32 IN L/464
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

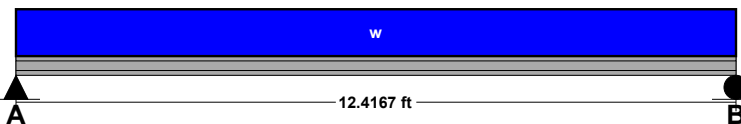
Live Load 1378 lb 1378 lb
Dead Load 1275 lb 1275 lb
Total Load 2653 lb 2653 lb
Bearing Length 1.18 in 1.18 in

BEAM DATA

Center

Span Length 12.42 ft
Unbraced Length-Top 0 ft
Unbraced Length-Bottom 12.42 ft
Live Load Duration Factor 1.00
Notch Depth 0.00

LOADING DIAGRAM



MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: $F_b = 3100$ psi $F_b' = 3125$ psi
 $C_d = 1.00$ $C_F = 1.01$
Shear Stress: $F_v = 290$ psi $F_v' = 290$ psi
 $C_d = 1.00$
Modulus of Elasticity: $E = 2000$ ksi $E' = 2000$ ksi
Comp. $\perp$ to Grain: $F_c - \perp = 750$ psi $F_c - \perp' = 750$ psi

UNIFORM LOADS

Center

Uniform Live Load 222 plf
Uniform Dead Load 197 plf
Beam Self Weight 8 plf
Total Uniform Load 427 plf

Controlling Moment:

8237 ft-lb

6.21 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear:

-2654 lb

12.0 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 31.63 in³ 63.28 in³
Area (Shear): 13.73 in² 33.75 in²
Moment of Inertia (deflection): 184.08 in⁴ 355.96 in⁴
Moment: 8237 ft-lb 16480 ft-lb
Shear: -2654 lb 6525 lb

NOTES



Project: 19 Balfour Street

Location: COL1A - Second Flr BR1

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 28.3%



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1378 lb
Dead Load: Vert-DL-Rxn = 1299 lb
Total Load: Vert-TL-Rxn = 2677 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

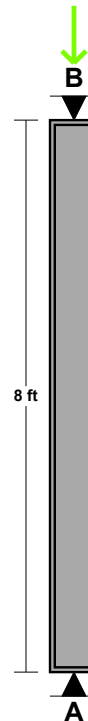
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 226 psi
	Cd=1.00 Cf=1.10 Cp=0.18	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1138 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1138 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3 in
Area:	A =	16.5 in ²
Section Modulus (X-X Axis):	Sx =	15.13 in ³
Section Modulus (Y-Y Axis):	Sy =	4.13 in ³
Slenderness Ratio:	Lex/dx =	17.45
	Ley/dy =	32

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 162 psi
Allowable Compressive Stress:	Fc' = 226 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1138 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1138 psi
Combined Stress Factor:	CSF = 0.72

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 1378 lb
Dead Load:	PD = 1275 lb
Column Self Weight:	CSW = 24 lb
Total Axial Load:	PT = 2677 lb

NOTES



Project: 19 Balfour Street

Location: COL1B - Second Flr BR1

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 61.5%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1378 lb
Dead Load:	Vert-DL-Rxn =	1298 lb
Total Load:	Vert-TL-Rxn =	2676 lb

COLUMN DATA

Total Column Length:	8 ft
Unbraced Length (X-Axis) Lx:	8 ft
Unbraced Length (Y-Axis) Ly:	8 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

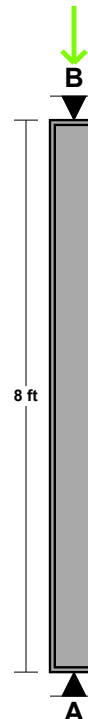
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 442 psi
	Cd=1.00 Cf=1.15 Cp=0.33	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 4.5 in	
Area:	A = 15.75 in ²	
Section Modulus (X-X Axis):	Sx = 9.19 in ³	
Section Modulus (Y-Y Axis):	Sy = 3.94 in ³	
Slenderness Ratio:	Lex/dx = 27.43	
	Ley/dy = 21.33	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 170 psi
Allowable Compressive Stress:	Fc' = 442 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1509 psi
Combined Stress Factor:	CSF = 0.38

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 1378 lb
Dead Load:	PD = 1275 lb
Column Self Weight:	CSW = 23 lb
Total Axial Load:	PT = 2676 lb

NOTES

PFS **APPROVED**
DATE 1/31/18
PFS CORPORATION
Bloomsburg, PA



Project: 19 Balfour Street

Location: BM2 - Second Flr K-LR Ceiling Beam

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 11.25 IN x 22.167 FT (8.1 + 14.1)

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 82.3%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

	Left	Center
Live Load	-0.04 IN L/2725	0.17 IN L/982
Dead Load	-0.01 in	0.14 in
Total Load	-0.05 IN L/2008	0.31 IN L/539
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240		

REACTIONS

	A	B	C
Live Load	815 lb	3270 lb	1315 lb
Dead Load	354 lb	3026 lb	1173 lb
Total Load	1169 lb	6296 lb	2488 lb
Uplift (1.5 F.S)	-196 lb	0 lb	0 lb
Bearing Length	0.52 in	2.80 in	1.11 in

BEAM DATA

	Left	Center
Span Length	8.08 ft	14.08 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	0 ft	0 ft
Live Load Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

	Base Values	Adjusted
Bending Stress:	Fb = 3100 psi	Fb' = 3125 psi
	Cd=1.00 CF=1.01	
Shear Stress:	Fv = 290 psi	Fv' = 290 psi
	Cd=1.00	
Modulus of Elasticity:	E = 2000 ksi	E' = 2000 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ = 750 psi	Fc - $\perp$ = 750 psi

Controlling Moment:

-8006 ft-lb

8.08 Ft from left support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear:

3578 lb

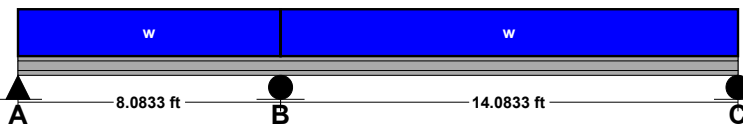
At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	30.74 in3	63.28 in3
Area (Shear):	18.51 in2	33.75 in2
Moment of Inertia (deflection):	158.49 in4	355.96 in4
Moment:	-8006 ft-lb	16480 ft-lb
Shear:	3578 lb	6525 lb

LOADING DIAGRAM



UNIFORM LOADS

	Left	Center
Uniform Live Load	222 plf	222 plf
Uniform Dead Load	197 plf	197 plf
Beam Self Weight	8 plf	8 plf
Total Uniform Load	427 plf	427 plf

NOTES



Project: 19 Balfour Street

Location: COL2A - Second Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 50.4%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	815 lb
Dead Load:	Vert-DL-Rxn =	369 lb
Total Load:	Vert-TL-Rxn =	1184 lb

COLUMN DATA

Total Column Length:	8 ft
Unbraced Length (X-Axis) Lx:	8 ft
Unbraced Length (Y-Axis) Ly:	8 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

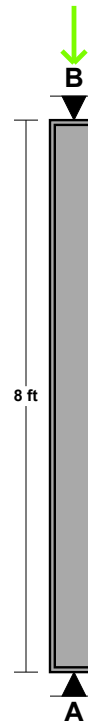
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 227 psi
	Cd=1.00 Cf=1.15 Cp=0.17	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1313 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1313 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 10.5 in ²	
Section Modulus (X-X Axis):	Sx = 6.13 in ³	
Section Modulus (Y-Y Axis):	Sy = 2.63 in ³	
Slenderness Ratio:	Lex/dx = 27.43	
	Ley/dy = 32	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 113 psi
Allowable Compressive Stress:	Fc' = 227 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1313 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1313 psi
Combined Stress Factor:	CSF = 0.5

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 815 lb
Dead Load:	PD = 354 lb
Column Self Weight:	CSW = 15 lb
Total Axial Load:	PT = 1184 lb

NOTES



Project: 19 Balfour Street

Location: COL2B - Second Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 9.2%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 3270 lb
Dead Load: Vert-DL-Rxn = 3049 lb
Total Load: Vert-TL-Rxn = 6319 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

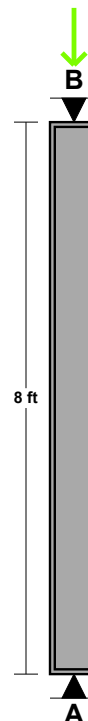
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 442 psi
	Cd=1.00 Cf=1.15 Cp=0.33	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	9.19 in ³
Section Modulus (Y-Y Axis):	Sy =	3.94 in ³
Slenderness Ratio:	Lex/dx =	27.43
	Ley/dy =	21.33

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)		
Actual Compressive Stress:	Fc =	401 psi
Allowable Compressive Stress:	Fc' =	442 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1509 psi
Combined Stress Factor:	CSF =	0.91

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	3270 lb
Dead Load:	PD =	3026 lb
Column Self Weight:	CSW =	23 lb
Total Axial Load:	PT =	6319 lb

NOTES



Project: 19 Balfour Street

Location: COL2C - Second Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 32.8%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1315 lb
Dead Load: Vert-DL-Rxn = 1197 lb
Total Load: Vert-TL-Rxn = 2512 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 226 psi
	Cd=1.00 Cf=1.10 Cp=0.18	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1138 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1138 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

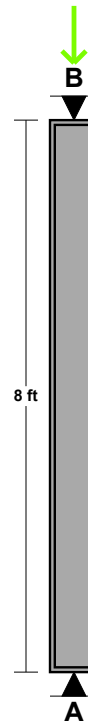
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3 in
Area:	A =	16.5 in ²
Section Modulus (X-X Axis):	Sx =	15.13 in ³
Section Modulus (Y-Y Axis):	Sy =	4.13 in ³
Slenderness Ratio:	Lex/dx =	17.45
	Ley/dy =	32

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	152 psi
Allowable Compressive Stress:	Fc' =	226 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1138 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1138 psi
Combined Stress Factor:	CSF =	0.67

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	1315 lb
Dead Load:	PD =	1173 lb
Column Self Weight:	CSW =	24 lb
Total Axial Load:	PT =	2512 lb

NOTES



Project: 19 Balfour Street

Location: BM3 - Second Flr BR2 & BR3 Ceiling Beam

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

1.5 IN x 11.25 IN x 9.917 FT

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 29.2%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.16 IN L/764

Dead Load 0.16 in

Total Load 0.31 IN L/382

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 1264 lb 1264 lb

Dead Load 1261 lb 1261 lb

Total Load 2525 lb 2525 lb

Bearing Length 2.24 in 2.24 in

BEAM DATA

Center

Span Length 9.92 ft

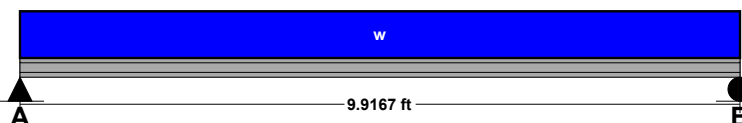
Unbraced Length-Top 0 ft

Unbraced Length-Bottom 9.92 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 255 plf

Uniform Dead Load 250 plf

Beam Self Weight 4 plf

Total Uniform Load 509 plf

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: $F_b = 3100$ psi $F_b' = 3125$ psi

$C_d = 1.00$ $CF = 1.01$

Shear Stress: $F_v = 290$ psi $F_v' = 290$ psi

$C_d = 1.00$

Modulus of Elasticity: $E = 2000$ ksi $E' = 2000$ ksi

Comp. $\perp$ to Grain: $F_c - \perp = 750$ psi $F_c - \perp' = 750$ psi

Controlling Moment: 6260 ft-lb

4.96 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -2525 lb

10.0 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 24.04 in³ 31.64 in³

Area (Shear): 13.06 in² 16.88 in²

Moment of Inertia (deflection): 111.72 in⁴ 177.98 in⁴

Moment: 6260 ft-lb 8240 ft-lb

Shear: -2525 lb 3263 lb

NOTES



Project: 19 Balfour Street

Location: COL3A - Second Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 63.4%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1264 lb
Dead Load: Vert-DL-Rxn = 1284 lb
Total Load: Vert-TL-Rxn = 2548 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

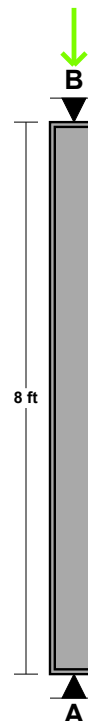
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 442 psi
	Cd=1.00 Cf=1.15 Cp=0.33	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	9.19 in ³
Section Modulus (Y-Y Axis):	Sy =	3.94 in ³
Slenderness Ratio:	Lex/dx =	27.43
	Ley/dy =	21.33

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 162 psi
Allowable Compressive Stress:	Fc' = 442 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1509 psi
Combined Stress Factor:	CSF = 0.37

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 1264 lb
Dead Load:	PD = 1261 lb
Column Self Weight:	CSW = 23 lb
Total Axial Load:	PT = 2548 lb

NOTES



APPROVED

DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: COL3B - Second Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 31.8%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1264 lb
Dead Load: Vert-DL-Rxn = 1285 lb
Total Load: Vert-TL-Rxn = 2549 lb

COLUMN DATA

Total Column Length: 8 ft
Unbraced Length (X-Axis) Lx: 8 ft
Unbraced Length (Y-Axis) Ly: 8 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 226 psi
	Cd=1.00 Cf=1.10 Cp=0.18	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1138 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1138 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

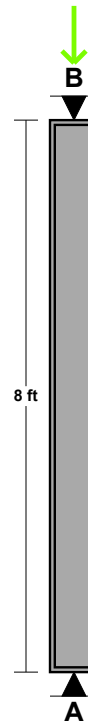
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3 in
Area:	A =	16.5 in ²
Section Modulus (X-X Axis):	Sx =	15.13 in ³
Section Modulus (Y-Y Axis):	Sy =	4.13 in ³
Slenderness Ratio:	Lex/dx =	17.45
	Ley/dy =	32

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	154 psi
Allowable Compressive Stress:	Fc' =	226 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1138 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1138 psi
Combined Stress Factor:	CSF =	0.68

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	1264 lb
Dead Load:	PD =	1261 lb
Column Self Weight:	CSW =	24 lb
Total Axial Load:	PT =	2549 lb

NOTES



Project: 19 Balfour Street

Location: BM4 - Second Flr BR2 & BR3 Ceiling Beam

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

1.5 IN x 11.25 IN x 9.0 FT

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 74.6%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.09 IN L/1252

Dead Load 0.09 in

Total Load 0.17 IN L/627

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 936 lb 936 lb

Dead Load 932 lb 932 lb

Total Load 1868 lb 1868 lb

Bearing Length 1.66 in 1.66 in

BEAM DATA

Center

Span Length 9 ft

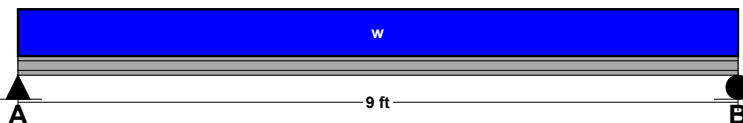
Unbraced Length-Top 0 ft

Unbraced Length-Bottom 9 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

LOADING DIAGRAM



MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: $F_b = 3100$ psi $F_b' = 3125$ psi

$C_d = 1.00$ $CF = 1.01$

Shear Stress: $F_v = 290$ psi $F_v' = 290$ psi

$C_d = 1.00$

Modulus of Elasticity: $E = 2000$ ksi $E' = 2000$ ksi

Comp. $\perp$ to Grain: $F_c - \perp = 750$ psi $F_c - \perp' = 750$ psi

UNIFORM LOADS

Center

Uniform Live Load 208 plf

Uniform Dead Load 203 plf

Beam Self Weight 4 plf

Total Uniform Load 415 plf

Controlling Moment: 4204 ft-lb

4.5 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1868 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 16.14 in³ 31.64 in³

Area (Shear): 9.66 in² 16.88 in²

Moment of Inertia (deflection): 68.1 in⁴ 177.98 in⁴

Moment: 4204 ft-lb 8240 ft-lb

Shear: 1868 lb 3263 lb

NOTES



APPROVED

DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: BM5 - Second Flr BR2 & BR3 Ceiling Beam

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

1.5 IN x 11.25 IN x 10.667 FT

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 98.2%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.08 IN L/1658

Dead Load 0.07 in

Total Load 0.15 IN L/845

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 833 lb 263 lb

Dead Load 812 lb 245 lb

Total Load 1645 lb 508 lb

Bearing Length 1.46 in 0.45 in

BEAM DATA

Center

Span Length 10.67 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 10.67 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: $F_b = 3100$ psi $F_b' = 3125$ psi

$C_d=1.00$ $CF=1.01$

Shear Stress: $F_v = 290$ psi $F_v' = 290$ psi

$C_d=1.00$

Modulus of Elasticity: $E = 2000$ ksi $E' = 2000$ ksi

Comp. $\perp$ to Grain: $F_c - \perp = 750$ psi $F_c - \perp' = 750$ psi

Controlling Moment: 3356 ft-lb

2.13 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1646 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 12.89 in³ 31.64 in³

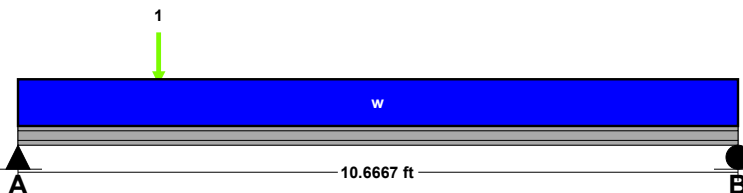
Area (Shear): 8.51 in² 16.88 in²

Moment of Inertia (deflection): 50.56 in⁴ 177.98 in⁴

Moment: 3356 ft-lb 8240 ft-lb

Shear: 1646 lb 3263 lb

LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 15 plf

Uniform Dead Load 8 plf

Beam Self Weight 4 plf

Total Uniform Load 27 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 936 lb

Dead Load 932 lb

Location 2.08 ft

NOTES



Project: 19 Balfour Street

Location: COL5A - Second Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 30.5%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	833 lb
Dead Load:	Vert-DL-Rxn =	827 lb
Total Load:	Vert-TL-Rxn =	1660 lb

COLUMN DATA

Total Column Length:	8 ft
Unbraced Length (X-Axis) Lx:	8 ft
Unbraced Length (Y-Axis) Ly:	8 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

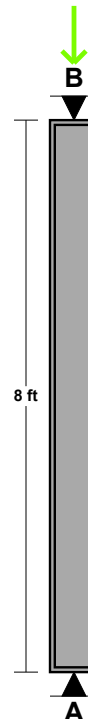
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi Cd=1.00 Cf=1.15 Cp=0.17	Fc' = 227 psi
Bending Stress (X-X Axis):	Fbx = 875 psi Cd=1.00 CF=1.50	Fbx' = 1313 psi
Bending Stress (Y-Y Axis):	Fby = 875 psi Cd=1.00 CF=1.50	Fby' = 1313 psi
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 10.5 in ²	
Section Modulus (X-X Axis):	Sx = 6.13 in ³	
Section Modulus (Y-Y Axis):	Sy = 2.63 in ³	
Slenderness Ratio:	Lex/dx = 27.43 Ley/dy = 32	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 158 psi
Allowable Compressive Stress:	Fc' = 227 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1313 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1313 psi
Combined Stress Factor:	CSF = 0.7

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 833 lb
Dead Load:	PD = 812 lb
Column Self Weight:	CSW = 15 lb
Total Axial Load:	PT = 1660 lb

NOTES



Project: 19 Balfour Street

Location: COL5B - Second Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 85.8%



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	263 lb
Dead Load:	Vert-DL-Rxn =	269 lb
Total Load:	Vert-TL-Rxn =	532 lb

COLUMN DATA

Total Column Length:	8 ft
Unbraced Length (X-Axis) Lx:	8 ft
Unbraced Length (Y-Axis) Ly:	8 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

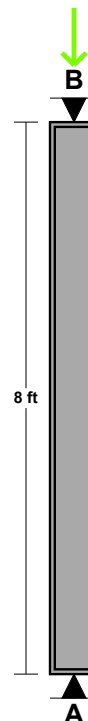
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 226 psi
	Cd=1.00 Cf=1.10 Cp=0.18	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1138 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1138 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	3 in
Area:	A =	16.5 in ²
Section Modulus (X-X Axis):	Sx =	15.13 in ³
Section Modulus (Y-Y Axis):	Sy =	4.13 in ³
Slenderness Ratio:	Lex/dx =	17.45
	Ley/dy =	32

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 32 psi
Allowable Compressive Stress:	Fc' = 226 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1138 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1138 psi
Combined Stress Factor:	CSF = 0.14

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 263 lb
Dead Load:	PD = 245 lb
Column Self Weight:	CSW = 24 lb
Total Axial Load:	PT = 532 lb

NOTES

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DATE 1/31/18
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Bloomsburg, PA



Project: 19 Balfour Street

Location: BM6 - Second Flr BR1 Floor Beam

Uniformly Loaded Floor Beam

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 9.25 IN x 12.417 FT

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 40.3%

Controlling Factor: Deflection



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.29 IN L/516

Dead Load 0.15 in

Total Load 0.44 IN L/337

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 1327 lb 1327 lb

Dead Load 707 lb 707 lb

Total Load 2034 lb 2034 lb

Bearing Length 0.90 in 0.90 in

BEAM DATA

Center

Span Length 12.42 ft

Unbraced Length-Top 0 ft

Floor Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: Fb = 3100 psi Fb' = 3203 psi

Cd=1.00 CF=1.03

Shear Stress: Fv = 290 psi Fv' = 290 psi

Cd=1.00

Modulus of Elasticity: E = 2000 ksi E' = 2000 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 750 psi Fc $\perp$ ' = 750 psi

Controlling Moment: 6313 ft-lb

6.208 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -2034 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 23.65 in³ 42.78 in³

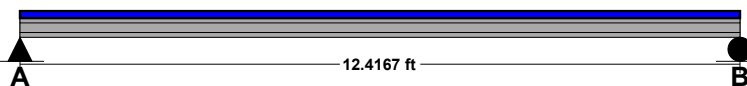
Area (Shear): 10.52 in² 27.75 in²

Moment of Inertia (deflection): 141.07 in⁴ 197.86 in⁴

Moment: 6313 ft-lb 11417 ft-lb

Shear: -2034 lb 5365 lb

LOADING DIAGRAM



FLOOR LOADING

Side 1

Side 2

Floor Live Load FLL = 30 psf 0 psf

Floor Dead Load FDL = 15 psf 0 psf

Floor Tributary Width FTW = 7.1 ft 0 ft

Wall Load WALL = 0 plf

BEAM LOADING

Beam Total Live Load: wL = 214 plf

Beam Total Dead Load: wD = 107 plf

Beam Self Weight: BSW = 7 plf

Total Maximum Load: wT = 328 plf

NOTES

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Project: 19 Balfour Street

Location: COL6A - First Flr BR1

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 5.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 48.0%



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2705 lb
Dead Load: Vert-DL-Rxn = 2023 lb
Total Load: Vert-TL-Rxn = 4728 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

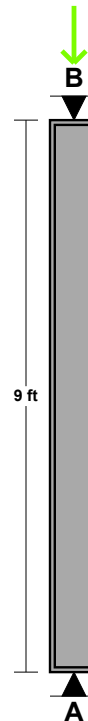
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 368 psi
	Cd=1.00 Cf=1.10 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	24.75 in ²
Section Modulus (X-X Axis):	Sx =	22.69 in ³
Section Modulus (Y-Y Axis):	Sy =	6.19 in ³
Slenderness Ratio:	L _{ex} /dx =	19.64
	L _{ey} /dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)		
Actual Compressive Stress:	Fc =	191 psi
Allowable Compressive Stress:	Fc' =	368 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1308 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1308 psi
Combined Stress Factor:	CSF =	0.52

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	2705 lb
Dead Load:	PD =	1982 lb
Column Self Weight:	CSW =	41 lb
Total Axial Load:	PT =	4728 lb

NOTES



Project: 19 Balfour Street

Location: COL6B - First Flr BR1

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 19.4%



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2705 lb
Dead Load: Vert-DL-Rxn = 2008 lb
Total Load: Vert-TL-Rxn = 4713 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 371 psi
	Cd=1.00 Cf=1.15 Cp=0.28	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

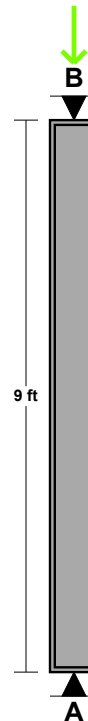
Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	9.19 in ³
Section Modulus (Y-Y Axis):	Sy =	3.94 in ³
Slenderness Ratio:	Lex/dx =	30.86
	Ley/dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	299 psi
Allowable Compressive Stress:	Fc' =	371 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1509 psi
Combined Stress Factor:	CSF =	0.81

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	2705 lb
Dead Load:	PD =	1982 lb
Column Self Weight:	CSW =	26 lb
Total Axial Load:	PT =	4713 lb

NOTES



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PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: BM7 - Second Flr K-LR Floor Beam

Multi-Span Floor Beam

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 9.25 IN x 22.167 FT (8.1 + 14.1)

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 18.1%

Controlling Factor: Deflection



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

	Left	Center
Live Load	-0.08 IN L/1180	0.40 IN L/425
Dead Load	-0.01 in	0.14 in
Total Load	-0.09 IN L/1025	0.54 IN L/314
Live Load Deflection Criteria: L/360		Total Load Deflection Criteria: L/240

REACTIONS

	A	B	C
Live Load	1047 lb	4198 lb	1688 lb
Dead Load	196 lb	1676 lb	650 lb
Total Load	1243 lb	5874 lb	2338 lb
Uplift (1.5 F.S)	-425 lb	0 lb	0 lb
Bearing Length	0.55 in	2.61 in	1.04 in

BEAM DATA

	Left	Center
Span Length	8.08 ft	14.08 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	8.08 ft	14.08 ft
Floor Duration Factor	1.00	
Notch Depth	0.00	

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

	Base Values	Adjusted
Bending Stress:	Fb = 3100 psi Cd=1.00 Cl=0.89 CF=1.03	Fb' = 2843 psi
Shear Stress:	Fv = 290 psi Cd=1.00	Fv' = 290 psi
Modulus of Elasticity:	E = 2000 ksi	E' = 2000 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ = 750 psi	Fc - $\perp$ = 750 psi

Controlling Moment:

-7470 ft-lb

Over left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear:

3339 lb

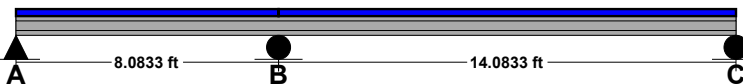
At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	31.53 in3	42.78 in3
Area (Shear):	17.27 in2	27.75 in2
Moment of Inertia (deflection):	167.51 in4	197.86 in4
Moment:	-7470 ft-lb	10137 ft-lb
Shear:	3339 lb	5365 lb

LOADING DIAGRAM



FLOOR LOADING

	Left	Center
Floor Live Load	FLL = 40 psf	40 psf
Floor Dead Load	FDL = 15 psf	15 psf
Floor Tributary Width Side One	TW1 = 7.1 ft	7.1 ft
Floor Tributary Width Side Two	TW2 = 0 ft	0 ft
Wall Load	WALL = 0 plf	0 plf

BEAM LOADING

	Left	Center
Reduced Floor Live Load	40 psf	40 psf
Total Live Load	285 plf	285 plf
Total Dead Load	107 plf	107 plf
Beam Self Weight	7 plf	7 plf
Total Load	399 plf	399 plf

NOTES



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Project: 19 Balfour Street

Location: COL7A - First Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 58.3%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1862 lb
Dead Load:	Vert-DL-Rxn =	576 lb
Total Load:	Vert-TL-Rxn =	2438 lb

COLUMN DATA

Total Column Length:	9 ft
Unbraced Length (X-Axis) Lx:	9 ft
Unbraced Length (Y-Axis) Ly:	9 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

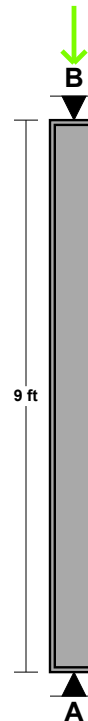
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 371 psi
	Cd=1.00 Cf=1.15 Cp=0.28	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 4.5 in	
Area:	A = 15.75 in ²	
Section Modulus (X-X Axis):	Sx = 9.19 in ³	
Section Modulus (Y-Y Axis):	Sy = 3.94 in ³	
Slenderness Ratio:	Lex/dx = 30.86	
	Ley/dy = 24	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 155 psi
Allowable Compressive Stress:	Fc' = 371 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1509 psi
Combined Stress Factor:	CSF = 0.42

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 1862 lb
Dead Load:	PD = 550 lb
Column Self Weight:	CSW = 26 lb
Total Axial Load:	PT = 2438 lb

NOTES

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Project: 19 Balfour Street

Location: COL7B - First Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

3.5 IN x 4.5 IN x 9 FT

2.0 Rigidlam LVL - Roseburg Forest Products

Section Adequate By: 8.3%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	7468 lb
Dead Load:	Vert-DL-Rxn =	4737 lb
Total Load:	Vert-TL-Rxn =	12205 lb

COLUMN DATA

Total Column Length:	9 ft
Unbraced Length (X-Axis) Lx:	9 ft
Unbraced Length (Y-Axis) Ly:	9 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

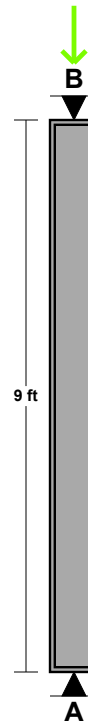
	Base Values	Adjusted
Compressive Stress:	Fc = 3000 psi	Fc' = 845 psi
	Cd=1.00 Cp=0.28	
Bending Stress (X-X Axis):	Fbx = 3100 psi	Fbx' = 3504 psi
	Cd=1.00 CF=1.13	
Bending Stress (Y-Y Axis):	Fby = 3100 psi	Fby' = 3504 psi
	Cd=1.00 CF=1.13	
Modulus of Elasticity:	E = 2000 ksi	E' = 2000 ksi

Column Section (X-X Axis):	dx =	4.5 in
Column Section (Y-Y Axis):	dy =	3.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	11.81 in ³
Section Modulus (Y-Y Axis):	Sy =	9.19 in ³
Slenderness Ratio:	Lex/dx =	24
	Ley/dy =	30.86

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 775 psi
Allowable Compressive Stress:	Fc' = 845 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 3504 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 3504 psi
Combined Stress Factor:	CSF = 0.92

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 7468 lb
Dead Load:	PD = 4702 lb
Column Self Weight:	CSW = 35 lb
Total Axial Load:	PT = 12205 lb

NOTES

No sill plate to be installed below column. Block framing solid below



Project: 19 Balfour Street

Location: COL7C - First Flr K-LR

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 5.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 46.5%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 3003 lb
Dead Load: Vert-DL-Rxn = 1864 lb
Total Load: Vert-TL-Rxn = 4867 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 368 psi
	Cd=1.00 Cf=1.10 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

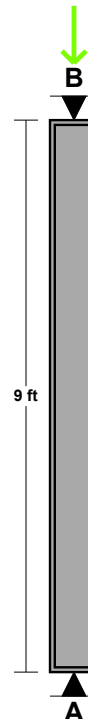
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	24.75 in ²
Section Modulus (X-X Axis):	Sx =	22.69 in ³
Section Modulus (Y-Y Axis):	Sy =	6.19 in ³
Slenderness Ratio:	Lex/dx =	19.64
	Ley/dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	197 psi
Allowable Compressive Stress:	Fc' =	368 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1308 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1308 psi
Combined Stress Factor:	CSF =	0.53

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	3003 lb
Dead Load:	PD =	1823 lb
Column Self Weight:	CSW =	41 lb
Total Axial Load:	PT =	4867 lb

NOTES



Project: 19 Balfour Street

Location: BM8 - Second Flr BR2 & BR3 Floor Beam
Uniformly Loaded Floor Beam
[2015 International Residential Code(2015 NDS)]
(2) 1.5 IN x 9.25 IN x 9.917 FT
2.0 Rigidlam LVL - Roseburg Forest Products
Section Adequate By: 175.3%
Controlling Factor: Deflection



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.12 IN L/1013
Dead Load 0.06 in
Total Load 0.18 IN L/661
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 1060 lb 1060 lb
Dead Load 564 lb 564 lb
Total Load 1624 lb 1624 lb
Bearing Length 0.72 in 0.72 in

BEAM DATA

Center

Span Length 9.92 ft
Unbraced Length-Top 0 ft
Floor Duration Factor 1.00
Notch Depth 0.00

MATERIAL PROPERTIES

2.0 Rigidlam LVL - Roseburg Forest Products

Base Values

Adjusted

Bending Stress: Fb = 3100 psi Fb' = 3203 psi

Cd=1.00 CF=1.03

Shear Stress: Fv = 290 psi Fv' = 290 psi

Cd=1.00

Modulus of Elasticity: E = 2000 ksi E' = 2000 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 750 psi Fc $\perp$ ' = 750 psi

Controlling Moment: 4027 ft-lb

4.958 ft from left support

Created by combining all dead and live loads.

Controlling Shear: -1624 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 15.09 in³ 42.78 in³

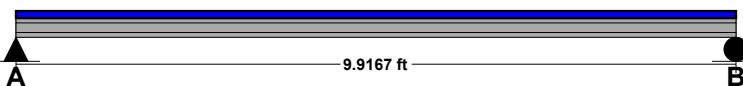
Area (Shear): 8.4 in² 27.75 in²

Moment of Inertia (deflection): 71.86 in⁴ 197.86 in⁴

Moment: 4027 ft-lb 11417 ft-lb

Shear: -1624 lb 5365 lb

LOADING DIAGRAM



FLOOR LOADING

Side 1

Side 2

Floor Live Load FLL = 30 psf 0 psf

Floor Dead Load FDL = 15 psf 0 psf

Floor Tributary Width FTW = 7.1 ft 0 ft

Wall Load WALL = 0 plf

BEAM LOADING

Beam Total Live Load: wL = 214 plf

Beam Total Dead Load: wD = 107 plf

Beam Self Weight: BSW = 7 plf

Total Maximum Load: wT = 328 plf

NOTES



Project: 19 Balfour Street

Location: COL8A - First Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 28.6%



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2324 lb
Dead Load: Vert-DL-Rxn = 1851 lb
Total Load: Vert-TL-Rxn = 4175 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

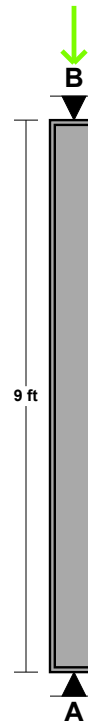
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 371 psi
	Cd=1.00 Cf=1.15 Cp=0.28	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	9.19 in ³
Section Modulus (Y-Y Axis):	Sy =	3.94 in ³
Slenderness Ratio:	L _{ex} /dx =	30.86
	L _{ey} /dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 265 psi
Allowable Compressive Stress:	Fc' = 371 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1509 psi
Combined Stress Factor:	CSF = 0.71

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 2324 lb
Dead Load:	PD = 1825 lb
Column Self Weight:	CSW = 26 lb
Total Axial Load:	PT = 4175 lb

NOTES



Project: 19 Balfour Street

Location: COL8B - First Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 5.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 54.0%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 2324 lb
Dead Load: Vert-DL-Rxn = 1866 lb
Total Load: Vert-TL-Rxn = 4190 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 368 psi
	Cd=1.00 Cf=1.10 Cp=0.29	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1308 psi
	Cd=1.00 CF=1.30 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

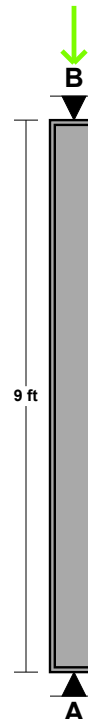
Column Section (X-X Axis):	dx =	5.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	24.75 in ²
Section Modulus (X-X Axis):	Sx =	22.69 in ³
Section Modulus (Y-Y Axis):	Sy =	6.19 in ³
Slenderness Ratio:	L _{ex} /dx =	19.64
	L _{ey} /dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	Fc =	169 psi
Allowable Compressive Stress:	Fc' =	368 psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	0 psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1308 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1308 psi
Combined Stress Factor:	CSF =	0.46

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	2324 lb
Dead Load:	PD =	1825 lb
Column Self Weight:	CSW =	41 lb
Total Axial Load:	PT =	4190 lb

NOTES



Project: 19 Balfour Street

Location: BM9 - Second Fir BR2 & BR3 Floor Beam
Uniformly Loaded Floor Beam
[2015 International Residential Code(2015 NDS)]
(2) 1.5 IN x 9.25 IN x 9.917 FT
#2 - Spruce-Pine-Fir - Dry Use
Section Adequate By: 34.5%
Controlling Factor: Moment



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

Center

Live Load 0.11 IN L/1122
Dead Load 0.06 in
Total Load 0.16 IN L/730
Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 669 lb 669 lb
Dead Load 360 lb 360 lb
Total Load 1029 lb 1029 lb
Bearing Length 0.81 in 0.81 in

BEAM DATA

Center

Span Length 9.92 ft
Unbraced Length-Top 0 ft
Floor Duration Factor 1.00
Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: Fb = 875 psi Fb' = 963 psi
Cd=1.00 CF=1.10
Shear Stress: Fv = 135 psi Fv' = 135 psi
Cd=1.00
Modulus of Elasticity: E = 1400 ksi E' = 1400 ksi
Comp. $\perp$ to Grain: Fc $\perp$ = 425 psi Fc $\perp$ ' = 425 psi

Controlling Moment: 2551 ft-lb

4.958 ft from left support

Created by combining all dead and live loads.

Controlling Shear: 1029 lb

At support.

Created by combining all dead and live loads.

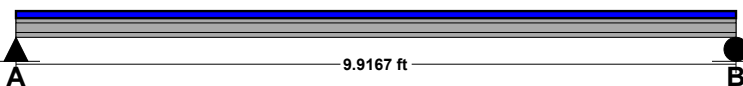
Comparisons with required sections:

Req'd

Provided

Section Modulus: 31.81 in³ 42.78 in³
Area (Shear): 11.43 in² 27.75 in²
Moment of Inertia (deflection): 65.05 in⁴ 197.86 in⁴
Moment: 2551 ft-lb 3431 ft-lb
Shear: 1029 lb 2498 lb

LOADING DIAGRAM



FLOOR LOADING

Side 1

Side 2

Floor Live Load FLL = 30 psf 0 psf
Floor Dead Load FDL = 15 psf 0 psf
Floor Tributary Width FTW = 4.5 ft 0 ft

Wall Load WALL = 0 plf

BEAM LOADING

Beam Total Live Load: wL = 135 plf
Beam Total Dead Load: wD = 68 plf
Beam Self Weight: BSW = 5 plf
Total Maximum Load: wT = 208 plf

NOTES



Project: 19 Balfour Street

Location: COL9A - First Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 3.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 53.8%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load: Vert-LL-Rxn = 1502 lb
Dead Load: Vert-DL-Rxn = 1198 lb
Total Load: Vert-TL-Rxn = 2700 lb

COLUMN DATA

Total Column Length: 9 ft
Unbraced Length (X-Axis) Lx: 9 ft
Unbraced Length (Y-Axis) Ly: 9 ft
Column End Condition-K (e): 1
Axial Load Duration Factor 1.00

COLUMN PROPERTIES

#2 - Spruce-Pine-Fir

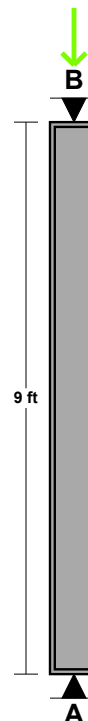
	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 371 psi
	Cd=1.00 Cf=1.15 Cp=0.28	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1509 psi
	Cd=1.00 CF=1.50 Cr=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi

Column Section (X-X Axis):	dx =	3.5 in
Column Section (Y-Y Axis):	dy =	4.5 in
Area:	A =	15.75 in ²
Section Modulus (X-X Axis):	Sx =	9.19 in ³
Section Modulus (Y-Y Axis):	Sy =	3.94 in ³
Slenderness Ratio:	L _{ex} /dx =	30.86
	L _{ey} /dy =	24

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 171 psi
Allowable Compressive Stress:	Fc' = 371 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1509 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1509 psi
Combined Stress Factor:	CSF = 0.46

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 1502 lb
Dead Load:	PD = 1172 lb
Column Self Weight:	CSW = 26 lb
Total Axial Load:	PT = 2700 lb

NOTES



Project: 19 Balfour Street

Location: COL9B - First Flr BR2 & BR3

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 9.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 48.1%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	932 lb
Dead Load:	Vert-DL-Rxn =	632 lb
Total Load:	Vert-TL-Rxn =	1564 lb

COLUMN DATA

Total Column Length:	9 ft
Unbraced Length (X-Axis) Lx:	9 ft
Unbraced Length (Y-Axis) Ly:	9 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

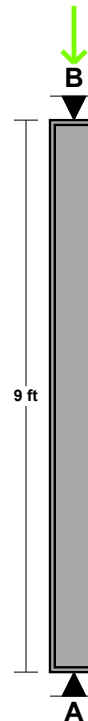
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 183 psi
	Cd=1.00 Cf=1.10 Cp=0.14	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1138 psi
	Cd=1.00 CF=1.30	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1138 psi
	Cd=1.00 CF=1.30	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 5.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 16.5 in ²	
Section Modulus (X-X Axis):	Sx = 15.13 in ³	
Section Modulus (Y-Y Axis):	Sy = 4.13 in ³	
Slenderness Ratio:	Lex/dx = 19.64	
	Ley/dy = 36	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 95 psi
Allowable Compressive Stress:	Fc' = 183 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1138 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1138 psi
Combined Stress Factor:	CSF = 0.52

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 932 lb
Dead Load:	PD = 605 lb
Column Self Weight:	CSW = 27 lb
Total Axial Load:	PT = 1564 lb

NOTES



Project: 19 Balfour Street

Location: Header - BR3 Window

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

(3) 1.5 IN x 5.5 IN x 3.5 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 41.0%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.01 IN L/3866

Dead Load 0.01 in

Total Load 0.02 IN L/1918

Live Load Deflection Criteria: L/360 Total Load Deflection Criteria: L/240

REACTIONS

A

B

Live Load 786 lb 214 lb

Dead Load 794 lb 222 lb

Total Load 1580 lb 436 lb

Bearing Length 0.83 in 0.23 in

BEAM DATA

Center

Span Length 3.5 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 3.5 ft

Live Load Duration Factor 1.00

Notch Depth 0.00

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: $F_b = 875$ psi $F_b' = 1308$ psi

$C_d = 1.00$ $C_F = 1.30$ $C_r = 1.15$

Shear Stress: $F_v = 135$ psi $F_v' = 135$ psi

$C_d = 1.00$

Modulus of Elasticity: $E = 1400$ ksi $E' = 1400$ ksi

Comp. $\perp$ to Grain: $F_c \perp = 425$ psi $F_c \perp' = 425$ psi

Controlling Moment: 1175 ft-lb

0.77 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 1579 lb

At left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 10.78 in³ 22.69 in³

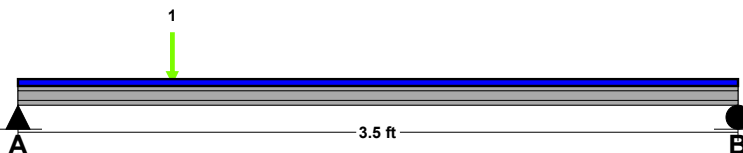
Area (Shear): 17.55 in² 24.75 in²

Moment of Inertia (deflection): 7.81 in⁴ 62.39 in⁴

Moment: 1175 ft-lb 2473 ft-lb

Shear: 1579 lb 2228 lb

LOADING DIAGRAM



UNIFORM LOADS

Center

Uniform Live Load 0 plf

Uniform Dead Load 0 plf

Beam Self Weight 5 plf

Total Uniform Load 5 plf

POINT LOADS - CENTER SPAN

Load Number One

Live Load 1000 lb

Dead Load 1000 lb

Location 0.75 ft

NOTES



APPROVED

DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: Floor Joist (Maximum Load and Span)

Floor Joist

[2015 International Residential Code(2015 NDS)]

1.5 IN x 9.25 IN x 14.25 FT @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 6.0%

Controlling Factor: Moment



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.25 IN L/698

Dead Load 0.09 in

Total Load 0.34 IN L/508

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS

A

B

Live Load 380 lb 380 lb

Dead Load 143 lb 143 lb

Total Load 523 lb 523 lb

Bearing Length 0.82 in 0.82 in

SUPPORT LOADS

A

B

Live Load 285 plf 285 plf

Dead Load 107 plf 107 plf

Total Load 392 plf 392 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: Fb = 875 psi Fb' = 1107 psi

Cd=1.00 CF=1.10 Cr=1.15

Shear Stress: Fv = 135 psi Fv' = 135 psi

Cd=1.00

Modulus of Elasticity: E = 1400 ksi E' = 1400 ksi

Comp. $\perp$ to Grain: Fc $\perp$ = 425 psi Fc $\perp$ = 425 psi

Controlling Moment: 1861 ft-lb

7.12 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: -523 lb

14.0 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:

Req'd

Provided

Section Modulus: 20.18 in³ 21.39 in³

Area (Shear): 5.81 in² 13.88 in²

Moment of Inertia (deflection): 102.29 in⁴ 144.23 in⁴

Moment: 1861 ft-lb 1973 ft-lb

Shear: -523 lb 1249 lb

Decking Information

Plywood Thickness: T = 3/4 in

Plywood Is Glued:

Moment of Inertia Calculations For Glued Floor:

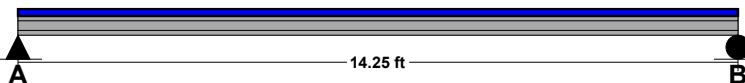
Joist Area: A-joist = 13.88 IN²

Plywood Area: A-ply = 2.08 IN²

Section Centroid: C = 5 IN ABOVE BASE

Moment of Inertia (deflection): I-comb = 144 IN⁴

LOADING DIAGRAM



JOIST DATA

Center

Span Length 14.25 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Floor sheathing applied to top of joists-top of joists fully braced.

Floor Duration Factor 1.00

JOIST LOADING

Uniform Floor Loading

Center

Live Load LL = 40 psf

Dead Load DL = 15 psf

Total Load TL = 55 psf

TL Adj. For Joist Spacing wT = 73.3 plf

NOTES



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DATE 1/31/18

PFS CORPORATION

Bloomsburg, PA



Project: 19 Balfour Street

Location: Porch Roof Rafter

Roof Rafter

[2015 International Residential Code(2015 NDS)]

1.5 IN x 5.5 IN x 5.0 FT (4 + 1) @ 16 O.C.

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 793.6%

Controlling Factor: Shear



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Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

	Center	Right
Live Load	0.01 IN L/8521	0.00 IN 2L/17936
Dead Load	0.00 in	0.00 in
Total Load	0.01 IN L/5069	0.00 IN 2L/Infinity
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180		

REACTIONS

	A	B
Live Load	53 lb	83 lb
Dead Load	40 lb	67 lb
Total Load	93 lb	150 lb
Bearing Length	0.15 in	0.24 in

SUPPORT LOADS

	A	B
Live Load	40 plf	62 plf
Dead Load	30 plf	50 plf
Total Load	70 plf	113 plf

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Bending Stress:	Fb = 875 psi	Fb' = 1504 psi
	Cd=1.15 CF=1.30 Cr=1.15	
Shear Stress:	Fv = 135 psi	Fv' = 155 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 425 psi	Fc - ⊥' = 425 psi

Controlling Moment:

91 ft-lb

1.957 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear:

-96 lb

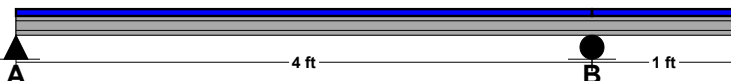
3.745 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	0.72 in3	7.56 in3
Area (Shear):	0.92 in2	8.25 in2
Moment of Inertia (deflection):	0.74 in4	20.8 in4
Moment:	91 ft-lb	948 ft-lb
Shear:	-96 lb	854 lb

LOADING DIAGRAM



RAFTER DATA

	Interior	Eave
Span Length	4 ft	1 ft
Rafter Pitch	4.5	:12
Roof sheathing applied to top of joists-top of rafters fully braced.		
Roof Duration Factor	1.15	
Peak Notch Depth	0.00	
Base Notch Depth	0.00	

RAFTER LOADING

Uniform Roof Loading

Roof Live Load:	LL =	20 psf
Roof Dead Load:	DL =	15 psf

Slope Adjusted Spans And Loads

Interior Span:	L-adj =	4.27 ft
Eave Span:	L-Eave-adj =	1.07 ft
Interior Live Load:	wL-adj =	23 plf
Eave Live Load:	wL-Eave-adj =	23 plf
Interior Dead Load:	wD-adj =	19 plf
Eave Dead Load:	wD-Eave-adj =	19 plf
Interior Total Load:	wT-adj =	42 plf
Eave Total Load:	wT-Eave-adj =	42 plf

NOTES

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Project: 19 Balfour Street

Location: Porch Roof Hip Beam

Hip/Valley Beam

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 5.5 IN x 5.7 FT (Actual 5.9 FT)

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 271.8%

Controlling Factor: Moment



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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DEFLECTIONS

Center

Live Load 0.02 IN L/2862

Dead Load 0.02 in

Total Load 0.05 IN L/1520

Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180

REACTIONS

A

B

Live Load 215 lb 107 lb

Dead Load 187 lb 98 lb

Total Load 402 lb 205 lb

Bearing Length 0.32 in 0.16 in

BEAM DATA

Span Length 5.7 ft

Unbraced Length-Top 0 ft

Unbraced Length-Bottom 0 ft

Roof Pitch Side One: 4.5 :12

Roof Pitch Side Two: 4.5 :12

Roof Duration Factor 1.15

Beam End Elevation Difference 1.5 ft

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

Base Values

Adjusted

Bending Stress: $F_b = 875$ psi $F_b' = 1308$ psi

$C_d = 1.15$ $C_F = 1.30$

Shear Stress: $F_v = 135$ psi $F_v' = 155$ psi

$C_d = 1.15$

Modulus of Elasticity: $E = 1400$ ksi $E' = 1400$ ksi

Comp. $\perp$ to Grain: $F_c \perp = 425$ psi $F_c \perp' = 425$ psi

Controlling Moment: 443 ft-lb

2.85 ft from left support

Created by combining all dead and live loads.

Controlling Shear: 389 lb

At support.

Created by combining all dead and live loads.

Comparisons with required sections:

Req'd

Provided

Section Modulus: 4.07 in³ 15.13 in³

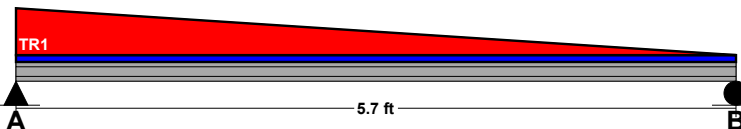
Area (Shear): 3.75 in² 16.5 in²

Moment of Inertia (deflection): 4.93 in⁴ 41.59 in⁴

Moment: 443 ft-lb 1649 ft-lb

Shear: 389 lb 1708 lb

LOADING DIAGRAM



HIP/VALLEY LOADING

Roof Live Load:

LL = 20 psf

Roof Dead Load:

DL = 15 psf

Side 1 Rafter Length:

RL1 = 4 ft

Tributary Width based on half span of rafters.

Side 2 Rafter Length:

RL2 = 4 ft

Tributary Width based on half span of rafters.

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS

Adjusted Beam Length: $L_{adj} = 5.89$ ft

Beam Self Weight: BSW = 3 plf

TRAPEZOIDAL LOADS - CENTER SPAN

Load Number One

Left Live Load 113.1 plf

Left Dead Load 90.6 plf

Right Live Load 0 plf

Right Dead Load 0 plf

Load Start 0 ft

Load End 5.7 ft

Load Length 5.7 ft

NOTES



Project: 19 Balfour Street

Location: BM10 - Porch Roof Beam

Multi-Loaded Multi-Span Beam

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 7.25 IN x 10.0 FT (5 + 5)

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 521.2%

Controlling Factor: Shear



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS

	Left	Center
Live Load	0.00 IN L/MAX	0.00 IN L/MAX
Dead Load	0.00 in	0.00 in
Total Load	0.01 IN L/8654	0.01 IN L/8654
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180		

REACTIONS

	A	B	C
Live Load	136 lb	388 lb	136 lb
Dead Load	101 lb	337 lb	101 lb
Total Load	237 lb	725 lb	237 lb
Bearing Length	0.19 in	0.57 in	0.19 in

BEAM DATA

	Left	Center
Span Length	5 ft	5 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	5 ft	5 ft
Live Load Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES

#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Bending Stress:	Fb = 875 psi Cd=1.15 Cl=0.99 CF=1.20	Fb' = 1194 psi
Shear Stress:	Fv = 135 psi Cd=1.15	Fv' = 155 psi
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Comp. $\perp$ to Grain:	Fc $\perp$ = 425 psi	Fc $\perp$ = 425 psi

Controlling Moment:

-362 ft-lb

Over right support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear:

-362 lb

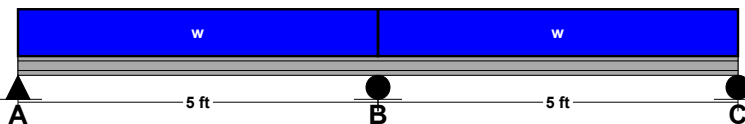
At right support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	3.64 in ³	26.28 in ³
Area (Shear):	3.5 in ²	21.75 in ²
Moment of Inertia (deflection):	1.98 in ⁴	95.27 in ⁴
Moment:	-362 ft-lb	2614 ft-lb
Shear:	-362 lb	2251 lb

LOADING DIAGRAM



UNIFORM LOADS

	Left	Center
Uniform Live Load	62 plf	62 plf
Uniform Dead Load	50 plf	50 plf
Beam Self Weight	4 plf	4 plf
Total Uniform Load	116 plf	116 plf

NOTES



Project: 19 Balfour Street

Location: COL10A - Porch Post

Column

[2015 International Residential Code(2015 NDS)]

(2) 1.5 IN x 3.5 IN x 8.0 FT

#2 - Spruce-Pine-Fir - Dry Use

Section Adequate By: 69.0%



Alan Behrent
Modular Steel Systems, Inc.
11 Edwards Drive
Bloomsburg, PA 17815

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CAUTIONS

* Laminations to be nailed together per National Design Specifications for Wood Construction Section 15.3.3.1

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	388 lb
Dead Load:	Vert-DL-Rxn =	352 lb
Total Load:	Vert-TL-Rxn =	740 lb

COLUMN DATA

Total Column Length:	8 ft
Unbraced Length (X-Axis) Lx:	8 ft
Unbraced Length (Y-Axis) Ly:	8 ft
Column End Condition-K (e):	1
Axial Load Duration Factor	1.00

COLUMN PROPERTIES

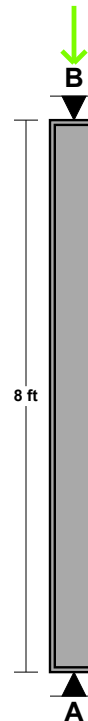
#2 - Spruce-Pine-Fir

	Base Values	Adjusted
Compressive Stress:	Fc = 1150 psi	Fc' = 227 psi
	Cd=1.00 Cf=1.15 Cp=0.17	
Bending Stress (X-X Axis):	Fbx = 875 psi	Fbx' = 1313 psi
	Cd=1.00 CF=1.50	
Bending Stress (Y-Y Axis):	Fby = 875 psi	Fby' = 1313 psi
	Cd=1.00 CF=1.50	
Modulus of Elasticity:	E = 1400 ksi	E' = 1400 ksi
Column Section (X-X Axis):	dx = 3.5 in	
Column Section (Y-Y Axis):	dy = 3 in	
Area:	A = 10.5 in ²	
Section Modulus (X-X Axis):	Sx = 6.13 in ³	
Section Modulus (Y-Y Axis):	Sy = 2.63 in ³	
Slenderness Ratio:	Lex/dx = 27.43	
	Ley/dy = 32	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)	
Actual Compressive Stress:	Fc = 71 psi
Allowable Compressive Stress:	Fc' = 227 psi
Eccentricity Moment (X-X Axis):	Mx-ex = 0 ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey = 0 ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx = 0 ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My = 0 ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx = 0 psi
Allowable Bending Stress (X-X Axis):	Fbx' = 1313 psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby = 0 psi
Allowable Bending Stress (Y-Y Axis):	Fby' = 1313 psi
Combined Stress Factor:	CSF = 0.31

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL = 388 lb
Dead Load:	PD = 337 lb
Column Self Weight:	CSW = 15 lb
Total Axial Load:	PT = 740 lb

NOTES





10/23/2017

Alternative Weld Calculation

Project: 577 Lincoln Ave Staten Island, NY 10306

Original Design - 1/2" dia. Bolt @ 48" o.c.

Alternative Design - 3/8"x9"x6" Plate w/ 3/8" Weld All Around @ 48" o.c.

1/2" Dia. Bolt:

$$\text{Allowable Shear} = F_{nv} / \Omega \times \text{Area} = 12.0 \text{ ksi} \times (0.196 \text{ in}^2) = 2.352 \text{ kips}$$

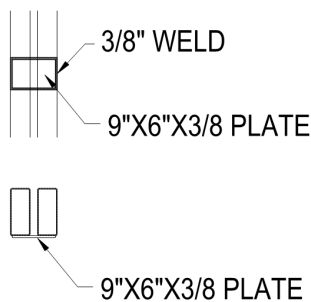
Weld Capacity:

$$\text{Allowable Load} = R_n / \Omega = 0.928 \times D \times l = 4.176 \text{ kips} > 2.352 \text{ kips} \quad \text{OK}$$

Plate Capacity:

$$\text{Allowable Load} = [0.6 \times F_y \times A \times C] / \Omega = [0.6 \times 36 \times (6 \times 0.375) \times 1.0] / 1.67 = 29.1018 \text{ kips} > 2.352 \text{ kips} \quad \text{OK}$$

Alternative Design - 3/8"x9"x6" Plate w/ 3/8" Weld All Around @ 48" o.c. is acceptable



DETAIL



BWL Design is Based upon Wood Frame Construction Manual 2015 Edition

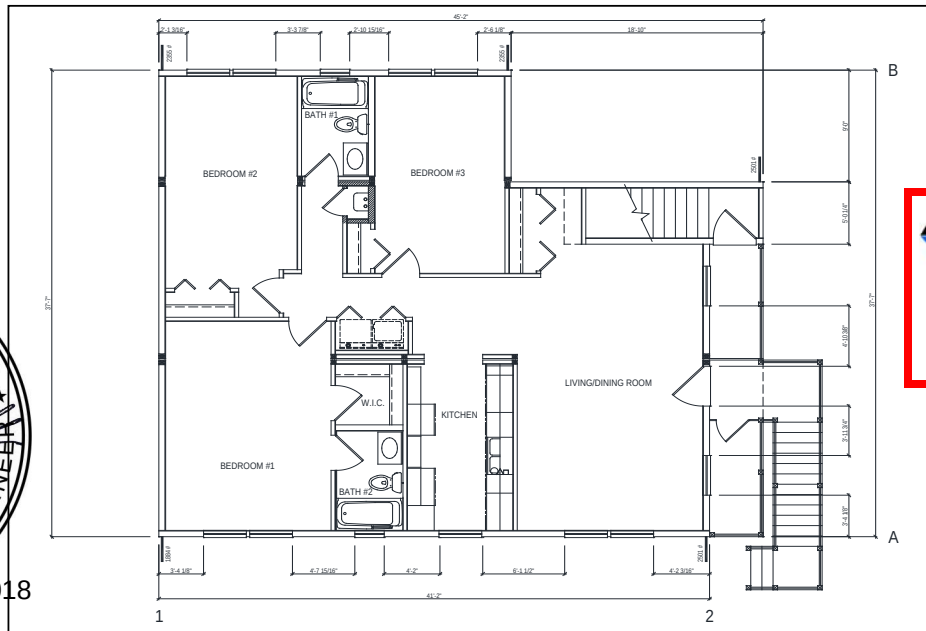
Exterior Perforated (Type II) Shear wall (WFCM 3.4.4.2)

Project ID # 201720-1 - 19 Balfour Street

Design Criteria: Wind Speed (V_{ult}) = 115 mph Exposure Category = B Use Values from page 215.

Roof Pitch = 7/12 Mean Roof Height (ft) = 34.08
(Add a Story when Ridge $\geq 10'$)

First Floor



Building Wall Elevation

	Parallel to Ridge		Perp. to Ridge	
	Line A	Line B	Line 1	Line 2
Wall Height (H) (ft)	8.00	8.00	8.00	8.00
Max. Unrestrained opening Height (in)	80.00	80.00	80.00	80.00
Actual Length of Full Height Sheathing (L_{FH}) (ft); min. length to have aspect ratio 3.5/1	22.50	10.83	37.58	17.17
Length of Wall (L_{Wall}) (ft)	41.17	45.17	37.58	37.58
Percent Full Height Sheathing (L_{FH}/L_{Wall})*100 (%)	54.65	23.98	100.01	45.68
Tabulated Min Length Full Height Sheathing-Segmented wall (L_{SW}) (Table 3.17A)*	12.01	12.01	14.45	14.45
Wall Height Adjustment per T-3.17A, footnote 4 WFCM 2015 (C_{WH})	0.87	0.87	0.87	0.87
Shear wall Adjustment for other sheathing materials than ones specified in Section 3.4.4.2 per Table 3.17D (C_{SWA})	1.00	0.44	1.00	0.74
Min Length Full Ht Sheathing Segmented Wind (ft) L Type I = $L_{SW} * C_{WH} * C_{SWA}$	10.45	4.65	12.57	9.29
Perforated (Type II) Length Increase Factor From Table 3.17E (interpolated)=W (C_L)	1.37	1.84	1.00	1.48
Min. Length Full Height Sheathing Perforated Wind (ft) ($L_{TYPE II-W} = L_{TYPE I} * W(C_L)$)	14.35	8.54	12.57	13.78
L TYPE II with less or equal to L_{FH}	PERF	PERF	PERF	PERF

* Values may have been interpolated.

Line A Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C
Line B Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 4" O/C **
Line 1 Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C
Line 2 Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 4" O/C
** Interior face of wall line B to have 7/16" WSP (blocked) secured with 8d common nails @ 4" O/C

Overturning Resistance (WFCM 3.2.3)

Braced Wall Line A

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v * L_{TYPE II-W/LWALL} * H = 1216$ lb

Braced Wall Line B

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 980$ plf
- Perforated Overturning force= $V = v * L_{TYPE II-W/LWALL} * H = 1483$ lb

Braced Wall Line 1

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v * L_{TYPE II-W/LWALL} * H = 1167$ lb

Braced Wall Line 2

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 590$ plf
- Perforated Overturning force= $V = v * L_{TYPE II-W/LWALL} * H = 1731$ lb

1/5/2018

BWL Design is Based upon Wood Frame Construction Manual 2015 Edition

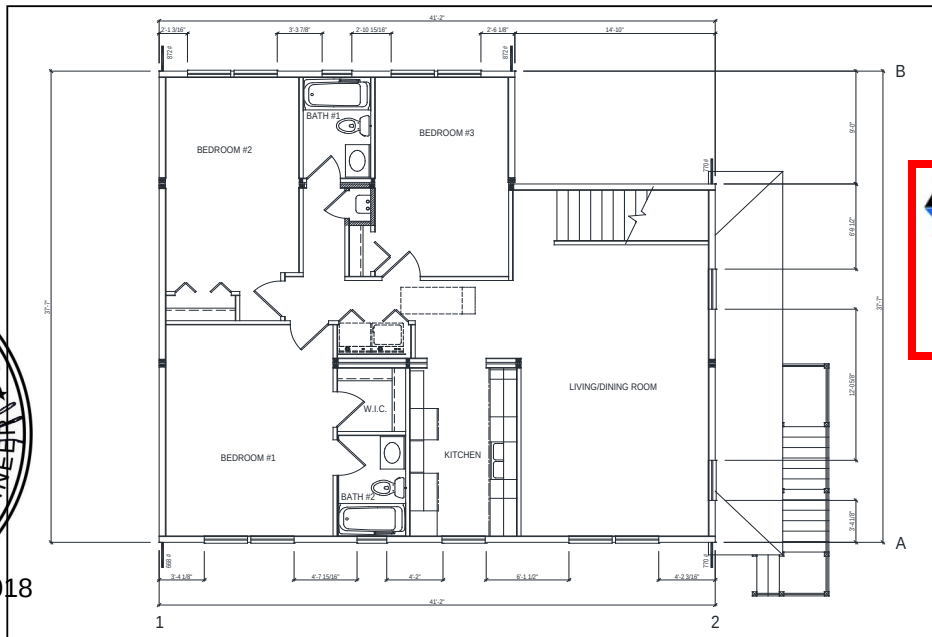
Exterior Perforated (Type II) Shear wall (WFCM 3.4.4.2)

Project ID # 201720-1 - 19 Balfour Street

Design Criteria: Wind Speed (V_{ult}) = 115 mph Exposure Category = B Use Values from page 215.

Roof Pitch = 7/12 Mean Roof Height (ft) = 34.08
(Add a Story when Ridge $\geq 10'$)

Second Floor



Building Wall Elevation	Parallel to Ridge		Perp. to Ridge	
	Line A	Line B	Line 1	Line 2
Wall Height (H) (ft)	8.00	8.00	8.00	8.00
Max. Unrestrained opening Height (in)	80.00	80.00	80.00	80.00
Actual Length of Full Height Sheathing (L_{FH}) (ft); min. length to have aspect ration 3.5/1	22.50	10.83	37.58	22.17
Length of Wall (L_{Wall}) (ft)	41.17	41.17	37.58	37.58
Percent Full Height Sheathing ($(L_{FH}/L_{Wall}) \times 100$) (%)	54.66	26.32	100.00	58.98
Tabulated Min Length Full Height Sheathing-Segmented wall (L_{SW}) (Table 3.17A)*	6.24	6.24	6.80	6.80
Wall Height Adjustment per T-3.17A, footnote 4 WFCM 2015 (C_{WH})	0.92	0.92	0.92	0.92
Shear wall Adjustment for other sheathing materials than ones specified in Section 3.4.4.2 per Table 3.17D (C_{SWA})	1.00	1.00	1.00	1.00
Min Length Full Ht Sheathing Segmented Wind (ft) L Type I = $L_{SW} \times C_{WH} \times C_{SWA}$	5.74	5.74	6.26	6.26
Perforated (Type II) Length Increase Factor From Table 3.17E (interpolated)=W (C_L)	1.37	1.79	1.00	1.33
Min. Length Full Height Sheathing Perforated Wind (ft) ($L_{TYPE II-W} = L_{TYPE I} \times W(C_L)$)	7.89	10.29	6.26	8.30
L TYPE II with less or equal to L_{FH}	PERF	PERF	PERF	PERF

* Values may have been interpolated.

Line A Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C

Line B Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C

Line 1 Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C

Line 2 Designed as 16" O/C, Perforated Wall with 7/16" WSP (Blocked) on exterior face secured with 8d common nails @ 6" O/C

Overturning Resistance (WFCM 3.2.3)

Braced Wall Line A

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v \times L_{TYPE II-W} / L_{WALL} \times H = 668$ lb

Braced Wall Line B

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v \times L_{TYPE II-W} / L_{WALL} \times H = 872$ lb

Braced Wall Line 1

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v \times L_{TYPE II-W} / L_{WALL} \times H = 581$ lb

Braced Wall Line 2

- Overturning Capacity $v = 436$ plf v adjusted for sheathing (Table 3.17D)= $v/C_{swa} = 436$ plf
- Perforated Overturning force= $V = v \times L_{TYPE II-W} / L_{WALL} \times H = 770$ lb

1/5/2018



PROJECT: ALL PROJECTS
 CEILING JOIST CONNECTION TO WALL

PROJECT NO: 0003.06514

PAGE NO. 1 OF 2

CALCULATED BY: DGP DATE: 12-9-2014

CHECKED BY: KEP DATE: 12-9-2014

REVISED 7-18-16 TO REFLECT CURRENT CODES

DESIGN INFORMATION:

MAXIMUM BOX WIDTH - 15'-9"
 CLEAR SPAN OF CEILING SYSTEM - 15'-1"
 CLEAR SPAN OF CEILING JOIST - 14'-10"
 1 1/2" THICK FRAMING

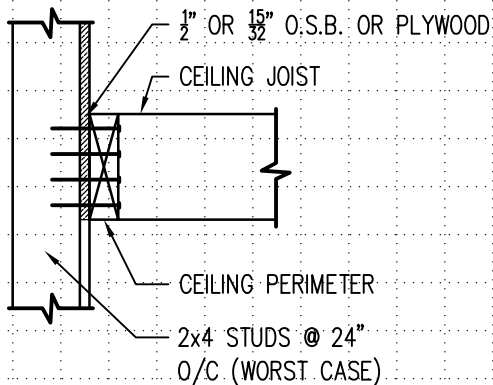
DESIGN LOADS

DEAD LOAD - 10PSF
 LIVE LOAD - 10PSF
 TOTAL LOAD - 20PSF

CODE INFORMATION:

ASCE7-10
 NDS 2012 & 2015

LATERAL SINGLE SHEAR
 DURATION FACTOR $C_d=0.9$
 TOE-NAIL FACTOR $C_{tn}=0.83$
 END GRAIN FACTOR $C_{eg}=0.67$

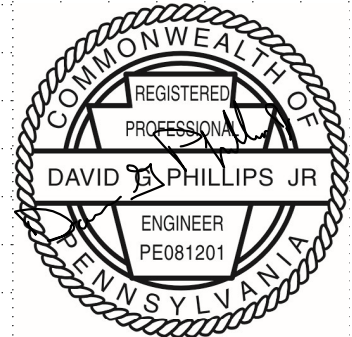


LOAD ON PERIMETER

$$(15.083' / 2) \times 20\text{psf} = 150.83\text{plf}$$

LOAD ON STUD

$$150.83\text{plf} \times 2'-0" = 302\text{lbs/stud}$$



PERIMETER TO STUD - FACE NAIL

LUMBER SPECIES	SPECIFIC GRAVITY(G)	FASTENER	SINGLE SHEAR lbs/fastener	QUANTITY
SPRUCE-PINE-FIR	0.42	0.131"x3" NAIL	74	5
SOUTHERN YELLOW PINE	0.55	0.131"x3" NAIL	95	4
SPRUCE-PINE-FIR	0.42	0.148"x3" NAIL	90	4
SOUTHERN YELLOW PINE	0.55	0.148"x3" NAIL	115	3
SPRUCE-PINE-FIR	0.42	0.162"x3" NAIL	108	3
SOUTHERN YELLOW PINE	0.55	0.162"x3" NAIL	139	3
SPRUCE-PINE-FIR	0.42	1/4"x3" SIMPSON SDS SCREW	171	2
SOUTHERN YELLOW PINE	0.55	1/4"x3" SIMPSON SDS SCREW	171	2
SPRUCE-PINE-FIR	0.42	1/4"x3" USP WS3 SCREW	147	3
SOUTHERN YELLOW PINE	0.55	1/4"x3" USP WS3 SCREW	160	2
SPRUCE-PINE-FIR	0.42	OLYLOG TLOK04	153	2
SOUTHERN YELLOW PINE	0.55	OLYLOG TLOK04	234	2





PROJECT: ALL PROJECTS
 CEILING JOIST CONNECTION TO WALL

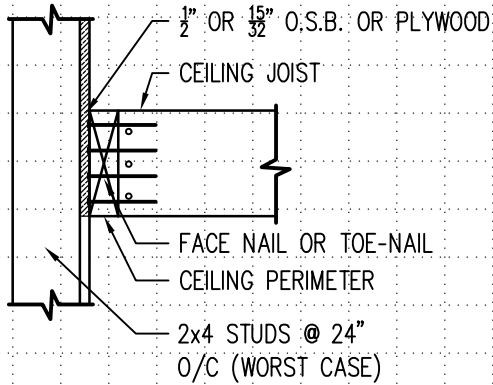
PROJECT NO: 0003.06514

PAGE NO. 2 OF 2

CALCULATED BY: DGP DATE: 12-9-2014

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REVISED 7-18-16 TO REFLECT CURRENT CODES

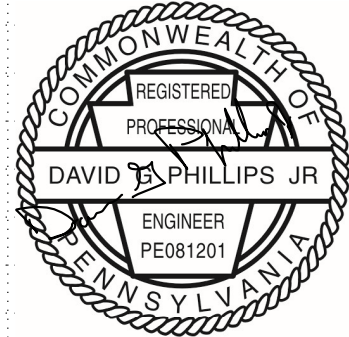


LOAD ON JOIST

$$(14.83' / 2) \times 20\text{psf} = 148.3\text{plf}$$

LOAD ON PERIMETER

$$148.3\text{plf} \times 2'-0" = 297\text{lbs/stud}$$



JOIST TO PERIMETER - FACE NAIL

LUMBER SPECIES	SPECIFIC GRAVITY(G)	FASTENER	SINGLE SHEAR lbs/fastener	QUANTITY
SPRUCE-PINE-FIR	0.42	0.131"x3" NAIL	74	4
SOUTHERN YELLOW PINE	0.55	0.131"x3" NAIL	95	4
SPRUCE-PINE-FIR	0.42	0.148"x3" NAIL	90	4
SOUTHERN YELLOW PINE	0.55	0.148"x3" NAIL	115	3
SPRUCE-PINE-FIR	0.42	0.162"x3" NAIL	108	3
SOUTHERN YELLOW PINE	0.55	0.162"x3" NAIL	139	3
SPRUCE-PINE-FIR	0.42	1/4"x3" SIMPSON SDS SCREW	171	2
SOUTHERN YELLOW PINE	0.55	1/4"x3" SIMPSON SDS SCREW	171	2
SPRUCE-PINE-FIR	0.42	1/4"x3" USP WS3 SCREW	147	3
SOUTHERN YELLOW PINE	0.55	1/4"x3" USP WS3 SCREW	160	2
SPRUCE-PINE-FIR	0.42	OLYLOG TLOK04	153	2
SOUTHERN YELLOW PINE	0.55	OLYLOG TLOK04	234	2

JOIST TO PERIMETER - TOE NAIL

LUMBER SPECIES	SPECIFIC GRAVITY(G)	FASTENER	SINGLE SHEAR lbs/fastener	QUANTITY
SPRUCE-PINE-FIR	0.42	0.131"x3" NAIL	61	5
SOUTHERN YELLOW PINE	0.55	0.131"x3" NAIL	79	4
SPRUCE-PINE-FIR	0.42	0.148"x3" NAIL	72	5
SOUTHERN YELLOW PINE	0.55	0.148"x3" NAIL	96	4
SPRUCE-PINE-FIR	0.42	0.162"x3" NAIL	80	4
SOUTHERN YELLOW PINE	0.55	0.162"x3" NAIL	113	3





PFS Test Report

**PFS TEST REPORT #04-83
R & D TESTING
OF
RAFTER-TO-CEILING JOIST
CONNECTORS
FOR
SIGNATURE BUILDING SYSTEMS, INC.
MOOSIC, PENNSYLVANIA**

The rafter connectors described in this report are purchased from Signature Building Systems of PA, LLC.

BY:

**PFS CORPORATION
2402 DANIELS STREET
MADISON, WISCONSIN**



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Calculations—Witnessing—Sampling—Research**

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STRUCTURAL and CONSTRUCTION ADHESIVES

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FASTENERS and CONNECTIONS

Nails, Screws, Staples, Bolts, Connector Plates, Joist Hangers

CORPORATE HEADQUARTERS

2402 Daniels Street
Madison, WI 53718
608.221.3361
Fax: 608.223.5560
Michael J. Slifka, PE
mslifka@pfscorporation.com
James A. Rothman, PE
jrothman@pfscorporation.com

NORTHEASTERN REGION

2877 Skatetown Road
Bloomsburg, PA 17815
570.784.8396
Fax: 570.784.5961
Richard L. Wenner, PE
rwenner@pfscorporation.com

MIDWEST REGION/LABORATORY

2402 Daniels Street
Madison, WI 53718
608.224-5520
Fax: 608.221.2084
Ronald H. Reindl, AIA
rreindl@pfscorporation.com

WESTERN REGION

3637 Motor Avenue, Suite 380
Los Angeles, CA 90034
310.559.7287
310.559.1368
J. Robert Nelson, PE
nelson@pfscorporation.com

SOUTHCENTRAL REGION

9550 Skillman Street, Suite 515
Dallas, TX 75243
214.221.5585
Fax: 214.221.5589
James M. Hopland, PE
jimhopland@pfscorporation.com

SOUTHEASTERN REGION

6608 Six Forks Road, Suite 201
Raleigh, NC 27615
919.845.8450
Fax: 919.845.8454
Larry A. Beineke, PE, PhD
lbeineke@pfscorporation.com



PFS Corporation

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Headquarters

2402 Daniels Street
Madison, WI 53718

Phone: 608.221.3361
Fax: 608.223.5560

Website

www.pfscorporation.com

Michael J. Slifka, PE

President
mslifka@pfscorporation.com

James A. Rothman, PE

Executive Vice President
Senior Vice President, QC
jrothman@pfscorporation.com

Regional Offices

Northeast

Bloomburg, PA
570.784.8396

South Central

Dallas, TX
214.221.5585

Western

Los Angeles, CA
310.559.7287

Midwest

Madison, WI
608.221.3361

Southeast

Raleigh, NC
919.845.8450

Sales Office

Mentone, AL
256.634.4071

PFS Test Report: #04-83

Test Dates: 11/17 – 12/7/04

Report Date: 12/7/04

Page 1 of 7

**PFS TEST REPORT #04-83
R & D TESTING
OF
RAFTER-TO-CEILING JOIST CONNECTORS
FOR
SIGNATURE BUILDING SYSTEMS, INC.
MOOSIC, PENNSYLVANIA**

GENERAL

PFS Corporation in Madison, Wisconsin, performed R & D testing of rafter-to-ceiling joist connectors for the client, Signature Building Systems, Inc., Moosic, Pennsylvania. PFS Laboratory performed the tests in accordance with the procedures described in NTA Test Report #SB101003-10 issued December 31, 2003. A subcontractor performed the mechanical properties testing on client identified and submitted sheet steel coupons. The coupons were reportedly taken from the same steel stock used for the manufacturing of the test connector. The PFS Laboratory received the test connectors on September 2, the steel coupons on October 19, and the test fasteners on November 15, 2004. The testing was performed from November 17th, through December 7, 2004.

DESCRIPTION OF TEST SPECIMENS

The hanger provided for testing is a metal connector plate for joining a ceiling joist ("header") to a roof rafter ("joist") at the eave. The plates have 12 pre-formed holes, 6 on each side of the hanger, to permit attachment to the header member using client identified and submitted nails (see detail drawing). A 5/8-in. diameter hole was provided at the joist connection to allow for use of a single bolt in double shear. The hanger is designed to transmit shear forces, in all directions, in plane with the header/joist assembly. Furthermore, the bolted connection provides a hinge point for the joist member; allowing the joist to be rotated in the plane of the connector. It should be noted that each "Test B" specimen was assembled with a gap of approximately 1/8-inch between the joist and the hanger.

The manufacturer of the hanger was not specified and the hangers were not imprinted to identify the manufacturer or the hanger model. The hanger was formed from No. 16 gage (.058-in) galvanized steel, which is ASTM A 653 Grade 40, structural-quality steel with a minimum yield strength of 41 ksi.

In this investigation, header and joist members were comprised of 2X6 #2 Spruce Pine-fir (SPF) lumber. All lumber was conditioned to moisture content between 17 and 20 percent at the time of construction and testing. The hanger was tested in two directions, designated as Test A and Test B as indicated in tables and photos. Test A applied the test load parallel to the header, whereas in Test B the test load was applied perpendicular to the header. The hangers were fastened to the rafter and joist members as indicated in Table 1.

DESCRIPTION OF TEST SPECIMENS (Cont.)

Hanger Fastening Schedule

Location	Fastener	Quantity
Hanger-to Hanger (fixed)	0.148-dia. x 1.5-in. Galvanized Nail	12 (6 per side)
Hanger-to-Joist (hinged)	½ x 2.75-in. Galvanized Bolt with standard washer under bolt head and nut (2 washers)	1

TABLE 1

TEST PROCEDURE

The procedures were in accordance with the procedures described in NTA Test Report #SB101003-10 issued December 31, 2003. The setup was designed such that when a specimen was inserted into the test machine, the top of the header is level and the sides are vertical. And, except for the restraint provided by the hanger, the joist member is unrestricted in vertical movement. Three replicate specimens were tested in each configuration. All bolts used in loading and securing the specimens were ½-inch diameter with sufficient length to exclude the threads from the shear plane.

A linear voltage deflection transducer (LVDT), capable of reading to 0.001-inch, was used for the measurement of the joist displacement with respect to the header. The LVDT was positioned parallel to the direction of the applied load, with the gauge fixed to the header and aligned with the center of the joist member. The force was applied with a universal test machine at a continuous rate of 0.05-in./minute. Force and deflection data was monitored and recorded with an electronic data acquisition system continuously throughout the test.

A pre-load of 10% of the estimated ultimate load, was applied to the joist to seat the test assembly. The pre-load was removed, the gauges were zeroed and the amount of pre-load was recorded.

(See Photos 1 –4 and Tables 2 – 3 for Results)

Mechanical Properties

Anderson Laboratory, Inc., of Greendale, WI an A2LA accredited laboratory (#711.01 & #711.02), conducted the mechanical properties tests according to ASTM E8-04, "Standard Test Method for Tension Testing of Metallic Materials." Two (2), test specimens were prepared from nominal, 3-in wide-by-9-in. long pieces of 16 ga. steel. *(See Table 4 for Results)*

Specific Gravity and Moisture Content

Moisture content was determined according to ASTM D 4442-92 (97) Method B. Companion wood specimens were cut from each piece of test lumber within 12-in. of the hanger connection.

TEST RESULTS

The results for each specimen are provided in Table 2. The results include the ultimate load, as well as the load corresponding to 1/8-in. deflection of the joist with respect to the header. Similar results were observed in all specimens under a given loading condition. Additionally, the observed mode of failure was the same in all specimens, which occurred when the metal began to tear at the transition, or notch, where the hanger metal is bent in opposite direction. See photo 2.

TEST RESULTS (Cont.)

Moisture Content, Specific Gravity

Average moisture content at time of testing was 18% and average specific gravity was 0.40 respectively.

Specimen #	Pre-load (lbf)	Ultimate Load (lbf)	Deflection Load at 1/8-in. (lbf)	Moisture Content (%)	Failure Mode
1	50	489	174	18	Tearing of metal at transition
2		467	154	20	Tearing of metal at transition
3		492	139	17	Tearing of metal at transition
Average	50	483	156	18	

TABLE 2, Lateral Test (A)

Specimen #	Pre-load (lbf)	Ultimate Load (lbf)	Deflection Load at 1/8-in. (lbf)	Moisture Content (%)	Failure Mode
1	100	965	351	17	Tearing of metal at transition
2		1044	316	17	Tearing of metal at transition
3		982	381	19	Tearing of metal at transition
Average	100	997	349	18	

TABLE 3, Uplift Test (B)

ASTM E8 Steel Coupons

16GA Steel		
Specimen #	1	2
Original Dimension, (in.)	0.0577 x .502	0.0573 x .504
Original Area, (sq. in.)	0.290	0.289
Yield, (psi)	49,059	50,625
Yield Method	2% offset	2% offset
Tensile, (psi)	56,032	56,061
Elongation, (%)	35.00	35.00
Gauge Length (in.)	2	2

TABLE 4

TEST RESULTS (Cont.)

MOISTURE CONTENT & SPECIFIC GRAVITY

Specimen #	Initial Wt. (g)	Oven Dry Wt. (g)	Length (in.)	Width (in.)	Thickness (in.)	Moisture Content (%)	Specific Gravity
A1	46.81	39.05	2.005	1.995	1.527	19.9	0.39
A2	50.04	41.78	2.011	1.998	1.543	19.8	0.41
A3	50.63	42.08	2.009	2.003	1.541	20.3	0.41
Average						20.0	0.40
B1	48.08	40.65	2.006	1.974	1.536	18.3	0.41
B2	50.70	42.33	2.012	2.008	1.523	19.8	0.42
B3	47.87	40.53	2.008	2.022	1.541	18.1	0.39
Average						18.7	0.41

TABLE 5

The results were assessed for compliance with the IBC and IRC, as described in ICC-ES AC13. Accordingly, the allowable load from the test results shall be the lowest values determined by the following: (*See Table 6*)

1. The lowest ultimate test load from any test divided by three (where three tests are conducted and each ultimate vertical load does not vary by more than 20-percent).
2. The average ultimate test load for all tests divided by 6 (where six or more tests are conducted).
3. The average load at which the movement of the joist with respect to the header is 0.125 inches in any test.

CONCLUSION

PFS Corporation assessed the strength of truss hinge plates provided by Signature Building Systems, Inc. of Moosic, Pennsylvania. The hanger was tested for direct load capacity in two directions. These values are presented in Table 6, below.

It is important to note that the allowable design load must also not exceed the allowable design load for nails or other fasteners utilized to secure the joist hanger to the wood member. Furthermore, the allowable design load for the wood members forming the connection cannot be exceeded.

RESULT SUMMARY

Specimen	Test Direction	Allowable Test Load (lbf)
Signature Building Systems 16-Ga. Truss Hinge Connector Attached as described herein	A (lateral)	156 (Criteria 3.)
	B (uplift)	322 (Criteria 1.)

TABLE 6

TEST REPORT DUPLICATION

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Report Reviewed by:



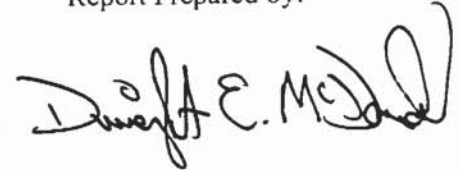
James P. Van Schoyck
Lab Administrator

Report Reviewed by:



Jon P. Madderom, P.E.
Staff Engineer

Tests Witnessed by and
Report Prepared by:



Dwight E. McDonald
Lab Testing Manager



PHOTO 1: Test A, Lateral Test Specimen/Test Setup



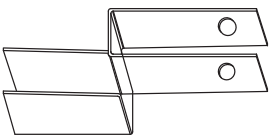
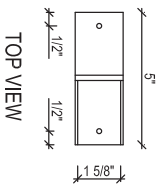
PHOTO 2: Test A, Typical Failure



PHOTO 3: Test B, Uplift Test Specimen/Test Setup

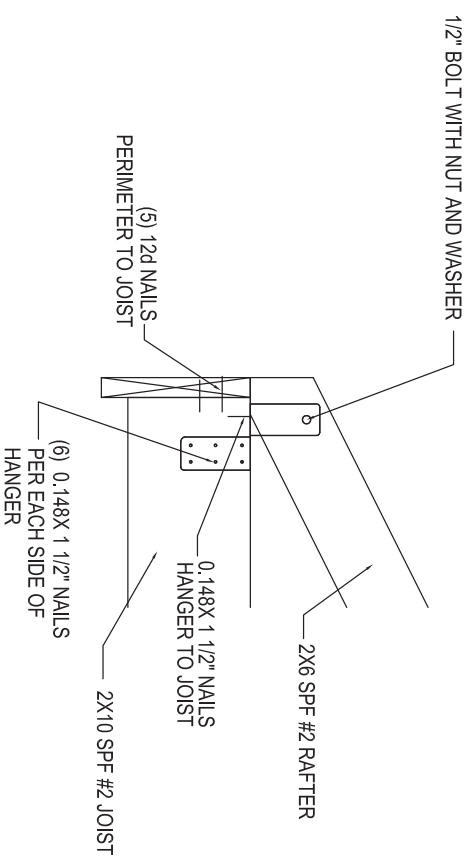


PHOTO 4: Test B, Typical Failure



HANGER DETAIL

INSTALLATION DETAIL



PROJECT NAME:		BUILDER:					
PROJECT SITE:		ADDRESS:		PROJ. ID #:		SHEET #	
				SERIAL #:		DWN. BY:	
						CHECKED BY:	
						DATE:	
REVISIONS							
DWN BY	#	DATE					
<i>Signature Building Systems Inc.</i> 1004 SPRINGBROOK AVENUE, MOOSIC, PA 18607 tel. (570) 774-1000 Fax. (570) 774-1010							

Signature Building Systems Inc.
1004 SPRINGBROOK AVENUE, MOOSIC, PA 18607
tel. (570) 774-1000 Fax. (570) 774-1010



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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

SECTION: 06 17 33—WOOD I-JOISTS

REPORT HOLDER:

APA—THE ENGINEERED WOOD ASSOCIATION

**7011 SOUTH 19TH STREET
TACOMA, WASHINGTON 98466**

EVALUATION SUBJECT:

PERFORMANCE RATED I-JOISTS



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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 17 33—Wood I-joists

REPORT HOLDER:

APA—THE ENGINEERED WOOD ASSOCIATION
7011 SOUTH 19TH STREET
TACOMA, WASHINGTON 98466
(253) 565-6600
www.apawood.org
help@apawood.org

EVALUATION SUBJECT:

PERFORMANCE RATED I-JOISTS

ADDITIONAL LISTEES:

EACOM TIMBER CORPORATION
1195 PEOPLES ROAD
SAULT STE. MARIE, ONTARIO P6C 3W7
CANADA

BOISE CASCADE WOOD PRODUCTS, LLC
POST OFFICE BOX 2400
WHITE CITY, OREGON 97503-0400

INTERNATIONAL BEAMS
240 SOUTH PINEAPPLE AVENUE, SUITE 510
SARASOTA, FLORIDA 34236

NORDIC STRUCTURES
1100 DE LA GAUCHETIERE STREET WEST, SUITE 504
MONTREAL, QUEBEC H3B 2S2
CANADA

ROSEBURG FOREST PRODUCTS
POST OFFICE BOX 1088
ROSEBURG, OREGON 97470

STARK TRUSS COMPANY, INC.
6855 CHESTNUT RIDGE ROAD NW
BEACH CITY, OHIO 44608

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code*® (IBC)

- 2015, 2012 and 2009 *International Residential Code*® (IRC)

Properties evaluated:

- Structural
- Fire resistance

2.0 USES

The prefabricated wood I-joists described in this report are used as floor joists, roof rafters and blocking to support code-required loads. The wood I-joists comply with Section 2303.1.2 of the IBC; and Section R502.1.2 of the 2015 IRC and Section R502.1.4 of the 2012 and 2009 IRC, for allowable stress design.

3.0 DESCRIPTION

3.1 General:

The prefabricated wood I-joists described in this report comply with the “PRI-400 Performance Standard for APA EWS I-joists,” dated April 2012, for the performance rating of prefabricated, performance-rated I-joists (PRI) used in floors of residential construction. The standard is promulgated by APA—The Engineered Wood Association. The standard complies with the requirements of the codes specifically referenced in Section 1.0 of this report, and with ASTM D5055 and the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14). PRI-400 also complies with the code sections referenced in Section 2.0 of this report.

3.2 Materials:

3.2.1 Flanges: The flanges are sawn lumber or structural composite lumber (SCL), with both flanges having a minimum net width and thickness of 1½ inches (38 mm), except the minimum flange thickness can be 1⅝ inches (33.3 mm) for structural composite lumber. The structural composite lumber used as flanges are recognized in an ICC-ES evaluation report issued to the manufacturer of the structural composite lumber, or are recognized in the ICC-ES evaluation report issued to the I-joist manufacturer. The structural composite lumber has a minimum equivalent specific gravity of 0.42, as it relates to fastener capacity. Sawn lumber flanges have a minimum specific gravity of 0.42. The top flange is the same size, type, grade and species as the bottom flange.

3.2.2 Webs: The webs have a minimum thickness of ⅜ inch (9.5 mm) and are Exposure 1, exterior-grade, plywood or oriented strand board panels, and comply with DOC PS-1 or DOC PS-2.

3.2.3 Adhesive: The webs are adhered to the flanges with exterior-type adhesive complying with ASTM D2559 and Section 5.4.3 of ASTM D5055.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Designed installations of the I-joists must be based on the allowable design properties in Table 1. Holes in webs of joists must comply with Figure 1 and Table 2. Where required by Table 1 and the notes to Figure 2, web stiffeners at joist supports must comply with Figure 2.

4.2 Installation:

4.2.1 General: I-joists produced by manufacturers listed in this report, or those complying with the requirements of PRI-400 and recognized in a separate ICC-ES evaluation report issued to the I-joist manufacturer, must be installed in accordance with this report. The separate evaluation report issued to the I-joist manufacturer must indicate the I-joists have been evaluated for compliance with this report, and that they are to be installed in accordance with this evaluation report and the separate report.

The I-joist properties in this evaluation report are based on I-joists installed such that the in-service moisture content of the joists does not exceed 16 percent.

The compression flange of the joists must have continuous lateral support. In single-span, simply supported conditions, the compression flange is the top flange of the joist, and lateral support is normally provided by the floor sheathing attached to the top flange. Lateral support for the I-joist bottom flange must be provided at interior supports of multiple-span joists, and the support adjacent to the unsupported end of cantilevered joists.

The ends of joists must be restrained to prevent rollover. This restraint is normally provided by diaphragm sheathing attached to the top flange and to an end wall or a shear-transfer panel capable of transferring a force of 50 pounds per foot (730 N/m). Blocking with equivalent strength is permitted to be used.

Concentrated loads in excess of 1,500 pounds (6672 N), applied to the top flange of the I-joist, require installation of web stiffeners in accordance with Figure 2, except the gap must be at the bottom flange. Blocking or squash blocks must be installed where concentrated loads occur at I-joist supports.

Spacing for nails installed in sawn lumber flanges of I-joists must be sufficient to prevent splitting of the wood. Allowable loads for nails in solid-sawn-lumber flanges must be in accordance with the allowable loads specified in the applicable code for spruce-pine-fir with a specific gravity of 0.42.

Spacing for nails installed in SCL flanges of joists must be sufficient to prevent splitting of the wood. Allowable loads for nails installed in SCL flanges must be in accordance with those in the applicable code for solid-sawn lumber with a specific gravity of 0.42. Fastener type and fastener penetration into the top flange of the I-joist, for fasteners attaching subfloor sheathing or combination subfloor/underlayment to the I-joist, must comply with the requirements of the applicable code. For engineered design, the designer must specify the proper I-joist designation and flange configuration to match the calculation assumptions.

4.2.2 One-hour Fire-resistive Floor-ceiling Assemblies: I-joists produced by manufacturers listed in this report, or complying with the requirements of PRI-400 and recognized in a separate ICC-ES evaluation report issued

to the I-joist manufacturer, may be used as wood structural framing members in one-hour fire-resistive floor-ceiling assemblies when the assemblies are constructed in accordance with Sections 4.2.2.1 through 4.2.2.4 of this report.

4.2.2.1 Assembly 1: The assembly must be as described in Figure 3.

4.2.2.2 Assembly 2: The I-joists are permitted to be used in lieu of the wood joists or trusses in the one-hour floor-ceiling assemblies described in ICC-ES evaluation report [ESR-1338](#), and described in item 21-1.1 of 2015 and 2012 IBC Table 721.1(3) and 2009 IBC Table 720.1(3). Minimum flange dimensions for the joists are 1.5 inches (38 mm) for width and $1\frac{5}{16}$ inches (33 mm) for thickness. The thickness of wood structural panels for the floor must not be less than $\frac{1}{2}$ inch (12.7 mm), nor less than required by the applicable code.

4.2.2.3 Assembly 3: The assembly must consist of a single-layer floor of minimum $\frac{3}{4}$ -inch (19.1 mm) tongue-and-groove plywood, or minimum $\frac{23}{32}$ -inch (18.3 mm) tongue-and-groove APA wood structural panels (exposure 1 or exterior-grade), conforming to DOC PS-1 or PS-2, or an ICC-ES evaluation report, with I-joists spaced up to 24 inches (610 mm) on center; and a ceiling of two layers of $\frac{1}{2}$ -inch-thick (12.7 mm), Type C gypsum board [two layers of $\frac{5}{8}$ -inch-thick (15.9 mm), Type X gypsum board must be used for installations using I-joists flanges smaller than $1\frac{1}{2}$ by $1\frac{3}{4}$ inches (38 by 44.5 mm)] applied to the bottom chord. Minimum flange dimensions of the I-joists are $1\frac{5}{16}$ inches by $1\frac{1}{2}$ inches (33 mm by 38 mm).

The floor sheathing must be installed in accordance with code requirements or with applicable ICC-ES evaluation reports, with all butt joints located on framing members.

The first layer of gypsum board must be attached with $\frac{5}{8}$ -inch-long (41.3 mm), Type W screws spaced up to 12 inches (305 mm) on center. The second layer of gypsum board must be installed with the joints staggered from the first layer and must be fastened with 2-inch-long (51 mm) [$2\frac{1}{4}$ inches (57 mm) long for $\frac{5}{8}$ -inch (15.9 mm) gypsum board], Type W screws spaced up to 12 inches (305 mm) on center in the field and up to 8 inches (203 mm) on center at the butt joints. Type G screws, $1\frac{1}{2}$ inches (38 mm) long [$1\frac{3}{4}$ inches (44.5 mm) long for $\frac{5}{8}$ -inch (15.9 mm) gypsum board], must be spaced up to 8 inches (203 mm) on center and up to 6 inches (152 mm) each side of the butt joint. The second layer must be finished with joint tape and compound.

Resilient channels are permitted to be used as part of the ceiling attachment system, provided they are spaced up to 16 inches (406 mm) on center. The resilient channels are permitted to be spaced up to 24 inches (610 mm) on center, if I-joists are spaced up to 16 inches (406 mm) on center. The channels are fastened perpendicular to joists with 1-inch-long (25.4 mm), case-hardened-steel, 0.15-inch-diameter-shank (0.38 mm), self-drilling, self-tapping, Phillips-head screws. The ceiling must be attached to the resilient channels as described above, except 1-inch (25.4 mm), Type S screws and $1\frac{5}{8}$ -inch (41.3 mm), Type S screws must be used for the first and second layers, respectively, spaced at up to 12 inches (305 mm) on center.

When used as a roof-ceiling assembly, the decking is permitted to be any wood deck specified in the code, and the I-joist spacing is permitted to exceed 24 inches (610 mm) on center. However, when the I-joist spacing exceeds 24 inches (610 mm), the ceiling attachment system, including the resilient channels, must be applied to

stripping spaced up to 24 inches (610 mm) on center. The attachment to the stripping is similar to the previously described attachment to the joists. The stripping must be either nominal 2-by-4-inch, construction-grade Douglas fir lumber [for spans of up to 5 feet (1524 mm)] attached to the bottom chord with two 10d box nails, or material and attachment of equivalent strength.

4.2.2.4 Other Fire-resistive Assemblies: The I-joists described in this report may be used in the assemblies described in 2015 and 2012 IBC Table 721.1(3) and 2009 IBC Table 720.1(3), Item Numbers 23-1.1 through 28.1.1, and Item Number 30-1.1 (2015 IBC only), provided the I-joists used meet the criteria described in the table's "Floor or Roof Construction" column. For the purposes of the minimum flange area requirement of 2.3 square inches (1480 mm²) in Item Number 23-1.1, a 1½-by-1½-inch (38 mm by 38 mm) flange having a cross-sectional area of 2.25 square inches (1450 mm²) may be considered sufficient.

4.3 Fire Protection of Floors:

The I-joists described in this report, when installed and protected as specified in Figure 4, meet the provisions of 2015 IRC Section R302.13 and 2012 IRC Section R501.3. The I-joists described in this report, when installed and protected as specified in Figures 5 through 9, are alternatives to the 2-by-10 dimensional lumber prescribed in 2015 IRC Section R302.13 and 2012 IRC Section R501.3 Exception 4, and have met the requirements for a floor assembly demonstrating equivalent floor performance.

5.0 CONDITIONS OF USE

The Performance Rated I-joists described in this report comply with, or are a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The I-joists must be produced by a manufacturer listed in this report or must be evaluated in a current ICC-ES evaluation report issued to the I-joist manufacturer.
- 5.2 The design and installation must comply with this report and the wood design provisions noted in the applicable edition of the NDS referenced in the applicable code.
- 5.3 Drawings and design calculations demonstrating compliance with this report must be submitted to the building official. The drawings and calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4 No cutting of I-joist flanges is permitted.
- 5.5 The I-joists must be produced at the manufacturing plants noted in Table 3, under a quality-control program with inspections by ICC-ES and APA—The Engineered Wood Association (AA-649).

6.0 EVIDENCE SUBMITTED

- 6.1 PRI-400 Performance Standard for APA—EWS I-joists, dated April 2012.
- 6.2 Data verifying compliance with the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14), dated October 2013 (Editorially revised January 2016).
- 6.3 Vertical uniform load transfer data in accordance with Section 3.2 of the ICC-ES Acceptance Criteria for Rim Board Products (AC124), dated February 2015 (Editorially revised January 2016).
- 6.4 Reports of fire tests conducted in accordance with ASTM E119.

7.0 IDENTIFICATION

The I-joists must be identified by a stamp indicating the product designation, the evaluation report number (ESR-1405), the manufacturer's name, and the name and logo of the inspection agency (ICC-ES and APA—The Engineered Wood Association).

TABLE 1—DESIGN PROPERTIES FOR APA EWS PERFORMANCE-RATED I-JOISTS¹

JOIST DEPTH (in)	JOIST SERIES	EI ⁽²⁾ x10 ⁶ (lbf-in ²)	M _r ⁽³⁾ (lbf-ft)	V _r ⁽⁴⁾ (lbf)	R _r ⁽⁵⁾ (lbf)					VLC ⁽⁸⁾ (lbf/ft)	K ⁽⁹⁾ x10 ⁶ (lbf)
					Intermediate Reaction ⁽⁶⁾	End Reaction ⁽⁷⁾					
						1 ³ / ₄ " Bearing		4" Bearing			
						Web Stiffeners?					
No	Yes	No	Yes								
9 ¹ / ₂ "	PRI-20	132	2,520	1,120	1,700	830	830	1,120	1,120	2,000	4.94
	PRI-30	159	3,225	1,120	1,905	945	945	1,120	1,120	2,000	4.94
	PRI-40	184	2,735	1,120	2,160	1,080	1,080	1,120	1,120	2,000	4.94
	PRI-50	186	3,800	1,120	2,040	1,015	1,015	1,120	1,120	2,000	4.94
	PRI-60	219	3,780	1,120	2,160	1,080	1,080	1,120	1,120	2,000	4.94
11 ⁷ / ₈ "	PRI-20	225	3,265	1,420	1,700	830	830	1,420	1,420	2,000	6.18
	PRI-30	271	4,170	1,420	1,905	945	945	1,420	1,420	2,000	6.18
	PRI-40	313	3,545	1,420	2,500	1,200	1,200	1,420	1,420	2,000	6.18
	PRI-50	316	4,915	1,420	2,040	1,015	1,015	1,420	1,420	2,000	6.18
	PRI-60	371	4,900	1,420	2,500	1,200	1,200	1,420	1,420	2,000	6.18
	PRI-70	416	6,595	1,420	2,335	1,160	1,160	1,420	1,420	2,000	6.18
	PRI-80	518	6,940	1,420	2,760	1,280	1,280	1,420	1,420	2,000	6.18
	PRI-90	571	8,770	1,925	3,355	1,400	1,400	1,885	1,925	2,000	6.18
14"	PRI-40	459	4,270	1,710	2,500	1,200	1,200	1,550	1,710	2,000	7.28
	PRI-50	463	5,860	1,710	2,040	1,015	1,015	1,550	1,710	2,000	7.28
	PRI-60	544	5,895	1,710	2,500	1,200	1,200	1,550	1,710	2,000	7.28
	PRI-70	609	7,865	1,710	2,335	1,160	1,160	1,550	1,710	2,000	7.28
	PRI-80	756	8,360	1,710	3,020	1,280	1,280	1,550	1,710	2,000	7.28
	PRI-90	832	10,460	2,125	3,355	1,400	1,400	1,885	2,125	2,000	7.28
16"	PRI-40	625	4,950	1,970	2,500	1,200	1,200	1,550	1,970	2,000	8.32
	PRI-50	630	6,715	1,970	2,040	1,015	1,015	1,550	1,970	2,000	8.32
	PRI-60	739	6,835	1,970	2,500	1,200	1,200	1,550	1,970	2,000	8.32
	PRI-70	826	9,010	1,970	2,335	1,160	1,160	1,550	1,970	2,000	8.32
	PRI-80	1,024	9,690	1,970	3,020	1,280	1,280	1,550	1,970	2,000	8.32
	PRI-90	1,126	11,985	2,330	3,355	1,400	1,400	1,885	2,330	2,000	8.32

For SI: 1 ft = 305 mm; 1 inch = 25.4 mm; 1 lbf = 4.448 N.

¹The tabulated values are design values for normal duration of load (10 years). All values, except for EI, VLC and K, are permitted to be adjusted for other load durations in accordance with the NDS. The VLC values must be decreased for permanent loads per the NDS, but are not permitted to be increased for shorter durations.

²Reference design bending stiffness (EI) of the I-joist.

³The reference design moment (M_r) of the I-joist must not be increased by any repetitive member use factor.

⁴Reference design shear (V_r) of the I-joist.

⁵The reference design reactions (R_r), after being adjusted by the load duration factor, C_D, must meet the following requirement:

$$R_r(C_D) \leq F_{c\perp}(C_b)(b_{brg})(L_{brg})$$

Where: F_{c⊥} = Reference compression design value perpendicular to grain (lbf/in²). Use the lesser of the F_{c⊥} for the I-joist flange (refer to manufacturer) or the F_{c⊥} for the supporting member.

C_b = Bearing area factor as defined in Section 3.10.4 of the NDS, if applicable.

b_{brg} = Bearing width of the I-joist (in). Typically equal to the flange width minus 0.15 inch edge easing (refer to manufacturer).

L_{brg} = Bearing length of the I-joist (in).

⁶Intermediate reaction design values are based on a minimum bearing length of 3¹/₂ inches, without web stiffeners.

⁷Interpolation of end reaction design values between tabulated bearing lengths is permitted, with or without bearing stiffeners.

⁸Vertical load capacity (VLC), for transfer of vertical uniform loads when I-joists are used as continuously-supported blocking.

⁹Deflection calculations must account for shear deformation, using the tabulated reference shear stiffness coefficient (K). For example, deflections of I-joists under uniform load or center-point load in simple-span applications are calculated as follows:

$$\text{Uniform Load: } \delta = \frac{5\omega\ell^4}{384EI'} + \frac{\omega\ell^2}{K'}$$

$$\text{Center-Point Load: } \delta = \frac{P\ell^3}{48EI'} + \frac{2P\ell}{K'}$$

Where: δ = Calculated deflection at center span (inches).

EI' = Bending stiffness, adjusted per NDS Section 7.3 (lbf-in²).

K' = Shear stiffness coefficient, adjusted per NDS Section 7.3 (lbf).

ℓ = Design span (inches)

ω = Uniform load (lbf/in).

P = Center point load (lbf).

Rules for cutting holes in the webs of PRI Joists:

1. The distance between the inside edge of the support and the centerline of any hole must be in compliance with the requirements of Table 2.
2. I-joist top and bottom flanges must NEVER be cut, notched, or otherwise modified.
3. Whenever possible, field-cut holes should be centered vertically along the depth of the web.
4. The maximum size hole that can be cut into an I-joist web must equal the clear distance between the flanges of the I-joist minus $\frac{1}{4}$ inch. A minimum of $\frac{1}{8}$ inch should always be maintained between the top or bottom of the hole and the adjacent I-joist flange.
5. The sides of square holes or longest sides of rectangular holes must not exceed three fourths of the diameter of the maximum round hole permitted at that location.
6. Where more than one hole is necessary, the distance between adjacent hole edges must exceed twice the diameter of the largest round hole or twice the size of the largest square hole (or twice the length of the longest side of the longest rectangular hole) and each hole must be sized and located in compliance with the requirements of Table 2.
7. Knockouts may be utilized anywhere they occur, and may be ignored for purposes of calculating minimum distances between holes.
8. A maximum $1\frac{1}{2}$ -inch-diameter hole can be placed anywhere in the web (including along cantilevered spans) provided that it meets the requirements of 6 above.
9. Except for factory knockouts and maximum $1\frac{1}{2}$ -inch-diameter holes (see note 8 above), the near edge of web holes must be at least 6 inches away from the nearest edge of a reaction (measured horizontally along the I-joist).
10. All holes must be cut in a workman-like manner in accordance with the restrictions listed above and as illustrated in Figure 1.
11. Limit 3 maximum size holes per span.
12. A group of round holes at approximately the same location is permitted if they meet the requirements for a single round hole circumscribed around them.

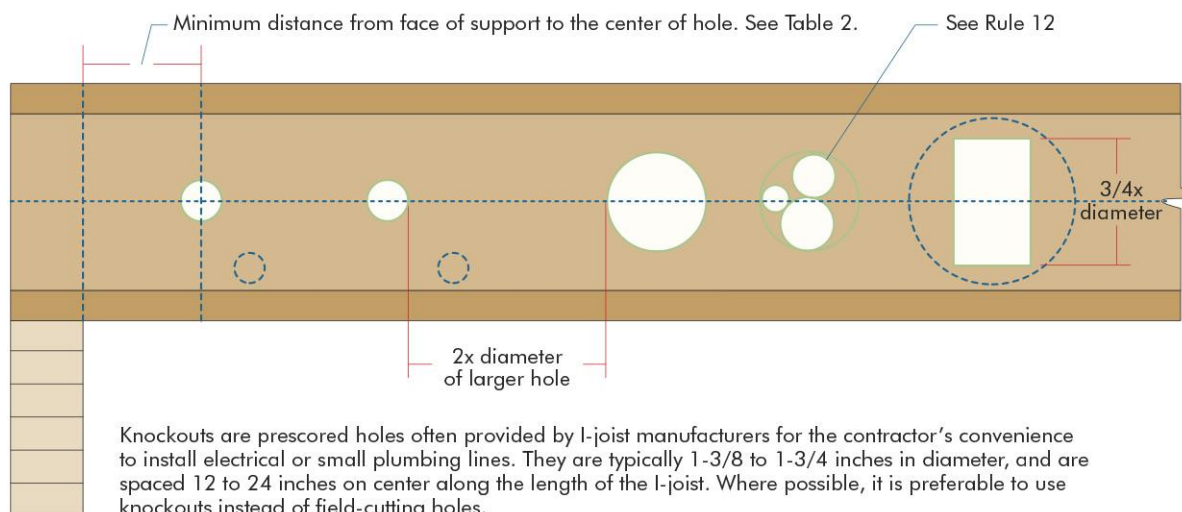


FIGURE 1—TYPICAL HOLES

**TABLE 2—LOCATION OF CIRCULAR HOLES IN PRI JOIST WEBS, SIMPLE OR MULTIPLE SPAN FOR DEAD LOADS
UP TO 10 PSF AND LIVE LOADS UP TO 40 PSF^{1,2,3,4,5}**

JOIST DEPTH (in)	JOIST SERIES	SAF ⁶	MINIMUM DISTANCE FROM INSIDE FACE OF ANY SUPPORT TO CENTER OF HOLE (ft - in.)														
			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 / ₂ "	PRI-20	13'-1"	0'-7"	0'-11"	2'-2"	3'-6"	5'-0"	5'-5"									
	PRI-30	13'-9"	0'-9"	2'-0"	3'-3"	4'-7"	6'-1"	6'-6"									
	PRI-40	14'-4"	0'-7"	1'-8"	3'-0"	4'-4"	5'-9"	6'-3"									
	PRI-50	14'-5"	1'-1"	2'-4"	3'-8"	5'-0"	6'-6"	6'-11"									
	PRI-60	15'-0"	1'-7"	2'-10"	4'-2"	5'-7"	7'-1"	7'-6"									
11 ⁷ / ₈ "	PRI-20	13'-5"	0'-7"	0'-8"	0'-8"	0'-9"	1'-11"	2'-4"	3'-7"	5'-8"	7'-0"						
	PRI-30	15'-0"	0'-7"	0'-8"	0'-8"	1'-9"	3'-4"	3'-9"	5'-0"	6'-10"	8'-0"						
	PRI-40	16'-7"	0'-7"	0'-8"	1'-2"	2'-5"	3'-9"	4'-1"	5'-1"	6'-8"	7'-11"						
	PRI-50	16'-1"	0'-7"	0'-8"	0'-11"	2'-5"	4'-1"	4'-6"	5'-9"	7'-7"	8'-10"						
	PRI-60	17'-10"	0'-7"	1'-9"	3'-0"	4'-4"	5'-9"	6'-1"	7'-2"	8'-9"	9'-10"						
	PRI-70	18'-5"	0'-7"	1'-2"	2'-5"	3'-9"	5'-2"	5'-7"	6'-11"	8'-10"	10'-1"						
	PRI-80	19'-7"	1'-8"	3'-0"	4'-3"	5'-7"	7'-1"	7'-5"	8'-7"	10'-2"	11'-4"						
	PRI-90	20'-2"	0'-7"	0'-8"	1'-1"	2'-9"	4'-6"	5'-0"	6'-5"	8'-5"	9'-9"						
14"	PRI-40	18'-3"	0'-7"	0'-8"	0'-8"	0'-9"	1'-10"	2'-2"	3'-2"	4'-7"	5'-5"	6'-0"	7'-7"	9'-4"			
	PRI-50	16'-1"	0'-7"	0'-8"	0'-8"	0'-9"	0'-9"	1'-0"	2'-5"	4'-4"	5'-7"	6'-5"	8'-7"	10'-5"			
	PRI-60	19'-9"	0'-7"	0'-8"	0'-8"	1'-7"	2'-10"	3'-3"	4'-6"	6'-3"	7'-4"	8'-1"	10'-0"	11'-8"			
	PRI-70	18'-6"	0'-7"	0'-8"	0'-8"	0'-11"	2'-6"	2'-11"	4'-2"	5'-11"	7'-0"	7'-10"	10'-1"	12'-0"			
	PRI-80	22'-2"	0'-7"	1'-9"	3'-0"	4'-4"	5'-8"	6'-1"	7'-1"	8'-7"	9'-7"	10'-3"	11'-11"	13'-5"			
	PRI-90	22'-10"	0'-7"	0'-8"	0'-8"	2'-1"	3'-8"	4'-1"	5'-4"	7'-1"	8'-3"	9'-0"	11'-0"	12'-7"			
16"	PRI-40	19'-8"	0'-7"	0'-8"	0'-8"	0'-9"	0'-9"	0'-10"	1'-5"	2'-9"	3'-7"	4'-1"	5'-6"	6'-7"	7'-0"	8'-9"	10'-9"
	PRI-50	16'-1"	0'-7"	0'-8"	0'-8"	0'-9"	0'-9"	0'-10"	0'-10"	0'-10"	1'-9"	2'-6"	4'-6"	6'-0"	6'-7"	9'-3"	11'-7"
	PRI-60	19'-9"	0'-7"	0'-8"	0'-8"	0'-9"	0'-9"	0'-10"	1'-10"	3'-6"	4'-6"	5'-2"	6'-11"	8'-6"	9'-1"	11'-5"	13'-4"
	PRI-70	18'-6"	0'-7"	0'-8"	0'-8"	0'-9"	0'-9"	0'-10"	1'-0"	2'-11"	4'-1"	4'-10"	6'-11"	8'-7"	9'-1"	11'-6"	13'-5"
	PRI-80	23'-11"	0'-7"	0'-8"	0'-8"	1'-7"	2'-11"	3'-3"	4'-6"	6'-2"	7'-3"	7'-11"	9'-9"	11'-3"	11'-9"	13'-11"	15'-7"
	PRI-90	25'-3"	0'-7"	0'-8"	0'-8"	0'-10"	2'-3"	2'-8"	3'-10"	5'-5"	6'-5"	7'-1"	8'-10"	10'-2"	10'-8"	12'-11"	14'-10"

For SI: 1 ft = 305 mm; 1 inch = 25.4 mm.

¹Tabulated values apply where I-joists are spaced 24 inches on center or less.

²Hole location distance is measured from inside face of supports to center of hole.

³Distances in this chart are based on uniformly loaded joists.

⁴Tabulated values are based on the allowable spans given in PRI-400, which assume the I-joists act compositely with glued and nailed floor sheathing (See APA PRI-400). For multiple-span applications, the lengths of end spans must be at least 40% of the adjacent span length.

⁵Joists with web hole locations and/or sizes that fall outside of the scope of this table must be analyzed based on the actual hole size, joist spacing, span and loading conditions. The I-joist shear capacity at the location of a circular web hole, V_{rh} , is calculated using the following equation: $V_{rh} = \text{Published Shear Value} \times [(\text{Joist Depth} - \text{Hole Diameter}) / \text{Joist Depth}]$.

⁶SAF = Span Adjustment Factor, used as defined below.

OPTIONAL:

Table 2 is based on the I-joists being used at their maximum span. If the I-joists are placed at less than their full allowable span, the minimum distance from the centerline of the hole to the face of any support (D) as given above may be reduced as follows:

$$D_{\text{reduced}} = \frac{L_{\text{actual}}}{\text{SAF}} \times D$$

Where: D_{reduced} = Distance from the inside face of any support to center of hole, reduced for less-than-maximum span applications (ft). The reduced distance must not be less than 6-inches from the face of support to edge of the hole.
 L_{actual} = The actual measured span distance between the inside faces of supports (ft).
 SAF = Span Adjustment Factor given in Table 2.
 D = The minimum distance from the inside face of any support to center of hole from Table 2 above.

If $\frac{L_{\text{actual}}}{\text{SAF}}$ is greater than 1, use 1 in the above calculation for $\frac{L_{\text{actual}}}{\text{SAF}}$.

Requirements for web stiffeners:

1. Wood Structural Panel web stiffeners must be placed on each side of the I-joist web at:
 - a) Hangers with side nailing
 - b) Hangers with a side, which do not support top flanges of I-joist.
 - c) Locations where concentrated loads in excess of 1,500 pounds are applied to the top flange of the I-joist between supports, or in the case of cantilever, anywhere between the cantilever tip and the support.
 - d) At exterior supports in engineered applications where concentrated loads cause exterior reaction loads to exceed 1,550 pounds.
2. Web stiffeners must be made of Utility grade SPF (south) or better for lumber and/or Sheathing grade or better for wood structural panels.

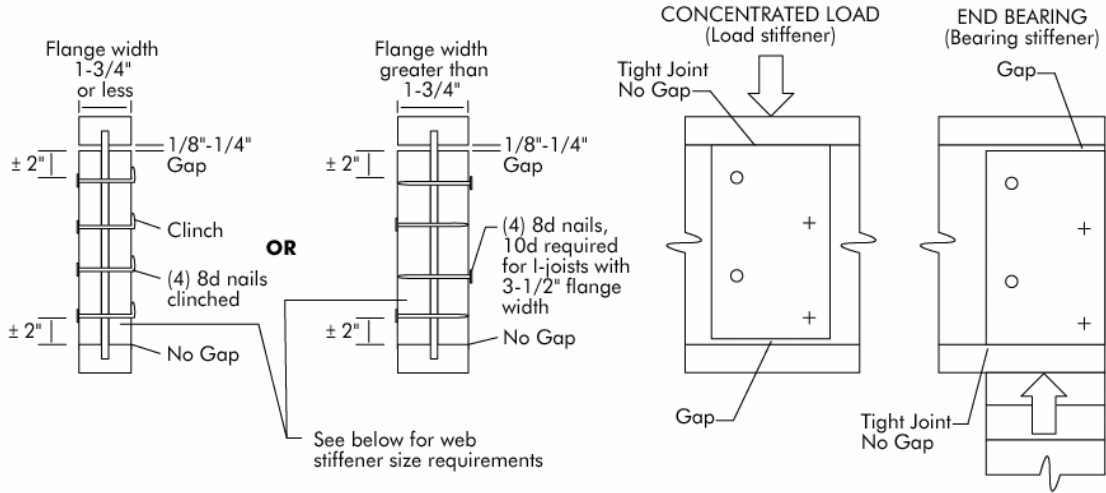


FIGURE 2—PRI I-JOIST WEB STIFFENER CONSTRUCTION DETAILS

Web stiffener size required

I-JOIST FLANGE WIDTH	WEB STIFFENER SIZE REQUIRED ON EACH SIDE OF WEB
1 ¹ / ₂ "	¹⁵ / ₃₂ " x 2 ⁵ / ₁₆ " minimum width
1 ³ / ₄ "	¹⁹ / ₃₂ " x 2 ⁵ / ₁₆ " minimum width
2 ⁵ / ₁₆ "	1" x 2 ⁵ / ₁₆ " minimum width
2 ¹ / ₂ "	1" x 2 ⁵ / ₁₆ " minimum width
3 ¹ / ₂ "	1 ¹ / ₂ " x 2 ⁵ / ₁₆ " minimum width

For SI: 1 inch = 25.4 mm.

TABLE 3—MANUFACTURERS AND THEIR LOCATIONS

MANUFACTURER	LOCATION
EACOM Timber Corporation	1195 Peoples Road, Sault Ste. Marie, Ontario P6C 3W7, Canada
Boise Cascade Wood Products, LLC	1000 North Park Drive, Roxboro, North Carolina 27573 70 Rue Industrielle, St. Jacques, New Brunswick E7B 1T1, Canada
International Beams	480, Rue Jocelyn-Bastille, CP 10, Pohenegamook, Quebec G0L 1J0, Canada 10 Rouse Street, Tillsonburg, Ontario N4G 5W8, Canada
Nordic Structures	521, Chemin Merrill, C.P. 216, Chibougamau, Quebec G8P 2K7, Canada
Roseburg Forest Products	4500 Riddle By-Pass Road, Riddle, Oregon 97469
Stark Truss Company, Inc.	6855 Chestnut Ridge Road NW, Beach City, OH 44608

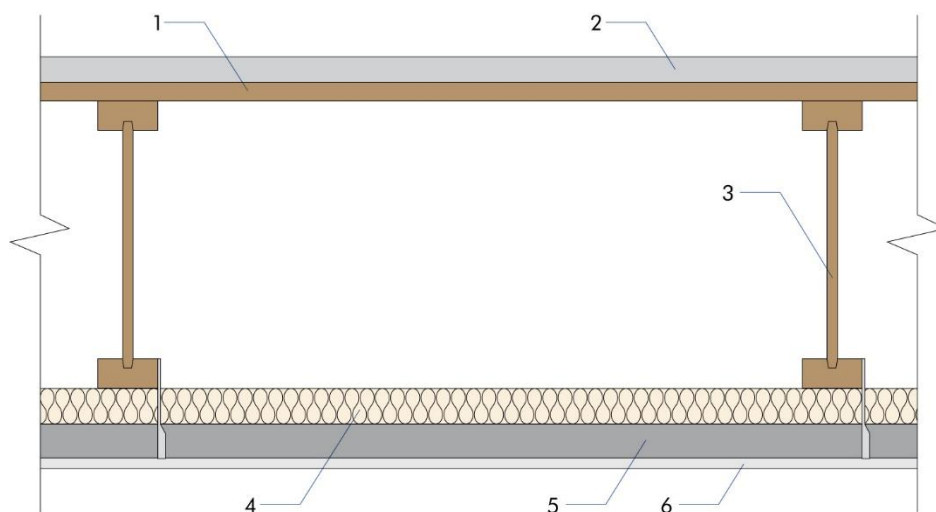
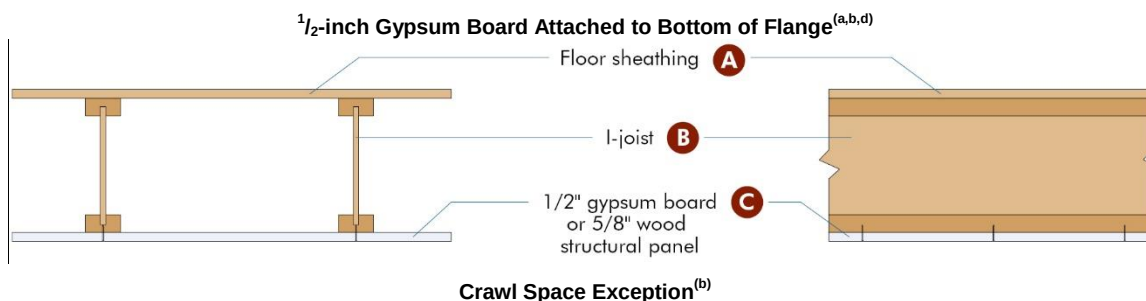
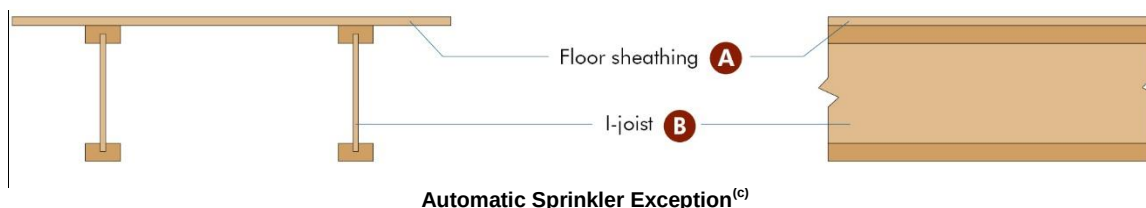


FIGURE 3—ONE-HOUR FIRE-RESISTANCE-RATED FLOOR-CEILING ASSEMBLY (Ceiling—one layer of $\frac{1}{2}$ -inch or $\frac{5}{8}$ -inch gypsum wallboard, attached to furring channels spaced 24 inches on center)

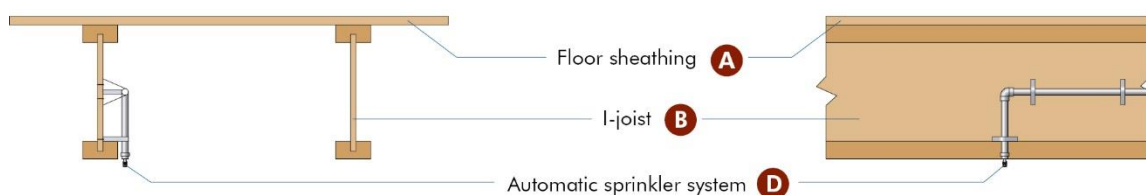
1. Single Floor – APA Rated Sturd-I-Floor wood structural panels (Exposure 1 or Exterior) with tongue-and-groove edges and conforming to APA Standard PRP-108, PS 1 or PS2, with thickness, span rating and fastening in accordance with code requirements or ICC-ES evaluation reports (minimum $\frac{23}{32}$ -inch nominal thickness). Installed with long dimension of panel (strength axis) or face grain of plywood perpendicular to joists with end joints staggered. The panels must be nailed in addition to being glued to framing with construction adhesive conforming to ASTM D3498 (APA Specification AFG-01). The construction adhesive must be applied to the top flanges of I-joists and perimeter framing using a nominal $\frac{1}{4}$ -inch diameter bead of adhesive, with double beads applied where panel end joints butt. A nominal $\frac{1}{4}$ -inch diameter bead of adhesive also is applied in the groove of tongue-and-groove edges of panels before joining panels together.
2. Finish Flooring – Approved lightweight concrete floor topping ($1\frac{1}{2}$ inches) or proprietary gypsum concrete floor topping optional over single floor, installed in accordance with an ICC-ES Evaluation Report. Minimum thickness of gypsum concrete topping is $\frac{3}{4}$ inch with I-joists spaced maximum 19.2 inches on center, or 1 inch with I-joists spaced 24 inches on center.
3. Wood Structural Members – Minimum $9\frac{1}{2}$ -inch deep wood I-joists spaced maximum of 24 inches on center, installed in accordance with requirements of this report. Top and bottom flanges, minimum size $1\frac{1}{2}$ -inch x $2\frac{1}{2}$ -inch LVL or $1\frac{1}{2}$ -inch x $2\frac{1}{2}$ -inch lumber; minimum web thickness $\frac{3}{8}$ inch. Minimum 2 inches bearing on supports. Holes may be cut in web of I-joist as permitted by this report.
4. Insulation – 1-inch-thick unfaced mineral wool batt insulation (minimum 6 pounds per cubic foot density) must be placed under the bottom flange of I-joists and supported on furring channels. Edges of the insulation batts must be tightly buffed against the furring channel support clips and adjoining insulation batts, and ends must be located over furring channels.
5. Furring Channels – Inverted hat-type channels, $\frac{7}{8}$ -inch deep x $2\frac{5}{8}$ -inches wide, formed of minimum 0.021-inch thick (25 gage) galvanized steel. Channels must be installed perpendicular to I-joists in continuous rows spaced 24 inches on center. Channels must be attached to the bottom flange of each I-joist with one support clip (Simpson Strong-Tie Co. Type CSC) at each crossing. Support clips must be nailed to I-joist flange with one 11 gage (0.1205-inch diameter) x $1\frac{1}{2}$ -inch nail. At locations of end joints of gypsum wallboard, install double row of channels, centered $1\frac{1}{2}$ inches from panel ends. Ends of channel must extend a minimum of 6 inches beyond the edge joint of adjoining panels. Channel splices must be centered under the I-joists and overlapped a minimum of 6 inches, and tied together with double strand of No. 18 SWG galvanized steel wire near each end of overlap.
6. Wallboard, Gypsum – Approved $\frac{1}{2}$ -inch or $\frac{5}{8}$ -inch proprietary Type X gypsum wallboard, 48 inches wide, installed perpendicular to furring channels (parallel to I-joists) with end joints continuous or staggered. Fasten to furring channels with 1-inch or $1\frac{1}{8}$ -inch Type S drywall screws spaced 12 inches on center. Drywall screws must be driven so that they are flush with the face and do not damage the core of the wallboard, and must be located $1\frac{1}{2}$ inches from panel ends and a maximum of 6 inches from panel edges. The wallboard must be:
 - National Gypsum Fire-Shield Type C gypsum wallboard,
 - U. S. Gypsum Fire Code C gypsum wallboard.
7. Finishing System (not shown) – Exposed face layer joints must be covered with tape and joint compound, and screw heads must be covered with joint compound.



In accordance with Exception 2 of the 2015 IRC Section R302.13 and 2012 IRC Section R501.3, floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances do not require membrane protection.



In accordance with Exception 1 of the 2015 IRC Section R302.13 and 2012 IRC Section R501.3, floor assemblies located directly over a space protected by an automatic sprinkler system do not require membrane protection.



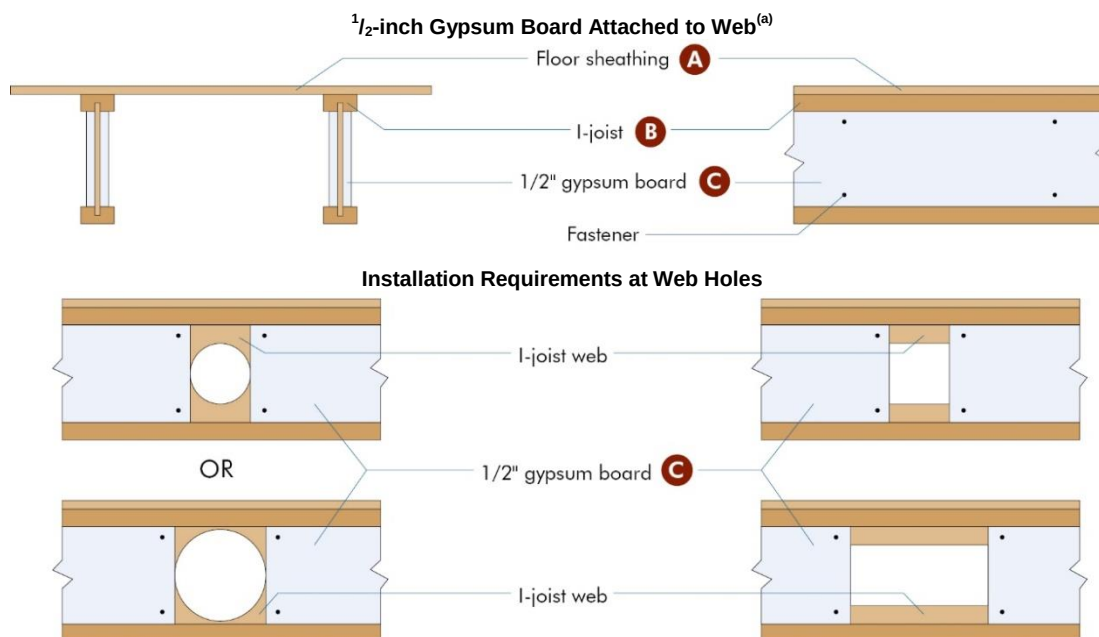
- (A) Floor sheathing: Materials and installation in accordance with 2015 and 2012 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4.0 of this report. Max. 24 inches on center spacing. Applicable to all flange sizes. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA.
- (C) $\frac{1}{2}$ -inch gypsum board: Materials and installation in accordance with 2015 and 2012 IRC Section R702.3.1 or equivalent. 1x3 (nominal) wood furring strips are permitted to be installed perpendicular to the bottom flange of the I-joists at 16 inches on center provided that the gypsum boards are directly attached to the furring strips using 1- $\frac{1}{4}$ -inch (32-mm) Type W drywall screws at 12 inches (305 mm) on center. Gypsum board not required to be finished with tape and joint compound; or $\frac{5}{8}$ -inch wood structural panel: Materials and installation in accordance with 2015 and 2012 IRC Section R503.2 or equivalent. Wood structural panel not required to be finished with wood filler or sanded.
- (D) Automatic sprinkler system: System in accordance with Section P2904 of the 2015 and 2012 IRC, NFPA 13D, or other equivalent sprinkler systems.

Notes: (a) In accordance with Exception 3 of the 2015 IRC Section R302.13 and the 2012 IRC Section R501.3, portions of floor assembly can be unprotected when complying with the following:

- 1) The aggregate area of the unprotected portions shall not exceed 80 square feet.
 - 2) Fire blocking in accordance with 2015 and 2012 IRC Section R302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
- (b) Insulation may be required for energy code compliance purposes. Check with the local building official for specific jurisdictional requirements.
- (c) In accordance with 2015 and 2012 IRC Section P2904, partial residential sprinkler systems are permitted to be installed only when the entire dwelling unit is not required to be equipped with a residential sprinkler system. Check with the local building official for specific jurisdictional requirements.
- (d) Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

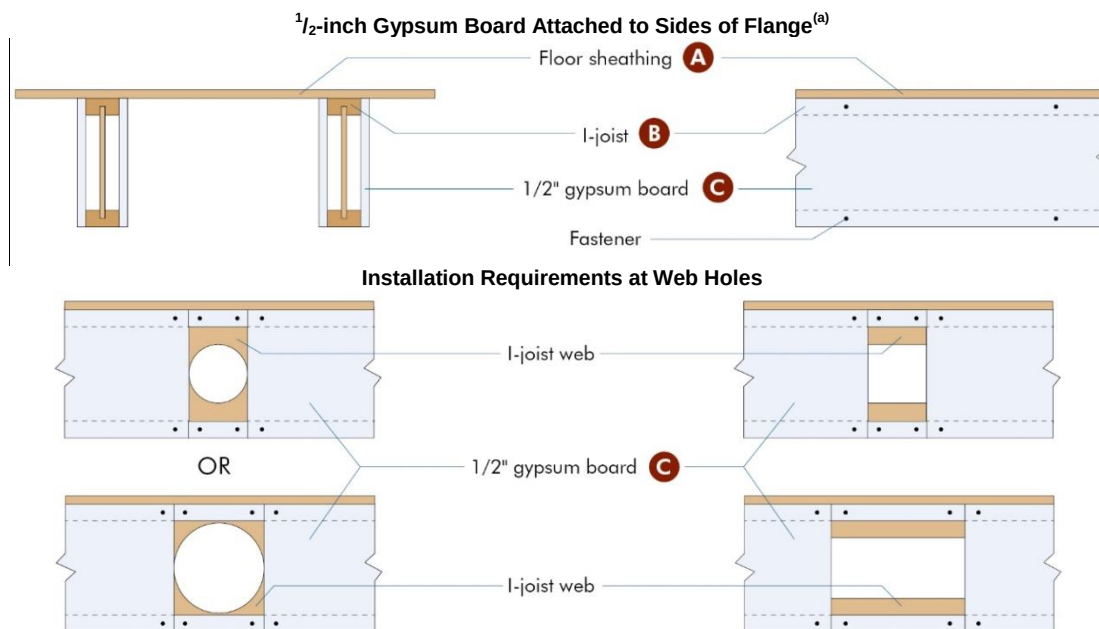
FIGURE 4—2015 AND 2012 IRC FLOOR ASSEMBLY DETAILS

For SI: 1 inch = 25.4 mm



- (A) Floor sheathing: Materials and installation in accordance with 2015 and 2012 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4 of this report. Maximum 24 inches on center spacing. Minimum flange size of $1\frac{1}{2}$ inches thick x 2 inches wide. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA. At hole location, fasteners shall be installed 1 inch from the edge of the gypsum board.
- (C) $\frac{1}{2}$ -inch gypsum board: Materials (entire length of I-joist) in accordance with 2015 and 2012 IRC Section R702.3.1 (not required to be finished with tape and joint compound). Fasteners: Minimum 1-inch screws (Type W or Type S) or nails installed 1 inch from edges and 16 inches on center, top and bottom. Fasteners may be staggered from top to bottom.
- Note: (a) Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

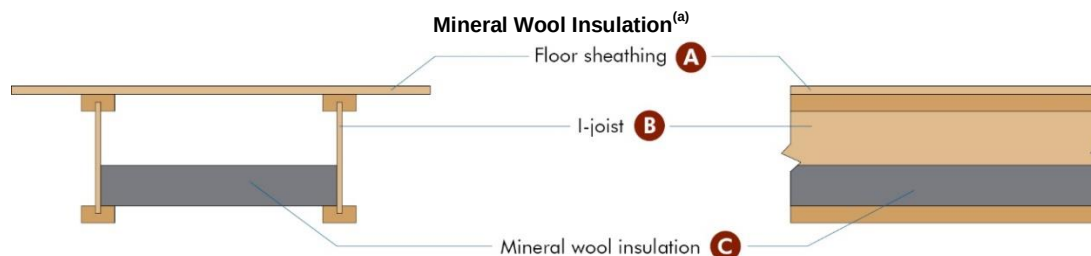
FIGURE 5—FIRE PROTECTION: $\frac{1}{2}$ -INCH GYPSUM BOARD DIRECTLY ATTACHED TO WEB



- (A) Floor sheathing: Materials and installation in accordance with 2015 and 2012 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4.0 of this report. Maximum 24 inches on center spacing. Minimum flange size of $1\frac{1}{8}$ inches thick x $1\frac{3}{4}$ inches wide. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA. At hole location, fasteners shall be installed $\frac{1}{2}$ inch from the edge and 1 inch from the end of the gypsum board. Maximum fastener spacing shall be no more than 8 inches on gypsum board above and below the hole.
- (C) $\frac{1}{2}$ -inch gypsum board: Materials (entire length of I-joist) in accordance with 2015 and 2012 IRC Section R702.3.1 (not required to be finished with tape and joint compound). Fasteners: Minimum 1-inch screws (Type W or Type S) or nails installed 1/2 inch from edges and 1 inch from ends, and 16 inches on center, top and bottom. Fasteners may be staggered from top to bottom.
- Note: (a) Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

FIGURE 6—FIRE PROTECTION: $\frac{1}{2}$ -INCH GYPSUM BOARD DIRECTLY ATTACHED TO SIDES OF FLANGE

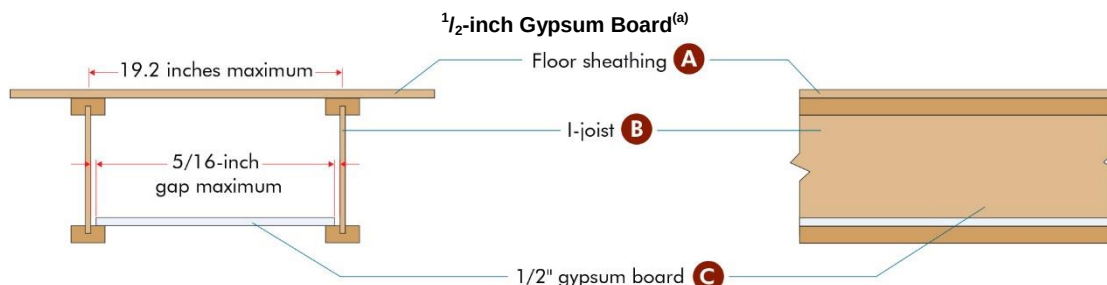
For SI: 1 inch = 25.4 mm



- (A) Floor sheathing: Materials and installation in accordance with 2015 and 2012 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4.0 of this report. Maximum 24 inches on center spacing. Minimum flange size of $1\frac{1}{8}$ inches thick x 2 inches wide. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA.
- (C) Mineral wool batt insulation: Minimum 2.5 lb/ft³ (nominal) and 3-inch-thick mineral wool batt insulation made of rock or furnace slag (ASTM C665 Type 1 compliant) installed as shown with insulation stay wire supports spaced no more than 24 inches apart and no more than 4 inches from ends of batts. Use minimum of $15\frac{1}{4}$ -inch-, $18\frac{1}{2}$ -, and 23-inch-wide insulation batt when I-joist spacing is 16 inches, 19.2 inches and 24 inches on center, respectively.

Note: (a) Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

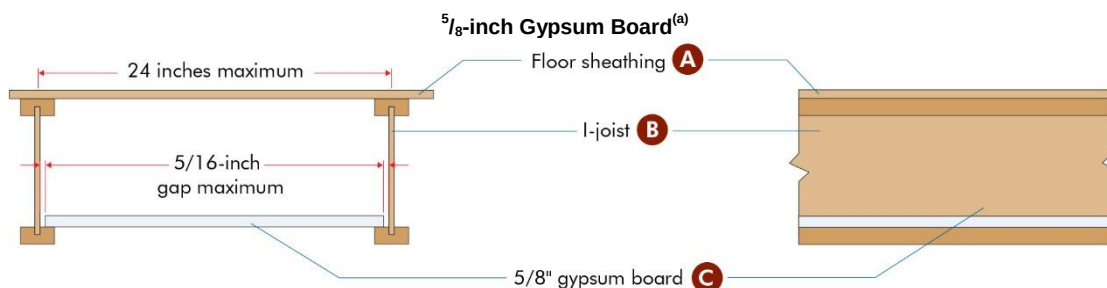
FIGURE 7—FIRE PROTECTION: MINERAL WOOL INSULATION



- (A) Floor sheathing: Materials and installation in accordance with 2015 and 2012 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4.0 of this report. Maximum 19.2 inches on center spacing. Minimum flange size of $1\frac{1}{8}$ inches thick x 2 inches wide. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA.
- (C) 1-layer of $\frac{1}{2}$ -inch-thick gypsum board complying to ASTM C1396 provisions for gypsum wallboards, installed on the top of the bottom flange. Mechanical fastener or adhesive attachment to the top of the bottom flange is not required. A maximum gap of $\frac{5}{16}$ inch between the edge of the gypsum and the I-joist web shall be permitted.

Note: Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

FIGURE 8—FIRE PROTECTION: $\frac{1}{2}$ -INCH GYPSUM BOARD INSTALLED ON TOP OF THE BOTTOM FLANGE



- (A) Floor sheathing: Materials and installation in accordance with 2012 and 2015 IRC Section R503.
- (B) I-joist: Installation in accordance with Section 4.0 of this report. Maximum 24 inches on center spacing. Minimum flange size of $1\frac{1}{8}$ inches thick x 2 inches wide. Minimum web thickness of $\frac{3}{8}$ inch. Adhesives used shall be as described in the quality manual approved by APA.
- (C) 1-layer of $\frac{5}{8}$ -inch-thick gypsum board complying to ASTM C1396 provisions for gypsum wallboards, installed on the top of the bottom flange. Mechanical fastener or adhesive attachment to the top of the bottom flange is not required. A maximum gap of $\frac{5}{16}$ inch between the edge of the gypsum and the I-joist web shall be permitted.

Note: (a) Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

FIGURE 9—FIRE PROTECTION: $\frac{5}{8}$ -INCH GYPSUM BOARD INSTALLED ON TOP OF THE BOTTOM FLANGE

For SI: 1 inch = 25.4 mm

Dwelling Unit Feeder and Service Load Calculation

Project: 201720-1 - 19 Balfour Street
Designer: Alan Behrent
Date: 12/11/2017

General Loads

General Lighting and Receptacles
Small Appliance Circuits
Laundry Circuit
Electric Range or Cooktop Unit
Electric Wall Oven
Dishwasher
Electric Dryer
Electric Water Heater
Other
Other

1434 SF	3 VA/SF	4302 VA
3 EA	1500 VA	4500 VA
1 EA	1500 VA	1500 VA

0 VA
0 VA
1200 VA
0 VA
0 VA
0 VA
0 VA

11,502 VA

10,601 VA

General Load Total

General Calculated Load

(100% of the first 10KW plus 40% of the remainder)



Heating and Air-Conditioning Load

The largest of the following six selections shall be included:

- (1) 100% of the nameplate rating(s) of the air conditioning and cooling.
- (2) 100% of the nameplate rating(s) of the heat pump when the heat pump is used without any supplemental electric heating.
- (3) 100% of the nameplate rating(s) of the heat pump compressor and 65% of the supplemental electric heating for central electric space-heating systems. If the heat pump compressor is prevented from operating at the same time as the supplementary heat, it does not need to be added to the supplementary heat for the total central space heating load.
- (4) 65% of the nameplate rating(s) of electric space heating if less than four separately controlled units.
- (5) 40% of the nameplate rating(s) of electric space heating if four or more separately controlled units.
- (6) 100% of the nameplate rating(s) of electric thermal storage and other heating systems where the usual load is expected to be continuous at the full nameplate value. Systems qualifying under this selection shall not be calculated under any other selection.

11500 VA
0 VA
0 VA
1000 VA
0 VA
0 VA

23,101 VA

Total Calculated Load

Calculated Feeder and Service Load (120/240V)

96.25 Amps

Feeder and Service Installed (120/240V)

200 Amps

Notes:



11/4/2015

Emily Lloyd
Commissioner

James J. Roberts, P.E.
Deputy Commissioner
Bureau of Water &
Sewer Operations

59-17 Junction Boulevard
Flushing, NY 11373

Build It Back
250 Broadway 24th Floor
New York, NY 10007
Attn: Susan Rosenstadt
Sr. Technical Adviser

To Whom It May Concern:

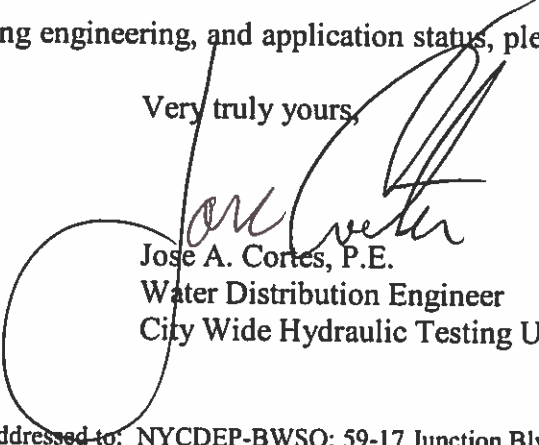
The hydrant flow test you requested at **Balfour Street** between **Lansing Street** and **Olympia Boulevard, Staten Island** was performed on **11/2/2015** at **2:06 PM** with the following results:

The static pressure taken on an 8 inch water main which is fed from two directions on the west side of Balfour Street 1st hydrant north of Lansing Street was 104 pounds per square inch. The residual pressure at this point was 100 pounds per square inch when 500 gallons of water per minute were flowing from the east side of Wills Place 1st hydrant north of Lansing Street.

This Department cannot guarantee that this pressure will be maintained in the future because a change may be needed in conformity with good engineering practices.

If you have any questions regarding engineering, and application status, please call (718) 595-3958.

Very truly yours,


Jose A. Cortes, P.E.
Water Distribution Engineer
City Wide Hydraulic Testing Unit

File: FT2015-5772-515821

All hydrant flow test requests are to be addressed to: NYCDEP-BWSO; 59-17 Junction Blvd, 12th Fl., Flushing; NY 11373-5108, Attn: Citywide Hydraulic Flow Test Unit

Enclose payment for \$500 payable to NYC Water Board for each test. Indicate the test street, cross streets and borough for each test. All requests are to be made by US or overnight mail, no hand deliveries accepted.





Hydraulics Summary Sheet

8800 Dashboard Hydraulics

v1.30.5_0716M

Project Information

KAlender Residence

19 Balfour Street
Staten Island NY 10305
contract #

Calculation Date: 1/5/2018 3:12 PM

system ID 1st floor pendant

drawing ref

building
construction Type 2
occupancy residence
authority New York

Contractor Information

Modular Steel Sysyems

11 edwards Drive

Bloomsburg, PA

calculated by J.C. Clark

telephone 240-417-0590

fax

email cclark9300@verizon.net

Hydraulics Criteria

density .05 GPM/ft²

remote area 2 sprinklers ft²

spr coverage 256 ft²

sprs flowing 2

system type Wet
design std NFPA 13-D 2013
hazard Residential

figure
curve

Flow Test

static pressure 104.00 psi

residual pressure 100.00 psi

quantity flowing 500.0 GPM

date & time of flow test
11/2/15 2:05 PM

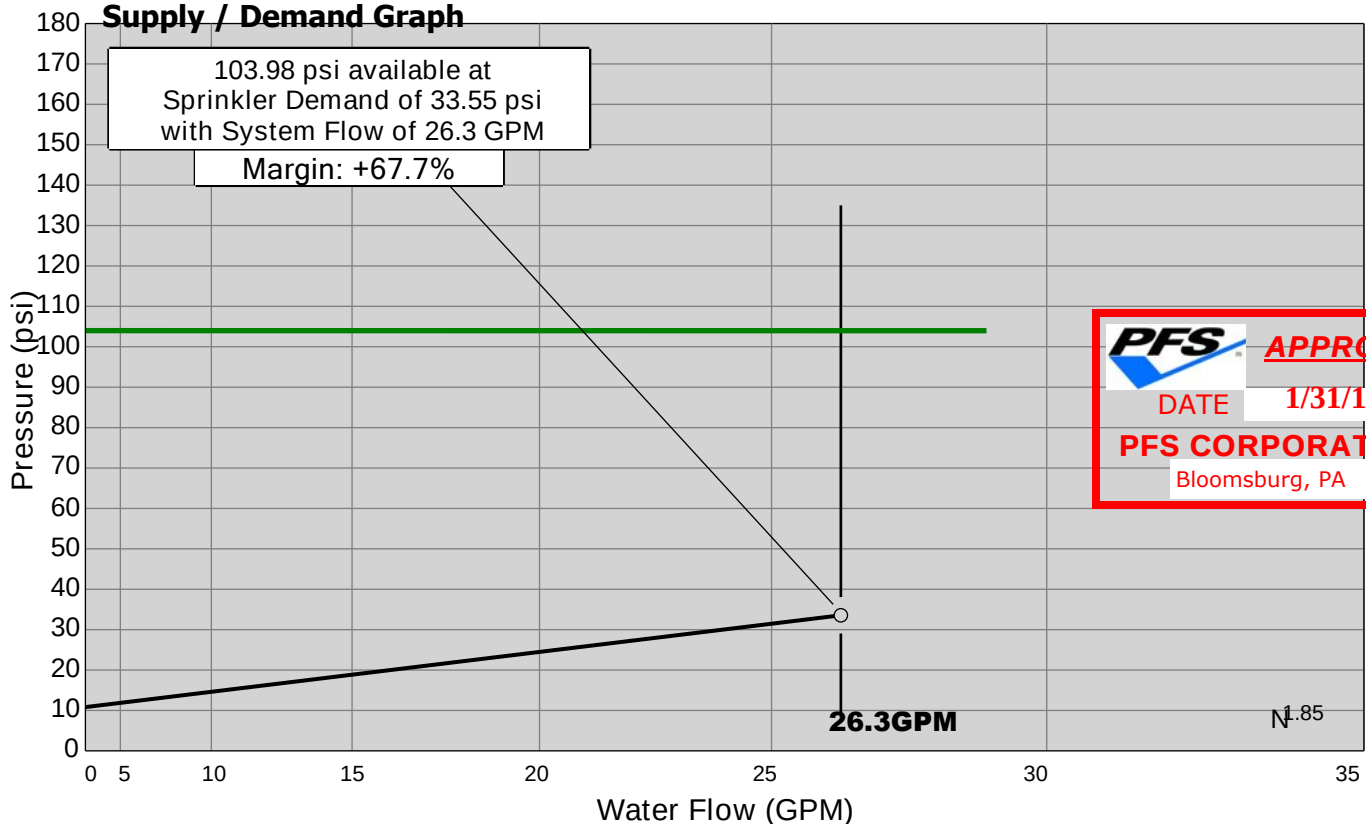
location of flow test
Balfour /lansing & Olympia

Sprinklers in Remote

No.	Mfgr	Mod	SIN#	Size	K
2	VIKING	FREEDOM	VK494	7/16"	4.90



Supply / Demand Graph





Supply Analysis

Source Node	Static Pressure	Residual Pressure	Quantity Flowing	Pressure Available	Total System Flow	Total Pressure Required
Zero	104.00psi	100.00psi	500.0GPM	103.98psi	26.3GPM	33.55psi

Sprinkler Flow:	26.3GPM	Additional Flows:	None
Hose Flow at Zero:	None	Total System Flow:	26.3GPM

Maximum velocity in pipe 1-2 is 10.1 ft/sec

Nodes Analysis

Node	Elev ft	Device	KFactor	Minimum Flow GPM	Node Pressure psi	Actual Discharge GPM	Notes
10	15.00	Sprinkler	4.90	13.00	7.04	13.00	
9	15.00	Sprinkler	4.90	13.00	7.41	13.33	
8	15.00				7.86	13.0	
7	15.00				8.16	26.3	
6	15.00				11.33	26.3	
5	15.00				15.57	26.3	
4	10.00				20.11	26.3	
3	10.00				26.13	26.3	
2	0.00				31.19	26.3	
1	0.00				32.84	26.3	





Pipe Information

KAlender Residence

From	Elev1 ft	Pipe ID	Flows Added GPM	Inside Diameter in	Fittings	Length ft	C Value	Total (Pt)	psi	Notes
To	Elev2 ft	Type	Total			Fitting ft	Friction Loss psi/ft	Elev (Pe)	psi	
						Total ft		Frict (Pf)	psi	

8	15.00	1" CPVC		1.1010	2EE,E	Len 19.0	C = 150	Pt 10)	7.039	
						Ftg 7.6		Pe	0.000	
10	15.00	BN2	13.0			Total 26.6		Pf	0.817	
7	15.00	1" CPVC		1.1010	2EE	Len 6.0	C = 150	Pt 8)	7.856	
						Ftg 3.8		Pe	0.000	
8	15.00	BN1	13.0			Total 9.8		Pf	0.301	
6	15.00	1" CPVC	13.3	1.1010	T,4EE	Len 10.8	C = 150	Pt 7)	8.157	
						Ftg 17.2		Pe	0.000	
7	15.00	NC2	26.3			Total 28.0		Pf	3.173	
5	15.00	1" CPVC		1.1010	2EE,2T, E	Len 10.7	C = 150	Pt 6)	11.330	
						Ftg 26.8		Pe	0.000	
6	15.00	NC1	26.3			Total 37.4		Pf	4.237	

Total Pressure at Node 5) 15.567 psi

7	15.00	1" CPVC		1.1010	T	Len 13.8	C = 150	Pt 9)	7.405	
						Ftg 9.6		Pe	0.000	
9	15.00	BN2	13.3			Total 23.4		Pf	0.752	

Total Pressure at Node 7) 8.157 psi

4	10.00	1" Sch 40		1.0490	T,EE	Len 5.0	C = 120	Pt 5)	15.567	
						Ftg 6.0		Pe	2.167	
5	15.00	FR1	26.3			Total 11.0		Pf	2.382	
3	10.00	1" Type L		1.0300	FS07	Len 0.1	C = 150	Pt 4)	20.115	Watts Residential backflow preventer FS-07: Loss = 6.00
						Ftg 0.0		Pe	0.000	
4	10.00	MA2	26.3			Total 0.1		Pf	0.016	
2	0.00	1½" Type L		1.5050	E	Len 25.0	C = 150	Pt 3)	26.131	
						Ftg 4.3		Pe	4.333	
3	10.00	UN2	26.3			Total 29.3		Pf	0.725	
1	0.00	1" Type L		1.0300	RFM	Len 0.1	C = 150	Pt 2)	31.189	1" Hersey Residential Fire Meter Model RFM 30: Loss = 1.63
						Ftg 0.0		Pe	0.000	
2	0.00	MA1	26.3			Total 0.1		Pf	0.016	
0	0.00	1½" Type L		1.5050	T	Len 20.0	C = 150	Pt 1)	32.838	
						Ftg 8.7		Pe	0.000	
1	0.00	UN1	26.3			Total 28.7		Pf	0.709	

Total Pressure at Node 0) 33.547 psi





Hydraulics Summary Sheet

8800 Dashboard Hydraulics

v1.30.5_0716M

Project Information

KAlender Residence

19 Balfour Street
Staten Island NY 10305
contract #

Calculation Date: 1/5/2018 3:05 PM

system ID 2nd floor sidewall

drawing ref

building
construction Type 2
occupancy residence
authority New York

Contractor Information

Modular Steel Sysyems

11 edwards Drive

Bloomsburg, PA

calculated by J.C. Clark

telephone 240-417-0590

fax

email cclark9300@verizon.net

Hydraulics Criteria

density .05 GPM/ft²

remote area 2 sprinklers ft²

spr coverage 256 ft²

sprs flowing 2

system type Wet
design std NFPA 13-D 2013
hazard Residential

figure
curve

Flow Test

static pressure 104.00 psi

residual pressure 100.00 psi

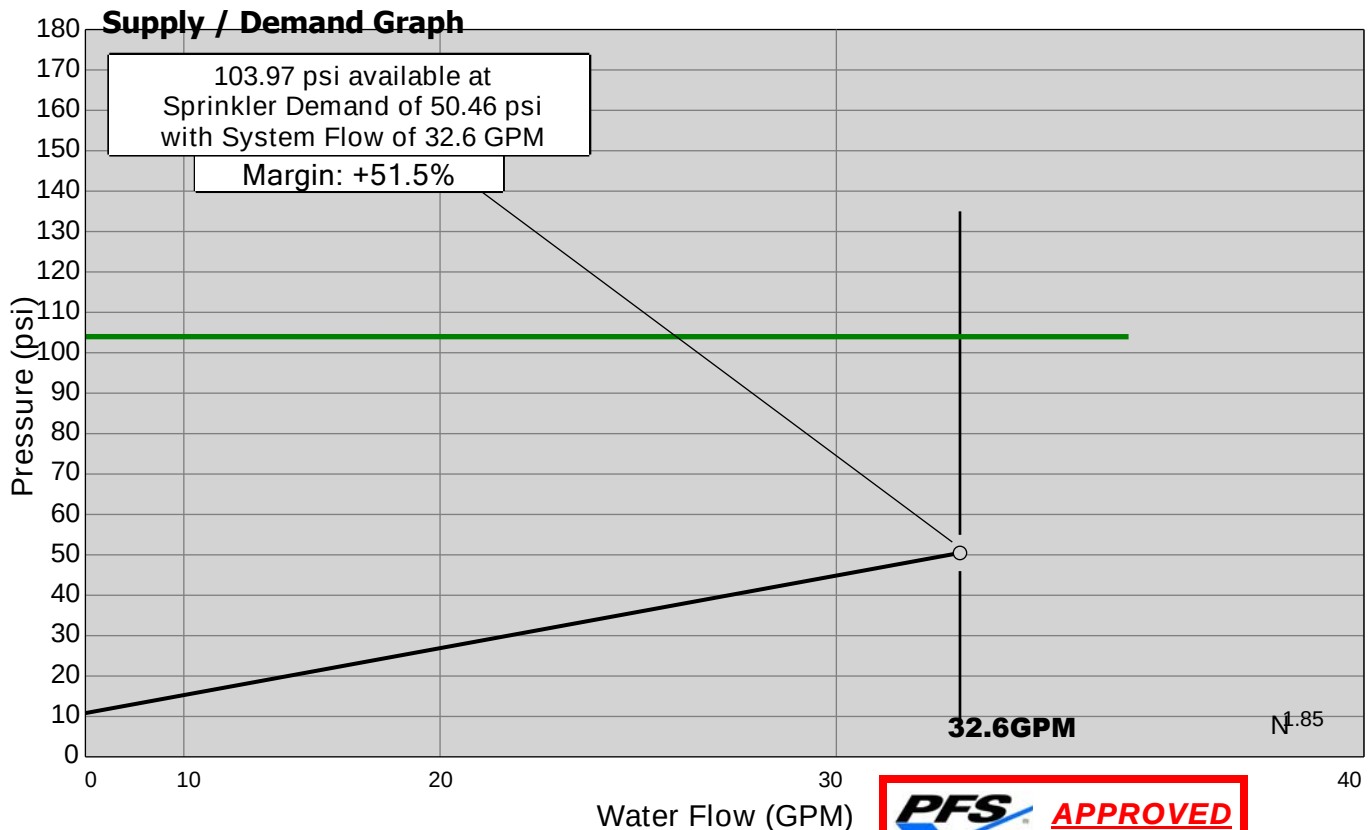
quantity flowing 500.0 GPM

date & time of flow test
11/2/15 2:05 PM

location of flow test
Balfour /lansing & Olympia

Sprinklers in Remote

No.	Mfgr	Mod	SIN#	Size	K
2	VIKING	FREEDOM	VK480	7/16"	4.00





Supply Analysis

Source Node	Static Pressure	Residual Pressure	Quantity Flowing	Pressure Available	Total System Flow	Total Pressure Required
Zero	104.00psi	100.00psi	500.0GPM	103.97psi	32.6GPM	50.46psi

Sprinkler Flow:	32.6GPM	Additional Flows:	None
Hose Flow at Zero:	None	Total System Flow:	32.6GPM

Maximum velocity in pipe 1-2 is 12.5 ft/sec

Nodes Analysis

Node	Elev ft	Device	KFactor	Minimum Flow GPM	Node Pressure psi	Actual Discharge GPM	Notes
12	25.00	Sprinkler	4.00	16.00	16.00	16.00	
11	25.00	Sprinkler	4.00	16.00	17.17	16.58	
8	15.00				21.64	16.0	
7	15.00				22.08	16.0	
6	15.00				23.35	32.6	
5	15.00				29.63	32.6	
4	10.00				35.32	32.6	
3	10.00				41.55	32.6	
2	0.00				46.96	32.6	
1	0.00				49.41	32.6	





Pipe Information

KAlender Residence

From	Elev1 ft	Pipe ID	Flows Added GPM	Inside Diameter in	Fittings	Length ft	C Value	Total (Pt)	psi	Notes
To	Elev2 ft	Type	Total			Fitting ft	Friction Loss psi/ft	Elev (Pe)	psi	
						Total ft		Frict (Pf)	psi	

8	15.00	1" CPVC		1.1010	T,E	Len 15.7 Ftg 13.4 Total 29.0	C = 150 0.04503	Pt 12) 16.001 Pe 4.333 Pf 1.308		
12	25.00	SG	16.0							

Total Pressure at Node 8) 21.642 psi

6	15.00	1" CPVC		1.1010	EE,E,T	Len 23.0 Ftg 15.3 Total 38.3	C = 150 0.04807	Pt 11) 17.173 Pe 4.333 Pf 1.841		
11	25.00	SG	16.6							

Total Pressure at Node 6) 23.346 psi

7	15.00	1" CPVC		1.1010	2EE	Len 6.0 Ftg 3.8 Total 9.8	C = 150 0.04503	Pt 8) 21.642 Pe 0.000 Pf 0.442		
8	15.00	BN1	16.0							
6	15.00	1" CPVC		1.1010	T,4EE	Len 10.8 Ftg 17.2 Total 28.0	C = 150 0.04503	Pt 7) 22.084 Pe 0.000 Pf 1.262		
7	15.00	NC2	16.0							
5	15.00	1" CPVC	16.6	1.1010	2EE,2T, E	Len 10.7 Ftg 26.8 Total 37.4	C = 150 0.16777	Pt 6) 23.346 Pe 0.000 Pf 6.279		
6	15.00	NC1	32.6							
4	10.00	1" Sch 40		1.0490	T,EE	Len 5.0 Ftg 6.0 Total 11.0	C = 120 0.32088	Pt 5) 29.626 Pe 2.167 Pf 3.530		
5	15.00	FR1	32.6							
3	10.00	1" Type L		1.0300	FS07	Len 0.1 Ftg 0.0 Total 0.1	C = 150 0.23212	Pt 4) 35.322 Pe 0.000 Pf 0.023		Watts Residential backflow preventer FS-07: Loss = 6.21
4	10.00	MA2	32.6							
2	0.00	1½" Type L		1.5050	E	Len 25.0 Ftg 4.3 Total 29.3	C = 150 0.03661	Pt 3) 41.551 Pe 4.333 Pf 1.075		
3	10.00	UN2	32.6							
1	0.00	1" Type L		1.0300	RFM	Len 0.1 Ftg 0.0 Total 0.1	C = 150 0.23212	Pt 2) 46.959 Pe 0.000 Pf 0.023		1" Hersey Residential Fire Meter Model RFM 30: Loss = 2.43
2	0.00	MA1	32.6							
0	0.00	1½" Type L		1.5050	T	Len 20.0 Ftg 8.7 Total 28.7	C = 150 0.03661	Pt 1) 49.409 Pe 0.000 Pf 1.051		
1	0.00	UN1	32.6							

Total Pressure at Node 0) 50.460 psi



RAPID RESPONSE Series LFII Residential Sprinklers 4.4 K-factor Horizontal Sidewall, Dry Type Wet Pipe and Dry Pipe Systems

General Description

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Horizontal Sidewall Sprinklers (TY2335) are dry type decorative, fast response, frangible bulb sprinklers designed for use in residential occupancies such as homes, apartments, dormitories, and hotels.

The Series LFII Dry Type Residential Horizontal Sidewall Sprinklers are typically used for the following situations:

- where sprinklers are required on dry pipe systems that are exposed to freezing temperatures; for example, horizontal sprinkler supply from unheated portions of buildings
- where sprinklers and/or a portion of the connecting piping are exposed to freezing temperatures; for example, horizontal sprinkler supply from wet systems into unheated areas
- where sprinklers are used on systems that are seasonally drained to avoid freezing; for example, vacation areas

The Series LFII Dry Type Residential Horizontal Sidewall Sprinklers are intended for use in Residential Sprinkler systems for one- and two-family dwellings and mobile homes per NFPA 13D; residential sprinkler systems for residential occupancies up to and including four stories in height per NFPA 13R; or, sprinkler systems for the residential portions of any occupancy per NFPA 13.

IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.

The recessed version is intended for use in areas with finished walls. It employs a two-piece Style 20 Recessed Escutcheon. The Recessed Escutcheon provides 1/4 inch (6,4 mm) of recessed adjustment or up to 1/2 inch (12,7 mm) of total adjustment from the flush mounting surface position. The design of this escutcheon provides a level of flexibility in adjusting sprinkler supply connections.

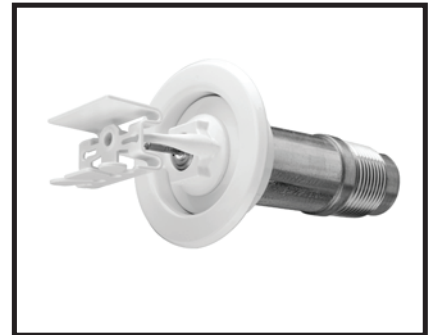
The Series LFII Dry Type Residential Horizontal Sidewall Sprinklers have been designed with heat sensitivity and water characteristics proven to help in the control of residential fires and to improve the chance for occupants to escape or be evacuated.

Dry Pipe System Application

The Series LFII Residential Pendent and Recessed Pendent Sprinklers offers a laboratory approved option for designing dry pipe residential sprinkler systems, whereas, most residential sprinklers are laboratory approved for wet systems only.

Through extensive testing, it has been determined that the number of design sprinklers (hydraulic design area) for the Series LFII Residential Horizontal Sidewall Sprinklers (TY2235) need not be increased over the number of design sprinklers (hydraulic design area) as specified for wet pipe sprinkler systems, as is accustomed for density/area sprinkler systems designed per NFPA 13.

Consequently, the Series LFII Residential Sprinklers offer the features of non-water filled pipe in addition to not having to increase the number of design sprinklers (hydraulic design area) for systems designed to NFPA 13, 13D, or 13R. Non-water filled pipe will permit options for areas sensitive to freezing.



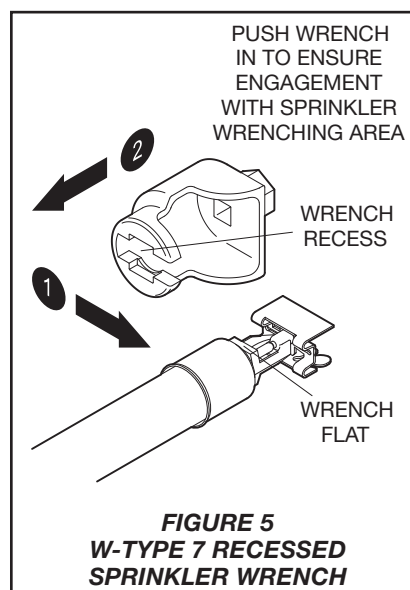
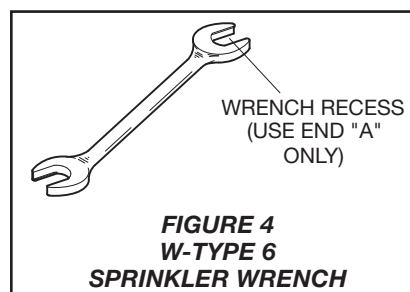
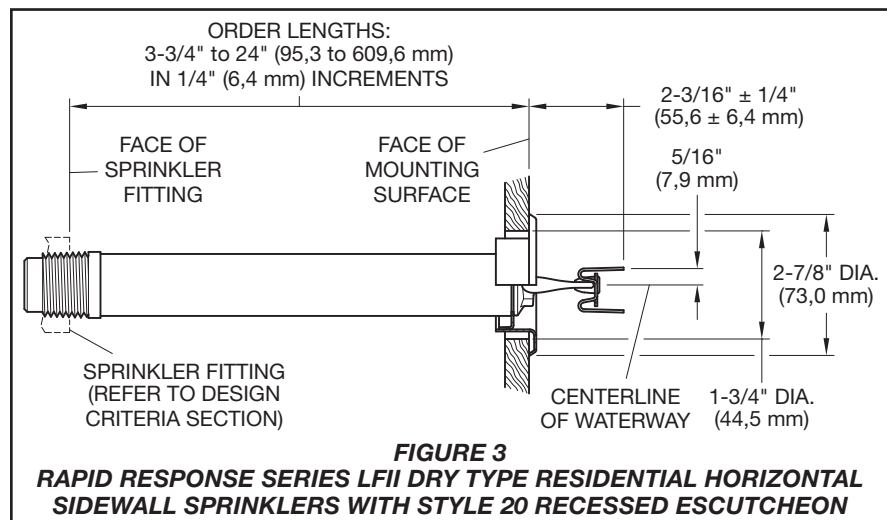
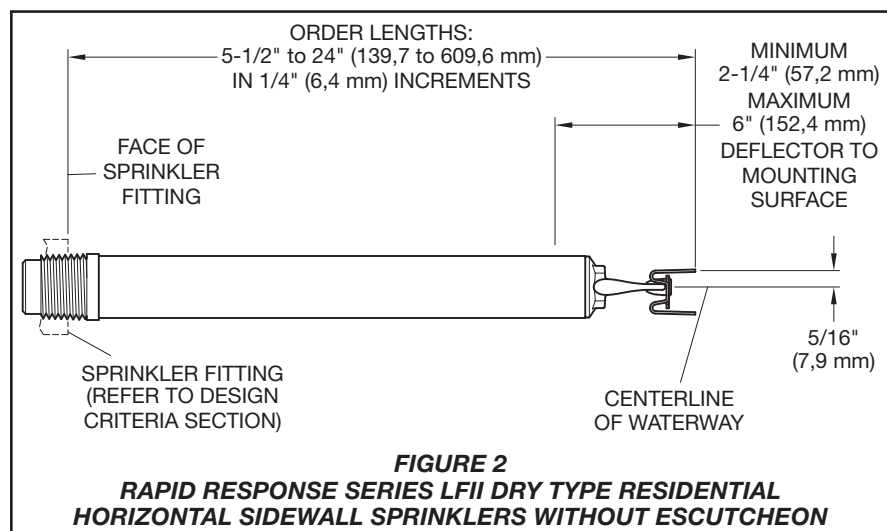
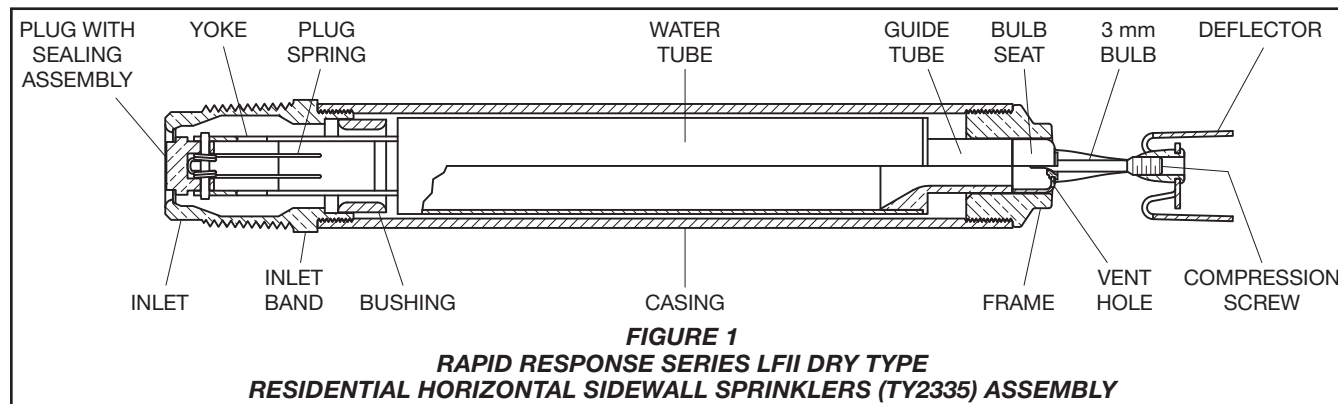
NOTICE

The Series LFII Dry Type Residential Horizontal Sidewall Sprinklers (TY2335) described herein must be installed and maintained in compliance with this document and the applicable standards of the National Fire Protection Association, in addition to the standards of any authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Sprinkler Identification Number (SIN)

TY2335



Technical Data

Approvals

UL Listed
For details on approval, refer to the Design Criteria section.

Maximum Working Pressure

175 psi (12,1 bar)

Discharge Coefficient

$K = 4.4 \text{ GPM/psi}^{1/2} (63,4 \text{ LPM/bar}^{1/2})$

Inlet Thread Connections

1 inch NPT or ISO 7-R1

Sprinkler Temperature Rating

155°F/68°C

Finishes

Natural Brass
Signal White
Chrome-Plated

Order Lengths

Minimum: 3-3/4 inches (95,3 mm)
Maximum: 24 inches (609,6 mm)

Physical Characteristics

Inlet	Brass
Plug	Brass
Yoke	Stainless Steel
Casing	Galvanized Steel
Insert	Bronze
Bulb Seat	Stainless Steel
Bulb	Glass
Compression Screw	Brass
Deflector	Brass
Frame	Brass
Guide Tube	Stainless Steel
Water Tube	Stainless Steel
Bushing	Brass
Plug Spring	Stainless Steel
Sealing Assembly	Beryllium Nickel w/TEFLON
Escutcheon	Carbon Steel

Operation

When the TYCO RAPID RESPONSE Series LFII Dry Type Residential Horizontal Sidewall Sprinkler is in service, water is prevented from entering the assembly by the Plug with Sealing Assembly (Figure 1) in the Inlet of the Sprinkler.

The glass Bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass Bulb to release the Bulb Seat. The system's water or air pressure is then able to unseat the Plug with Sealing Assembly. The Plug Spring turns the Plug with Sealing Assembly aside, allowing the sprinkler to activate and flow water.

Design Criteria

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Horizontal Sidewall Sprinklers (TY2335) are UL Listed for installation in accordance with this section.

Residential Sprinkler Design Guide

When conditions exist that are outside the scope of the criteria provided in this section, refer to the technical data sheet entitled Residential Sprinkler Design Guide (TFP490) for the manufacturer's recommendations that may be acceptable to the local authority having jurisdiction.

System Types

Wet pipe, and dry pipe systems may be utilized.

Hydraulic Design (NFPA 13D and 13R)

For systems designed to NFPA 13D or NFPA 13R, the minimum required sprinkler flow rate are given in Table A or B as a function of temperature rating and the maximum allowable coverage areas. The sprinkler flow rate is the minimum required discharge from each of the total number of "design sprinklers," as specified in NFPA 13D or NFPA 13R. The number of "design sprinklers" specified in NFPA 13D and 13R for wet pipe systems is to be applied when designing dry pipe systems.

Hydraulic Design (NFPA 13)

For systems designed to NFPA 13, the number of required design sprinklers is the four most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is the greater of the following:

- flow rates listed in Table A or B as a function of temperature rating and the maximum allowable coverage area.
- minimum discharge of 0.1 gpm/ft² over the design area comprised of the four most hydraulically demanding sprinklers for the actual coverage areas protected by four sprinklers.

The number of "design sprinklers" specified in NFPA 13 for wet pipe systems is to be applied when designing dry pipe systems.

Dry Pipe System Water Delivery

When using the Series LFII Residential Sprinklers (TY2335) in dry pipe sprinkler systems, the time for water delivery must not exceed 15 seconds for the most remote operating sprinkler.

Obstruction to Water Distribution

Sprinklers are to be located in accordance with the obstruction rules of NFPA 13D, 13R, and 13 as applicable for residential sprinklers as well as with the obstruction criteria described within the Technical Data Sheet TFP490.

Operational Sensitivity

The sprinkler must be located relative to the mounting surface as shown in Figures 2 and 3.

Sprinkler Spacing

The minimum lateral spacing between sprinklers is 8 feet (2,4 m). The maximum lateral spacing between sprinklers cannot exceed the length of the coverage area (refer to Table A or B) hydraulically calculated (e.g., a maximum of 12 feet for a 12 ft. x 12 ft. coverage area or 18 feet for a 18 ft. x 20 ft. coverage area).

Sprinkler Fittings

The following fittings may be used:

- The 1 inch NPT outlet or run of a malleable or ductile iron threaded tee fittings that meet the dimensional requirements of ANSI B16.3 (Class 150)
- The 1 inch NPT outlet or run of a cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125).

For dry pipe systems, only use the side outlet of maximum 2-1/2 inch size reducing tees when locating the Series LFII Dry Type Residential Recessed Pendent Sprinklers directly below the branch line. Otherwise, use the configuration shown in Figure 7 to assure complete drainage from above the Series LFII Sprinklers and the branch line.

Do not install the Series LFII Dry Type Residential Recessed Pendent Sprinklers into elbow fittings. The Inlet of the sprinkler can contact the interior of the elbow, potentially damaging the Inlet seal.

Only use the configuration in Figure 6 where the sprinkler fitting and water-filled pipe above the sprinkler fitting are not subject to freezing and where the length of the Series LFII Sprinkler has the minimum exposure length per Figure 8. Refer to the Exposure Length section and Table C.

- The 1 inch NPT outlet of a GRINNELL Figure 730 Mechanical Tee in wet pipe systems only
- The 1 inch NPT CPVC outlet of a 1" x 1" x 1" NPT Sprinkler Head Adapter Tee (P/N 80249) in wet systems only
- The 1 inch NPT CPVC outlet of a 1" x 1" NPT Female Adapter (P/N 80145) in wet systems only
- The 1 inch NPT outlet of a 1" x 1" x 1" NPT CPVC Sprinkler Head Adapter Tee (P/N 80259) in either wet or dry pipe systems

NOTICE

Do not install the Series LFII Dry Type Residential Horizontal Sidewall Sprinklers into any other type fitting without first consulting the Technical Services Department. Failure to use the appropriate fitting may result in the following:

- *failure of the sprinkler to operate properly due to formation of ice over the Inlet Plug or binding of the Inlet Plug.*
- *insufficient engagement of the inlet pipe threads with consequent leakage.*

Drainage

Branch, cross, and feed-main piping connected to Series LFII Dry Type Residential Sprinklers and subject to freezing temperatures must be pitched to allow proper drainage, in accordance with the minimum requirements of the National Fire Protection Association for dry pipe sprinkler systems.

Exposure Length

When using Series LFII Dry Type Residential Horizontal Sidewall Sprinklers in wet pipe sprinkler systems to protect areas subject to freezing temperatures, use Table C to determine a sprinkler's appropriate exposed barrel length to prevent water from freezing in the connecting pipes due to conduction. The exposed barrel length measurement must be taken from the face of the sprinkler fitting to the surface of the structure or insulation that is exposed to the heated area. Refer to Figure 8 for an example.

Clearance Space

When connecting an area subject to freezing and an area containing a wet-pipe sprinkler system, the clearance space around the sprinkler barrel of Dry Type Residential Sprinklers must

be sealed, in accordance with the National Fire Protection Association. Due to temperature differences between the two areas, the potential for the formation of condensation in the sprinkler and subsequent ice build-up is increased. If this condensation is not controlled, ice build-up can occur that might damage the dry type sprinkler and/or prevent proper operation in a fire situation.

Use of the Model DSB-2 Dry Sprinkler Boot, described in Technical Data Sheet TFP591 and shown in Figures 6 through 8, can provide the recommended seal.

Installation

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Horizontal Sidewall Sprinklers must be installed in accordance with this section.

General Instructions

The Series LFII Dry Type Residential Horizontal Sidewall Sprinklers must only be installed in fittings that meet the requirements of the Design Criteria section. For other important requirements regarding piping design and sealing of the clearance space around the Sprinkler Casing, refer to the Design Criteria section.

Do not install any bulb type sprinkler if the Bulb is cracked or there is a loss of liquid from the Bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm).

A leak-tight 1 inch NPT sprinkler joint should be obtained by applying a minimum-to-maximum torque of 20 to 30 ft.-lbs. (26,8 to 40,2 Nm). Higher levels of torque can distort the sprinkler Inlet or Frame with consequent leakage or impairment of the sprinkler.

Do not attempt to compensate for insufficient adjustment in an Escutcheon Plate by under- or over-tightening the sprinkler. Re-adjust the position of the sprinkler fitting to suit.

Step 1. Install horizontal sidewall sprinklers only in the horizontal position with their centerline of waterway perpendicular to the back wall and parallel to the ceiling. The word TOP on the Deflector is to face towards the ceiling.

Step 2. With a non-hardening pipe-thread sealant such as Teflon tape applied to the inlet threads, hand-tighten the sprinkler into the sprinkler fitting.

Step 3. Wrench-tighten the sprinkler using a pipe wrench on the Inlet Band or the Casing (Figure 1), or using the W-Type 6 or W-Type 7 Sprinkler Wrench as follows:

- For plain-barrel horizontal sidewall sprinklers, apply the Wrench Recess End "A" of the W-Type 6 Sprinkler Wrench (Figure 4) to the Wrench Flat.
- For recessed horizontal sidewall sprinklers, apply the Wrench Recess of the W-Type 7 Sprinkler Wrench to the Wrench Flat (Figure 5).

If sprinkler removal is necessary, remove the sprinkler using the same wrenching method noted above. Sprinkler removal is easier when a non-hardening sealant was used and torque guidelines were followed. After removal, inspect the sprinkler for damage.

Step 4. After installing the ceiling or applying a ceiling finish, slide the Style 20 Recessed Escutcheon Closure over the sprinkler. Push the closure over the mounting plate until its flange contacts the wall.

Care and Maintenance

The TYCO RAPID RESPONSE Series LFII Dry Type Residential Horizontal Sidewall Sprinklers (TY2335) must be maintained and serviced in accordance with this section.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection systems from the proper authorities and notify all personnel who may be affected by this action.

Absence of a Recessed Escutcheon Plate or a Domed Concealed Cover Plate to cover a clearance hole can delay sprinkler operation in a fire situation.

The owner must assure that the sprinklers are not used for hanging any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

A Vent Hole is provided in the Bulb Seat (Figure 1) to indicate if the Series LFII Dry Type Residential Horizontal Sidewall Sprinkler is remaining dry. Evidence of leakage from the Vent Hole indicates potential leakage past the Plug with Sealing Assembly and the need to remove the sprinkler to determine the cause of leakage (for example, an improper installation or an ice plug). Close the fire protection system control valve and drain the system before removing the sprinkler.

Maximum Coverage Area (a, b) Width x Length Ft. x Ft. (m x m)	Maximum Spacing Ft. (m)	WET PIPE SYSTEM Minimum Flow and Residual Pressure ^(c, d) 155°F (68°C)						
		Flow GPM (L/min)	Pressure PSI (bar)	Deflector to Ceiling	Installation Type	Minimum Spacing Ft. (m)		
12 x 12 (3,7 x 3,7)	12 (3,7)	13 (49,2)	8.7 (0,60)	4 to 6 Inches	Recessed or Plain Barreled	8 (2,4)		
14 x 14 (4,3 x 4,3)	14 (4,3)	14 (53,0)	10.1 (0,70)					
16 x 16 (4,9 x 4,9)	16 (4,9)	17 (64,3)	14.9 (1,03)					
16 x 18 (4,9 x 5,5)	16 (4,9)	19 (71,9)	18.6 (1,28)					
16 x 20 (4,9 x 6,1)	16 (4,9)	25 (94,6)	32.3 (2.23)					
12 x 12 (3,7 x 3,7)	12 (3,7)	15 (56,8)	11.6 (0,80)	6 to 12 Inches				
14 x 14 (4,3 x 4,3)	14 (4,3)	15 (56,8)	11.6 (0,80)					
16 x 16 (4,9 x 4,9)	16 (4,9)	19 (71,9)	18.6 (1,28)					
16 x 18 (4,9 x 5,5)	16 (4,9)	20 (75,7)	20.7 (1,43)					
16 x 20 (4,9 x 6,1)	16 (4,9)	25 (94,6)	32.3 (2.23)					

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) This dimension refers to the Width (backwall where the sprinkler is located) times the Length (horizontal throw of the sprinkler).
- (c) The requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section for details.
- (d) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in this table must be used.

TABLE A
WET PIPE SYSTEM
SERIES LFII DRY TYPE HORIZONTAL SIDEWALL SPRINKLERS
NFPA 13D, 13R AND 13 HYDRAULIC DESIGN CRITERIA

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced.

Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

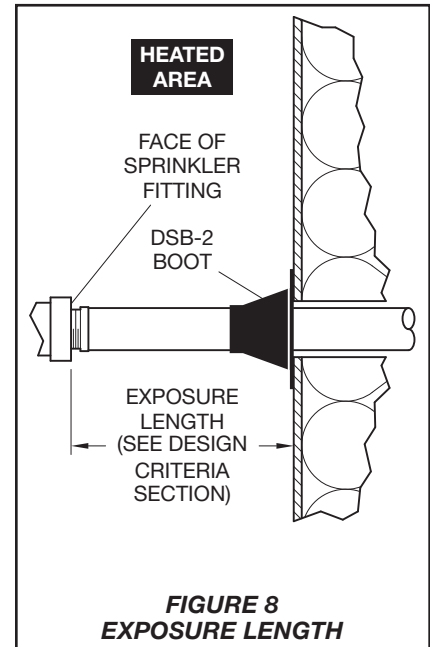
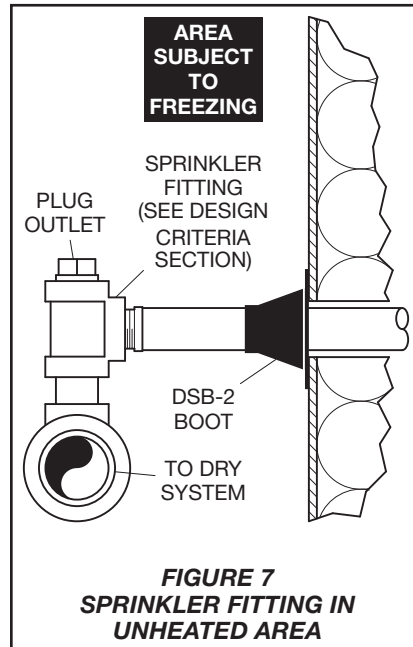
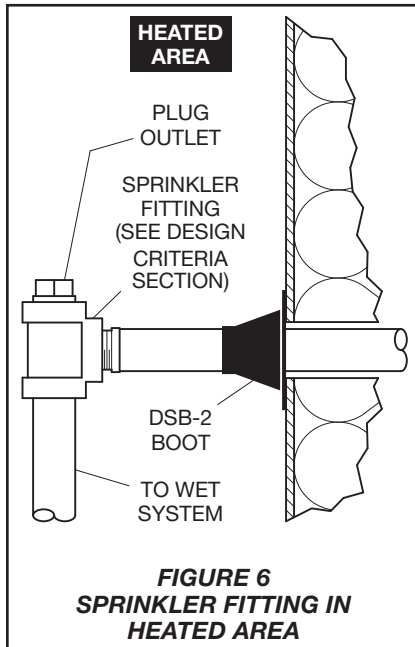
The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Automatic sprinkler systems are recommended to be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

Maximum Coverage Area (a, b) Width x Length Ft. x Ft. (m x m)	Maximum Spacing Ft. (m)	DRY PIPE SYSTEM Minimum Flow and Residual Pressure ^(c, d) 155°F (68°C)				
		Flow GPM (L/min)	Pressure PSI (bar)	Deflector to Ceiling	Installation Type	Minimum Spacing Ft. (m)
12 x 12 (3,7 x 3,7)	12 (3,7)	13 (49,2)	8.7 (0,60)	4 to 6 inches	Recessed or Plain Barreled	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (60,6)	13.2 (0,91)			
16 x 16 (4,9 x 4,9)	16 (4,9)	17 (64,3)	14.9 (1,03)			
16 x 18 (4,9 x 5,5)	16 (4,9)	N/A	N/A			
16 x 20 (4,9 x 6,1)	16 (4,9)	N/A	N/A			
12 x 12 (3,7 x 3,7)	12 (3,7)	15 (56,8)	11.6 (0,80)	6 to 12 Inches		
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (60,6)	13.2 (0,91)			
16 x 16 (4,9 x 4,9)	16 (4,9)	19 (71,9)	18.6 (1,28)			
16 x 18 (4,9 x 5,5)	16 (4,9)	N/A	N/A			
16 x 20 (4,9 x 6,1)	16 (4,9)	N/A	N/A			

- (a) For coverage area dimensions less than or between those indicated, use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.
- (b) This dimension refers to the Width (backwall where the sprinkler is located) times the Length (horizontal throw of the sprinkler).
- (c) The requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design under the Design Criteria section for details.
- (d) For NFPA 13 residential applications, the greater of 0.1 gpm/ft² over the design area or the flow in accordance with the criteria in this table must be used.

TABLE B
DRY PIPE SYSTEM
SERIES LFII DRY TYPE HORIZONTAL SIDEWALL SPRINKLERS
NFPA 13D, 13R AND 13 HYDRAULIC DESIGN CRITERIA



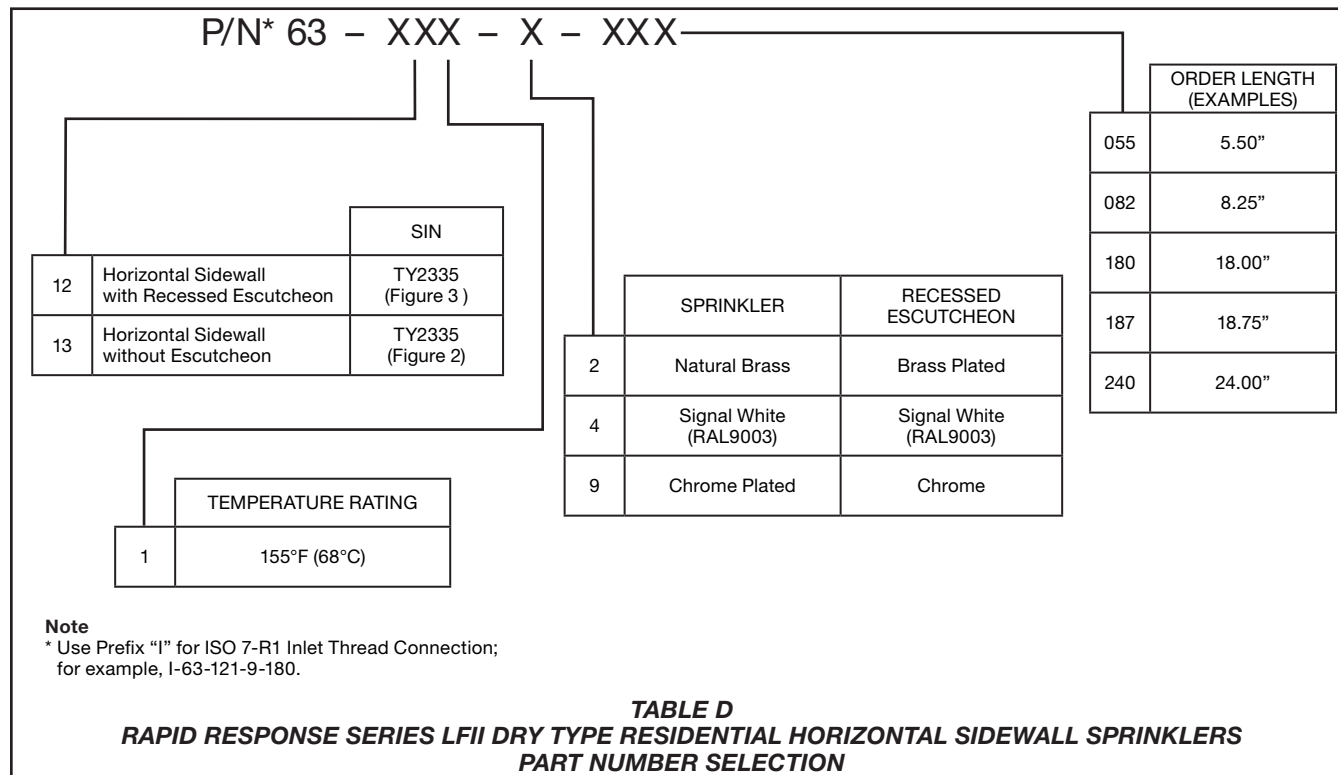
Ambient Temperature Exposed to Discharge End of Sprinkler	Temperatures for Heated Area ^(a)		
	40°F (4°C)	50°F (10°C)	60°F (16°C)
	Minimum Exposed Barrel Length, Inches (mm) ^(b)		
40°F (4°C)	0	0	0
30°F (-1°C)	0	0	0
20°F (-7°C)	4 (100)	0	0
10°F (-12°C)	8 (200)	1 (25)	0
0°F (-18°C)	12 (305)	3 (75)	0
-10°F (-23°C)	14 (355)	4 (100)	1 (25)
-20°F (-29°C)	14 (355)	6 (150)	3 (75)
-30°F (-34°C)	16 (405)	8 (200)	4 (100)
-40°F (-40°C)	18 (455)	8 (200)	4 (100)
-50°F (-46°C)	20 (510)	10 (255)	6 (150)
-60°F (-51°C)	20 (510)	10 (255)	6 (150)

Notes:

(a) For protected area temperatures that occur between values listed above, use the next cooler temperature.

(b) These lengths are inclusive of wind velocities up to 30 mph (18,6 kph).

**TABLE C
MINIMUM RECOMMENDED LENGTHS OF EXPOSED SPRINKLER BARRELS
IN WET PIPE SYSTEMS**



Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N). Refer to the Price List for a complete listing of Part Numbers.

Horizontal Sidewall Sprinkler Assembly

Specify the following information:

- Series LFLI Dry Type Residential Horizontal Sidewall Sprinkler (TY2335)
- with Recessed Escutcheon or without Escutcheon
- 4.4 K-factor
- 155°F (68°C) Temperature Rating
- Sprinkler Finish
- Escutcheon Finish (if applicable)
- Order Length (value from Figure 2 or 3)
- Inlet Thread Connection (1 Inch NPT or ISO 7-R1)
- P/N (from Table D)

Separately Ordered Sprinkler Wrench

Specify: W-Type 6 Sprinkler Wrench
(Figure 4), P/N 56-000-6-387

Specify: W-Type 7 Recessed Sprinkler
Wrench (Figure 5), P/N 56-850-4-001

Separately Ordered Escutcheon

Specify: Style 20 recessed Escutcheon
with (specify*) finish, P/N (specify*)

*Refer to Technical Data Sheet TFP770



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK494 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

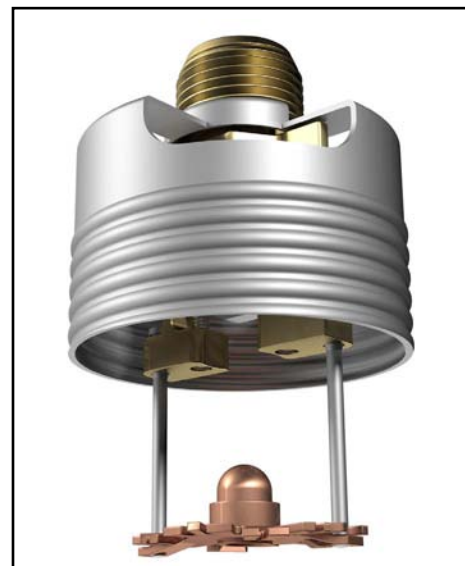
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

1. DESCRIPTION

Viking Freedom® Residential Concealed Pendent Sprinkler VK494 is a small thermosensitive, glass-bulb residential sprinkler designed for installation on concealed pipe systems where the appearance of a smooth ceiling is desired. The orifice design, with a K-Factor of 4.9 (70.6 metric*), allows the sprinkler's efficient use of available water supplies for the hydraulically designed fire-protection system. The fast response glass bulb operating element and special deflector characteristics meet the challenges of residential sprinkler standards.

The sprinkler is pre-assembled with a threaded adapter for installation with a low-profile small-diameter cover assembly installed flush to the ceiling. The two-piece design allows installation and testing of the sprinkler prior to installation of the cover plate. The "push-on", "thread-off" design of the concealed cover plate assembly allows easy installation of the cover plate after the system has been tested and the ceiling finish has been applied, while also providing up to 1/2" (13 mm) of vertical adjustment. The cover assembly can be removed and reinstalled, allowing temporary removal of ceiling panels without taking the sprinkler system out of service or removing the sprinkler. The Electroless Nickel PTFE (ENT) coating has been investigated for installation in corrosive atmospheres and is C-UL-US-EU Listed as corrosion resistant as indicated in the Approval Charts. The ENT finish is only available for the sprinkler assembly, the cover plate is not plated.



2. LISTINGS AND APPROVALS



UL Listed (C-UL-US-EU): Category VKKW

Refer to the Approval Charts and Design Criteria on for C-UL-US-EU Listing requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Minimum Operating Pressure: Refer to the Approval Chart.

Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).

Thread size: 1/2" (15 mm) NPT

Nominal K-Factor: 4.9 U.S. (70.6 metric*)

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

* Metric K-factor measurement shown is in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Material Standards:

Sprinkler Body: Brass UNS-C84400 or QM Brass

Deflector: Phosphor Bronze UNS-C51000

Deflector Pins: Stainless Steel UNS-S30200

Button: Brass UNS-C36000

Pip Cap and Insert Assembly: Copper UNS-C11000 and SS UNS-S30400

Compression Screw: 18-8 Stainless Steel

Yoke: UNS-S43000 Stainless Steel or Phosphor Bronze UNS-C51000

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape

Cover Adapter: Cold Rolled Steel UNS-G10080, Finish: Clear Chromate over Zinc Plating

Shipping Cap: Polyethylene

Cover Plate Materials:

Cover Plate Assembly: Copper UNS-C11000 and Brass UNS-C26800

Spring: Beryllium Nickel

Solder: Eutectic

Ordering Information: (Also refer to the current Viking price list.)

Viking Freedom® Residential Concealed Pendent Sprinkler VK494 and Cover Plate Assembly must be ordered separately:

Sprinkler: Order Sprinkler VK494 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A and ENT = JN

Temperature Suffix: 155 °F (68 °C) = B, 200 °F (93 °C) = E

For example, sprinkler VK494 with a Brass finish and a 200 °F (93 °C) temperature rating = Part No. 20759AE.

Cover Plate Assembly: Base Part No. 13504 (2-3/4" diameter), Base Part No. 13642 (3-5/16" diameter), or Base Part No. 15394 (square cover plate, 3-5/16" diameter)



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK494 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

Specify finish and temperature rating of the cover plate assembly by adding the appropriate suffixes for the finish and the cover temperature rating to the base part number:

Finish Suffix: Polished Chrome = F, Brushed Chrome = F-/B, Bright Brass = B, Antique Brass = B-/A, Brushed Brass = B-/B, Brushed Copper = E-/B, Painted White = M-/W, Painted Ivory = M-/I, Painted Black = M-/B

Temperature Suffix: 135 °F/57 °C = A

For example, cover 13504 with a Polished Chrome finish and a 135 °F/57 °C temperature rating = 13504FA.

Available Finishes And Temperature Ratings: Refer to Table 1.

Accessories: (Also refer to the Viking website.)

Sprinkler Wrenches:**

A. Heavy Duty Part No. 14047W/B** (available since 2006), or

B. Head Cabinet Wrench Part No. 14031*** (available since 2006)

C. Optional Concealed Cover Plate Installer Tool Part No. 14412 (available since 2007)

D. Optional Large Concealed Cover Plate Installer Tool Part No. 14867 (available since 2007)

Requires a 1/2" ratchet (not available from Viking). *Also optional for removal of the protective cap. Ideal for sprinkler cabinets.

Sprinkler Cabinet: Part No. 01731A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, when the temperature around the sprinkler approaches its operating temperature, the cover plate detaches, releasing the deflector. Continued heating of the exposed sprinkler causes the heat-sensitive liquid in the glass bulb to expand, causing the glass to shatter, releasing the yoke and pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the deflector, forming a uniform spray pattern over a specific area of coverage determined by the water supply pressure at the sprinkler to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

Viking Sprinkler Model VK494 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Temperature Rating of the Cover Assembly (Required) ³	Cover Plate Base Part Number ⁴	Large Cover Plate Base Part Number ⁴	Square Cover Plate Base Part Number ⁴	Bulb Color
Ordinary	155 °F (68 °C)	100 °F (38 °C)	135 °F (57 °C)	13504	13642	15394	Red
Intermediate	200 °F (93 °C)	150 °F (65 °C)	135 °F (57 °C)	13504	13642	15394	Green

Sprinkler Finishes: Brass and ENT

Cover Plate Finishes: Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black

Corrosion Resistant Coatings⁵: ENT

Footnotes

¹ The sprinkler temperature rating is stamped on the deflector.

² Based on NFPA-13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

³ Maximum ambient temperature for cover assembly is 100 °F (38 °C).

⁴ Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.

⁵ The corrosion resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway. For ENT coated sprinklers, the Belleville spring is exposed.



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK494 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
 Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

Approval Chart Viking VK494, 4.9 K-Factor Residential Concealed Pendent Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria. For Ceiling types refer to current editions of NFPA 13, 13R or 13D

Sprinkler Base Part Number ¹	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Wor- king Pressure
		Inches	mm	U.S.	metric ²	
20759	VK494	1/2	15	4.9	70.6	175 psi (12 bar)
Max. Coverage Area ⁶ W X L Ft. X Ft. (m X m)	Flow GPM (LPM)	Pressure PSI (bar)	Deflector to Ceiling	Installation Type	Listings and Approvals ^{3,5} 	Minimum Spacing Ft. (m)
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)	Refer to Figure 2	Concealed with Cover Plate Assembly. See Footnote 9.	See Footnotes 7,10, & 11	8 (2.4)
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)				
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)				
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)				
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)				

Footnotes

¹ Part number shown is the base part number. For complete part number, refer to current Viking price schedule.

² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

³ This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals. Refer also to Design Criteria.

⁴ Listed by Underwriter's Laboratories, Inc. for use in the U.S., Canada, and European Union.

⁵ Meets New York City requirements, effective July 1, 2008.

⁶ For areas of coverage smaller than shown, use the "Flow" and "Pressure" for the next larger area listed. Flows and pressures listed are per sprinkler. The distance from sprinklers to walls shall not exceed one-half the sprinkler spacing indicated for the minimum "Flow" and "Pressure" used.

⁷ Cover Temperature Rating is 135 °F (57 °C). Cover Part No. 13504¹, 13642¹ (large diameter), or 15394¹ (square cover plate).

⁹ Other paint colors are available on request with the same listings as the standard finish colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information. Custom colors are indicated on a label inside the cover assembly. Refer to Figure 3.

¹⁰ Accepted Cover Plate Finishes are: Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black ⁹.

¹¹ C-UL-US-EU Listed as corrosion resistant - Electroless Nickel PTFE (ENT)



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK494 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

DESIGN CRITERIA

(Also refer to the Approval Chart on page 3.)

UL Listing Requirements (C-UL-US-EU):

When using Viking Residential Concealed Pendent Sprinkler VK494 for systems designed to NFPA 13D or NFPA 13R, apply the listed areas of coverage and minimum water supply requirements shown in the Approval Chart.

For systems designed to NFPA 13: The number of design sprinklers is to be the four contiguous most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

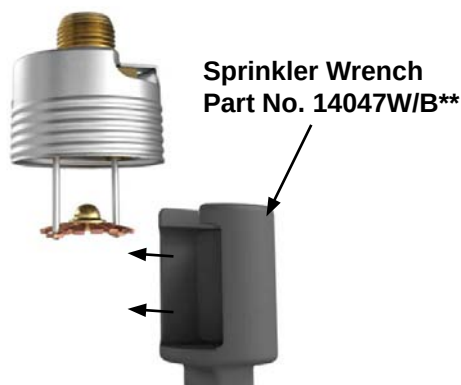
- The flow rates given in the Approval Chart for NFPA 13D and NFPA 13R applications for each listed area of coverage, or
- Calculated based on a minimum discharge of 0.1 gpm/sq. ft. over the "design area" in accordance with sections 8.5.2.1 or 8.6.2.1.2 of NFPA 13.
- Minimum distance between residential sprinklers: 8 ft. (2.4 m).

NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.

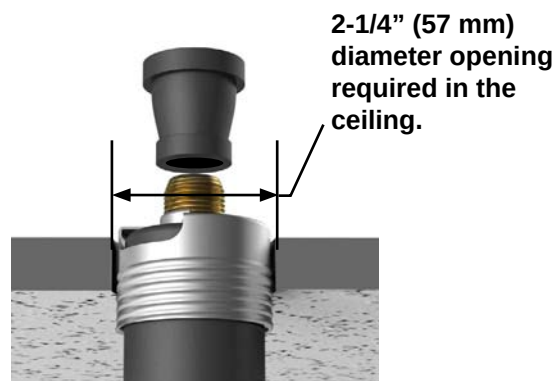
IMPORTANT: Always refer to Bulletin Form No. F_080415 - Best Practices for Residential Sprinkler Handling and Installation. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA and any other similar Authorities Having Jurisdiction, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. Final approval and acceptance of all residential sprinkler installations must be obtained from the Authorities Having Jurisdiction.

Sprinkler and Adapter Assembly

- Protective cap removed
- Use wrench 14047W/B**



Step 1:
Carefully slide the wrench sideways around the deflector and pins



Step 2:
Carefully press the wrench upward and turn slightly to ensure engagement with the sprinkler wrench flats.

NEVER install the sprinkler by applying the installation wrench across the frame arms. **DO NOT** overtighten. Use only the designated sprinkler wrenches, Viking Part Numbers 14047W/B** or 14031**. A leak tight seal should be achieved by turning the sprinkler clockwise 1 to 1-1/2 turns beyond finger tight.

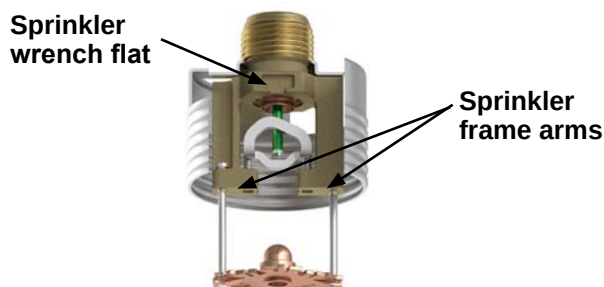


Figure 1: Sprinkler Installation and Proper Wrench Usage

** A 1/2" ratchet is required (Not available from Viking)



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK494 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
 Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

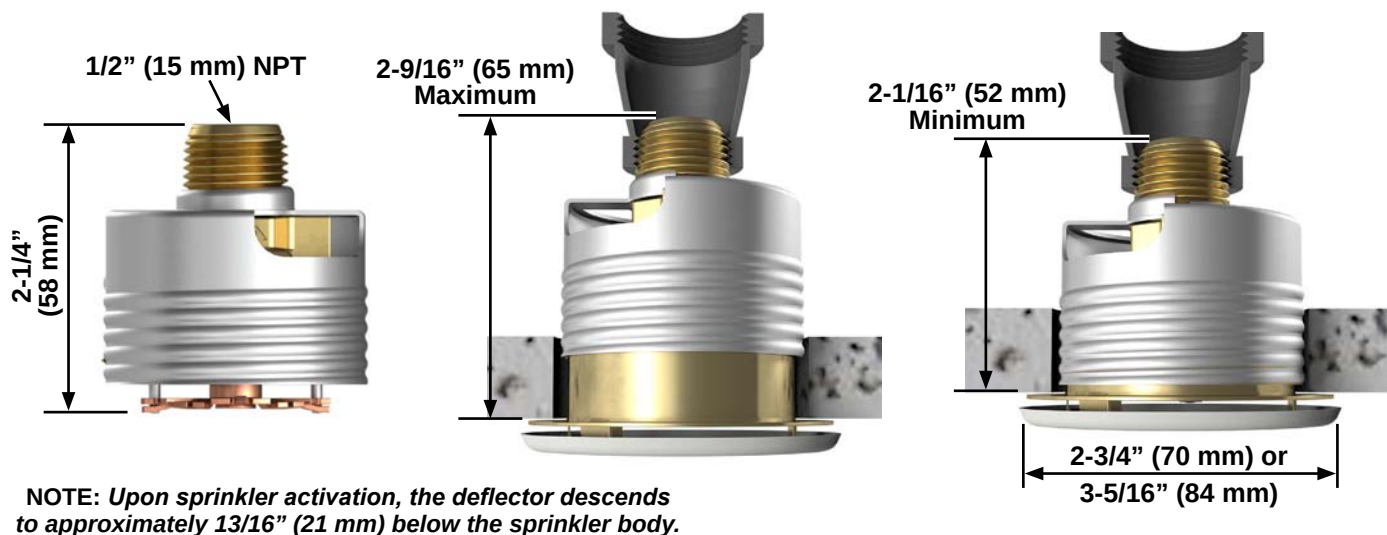


Figure 2: Sprinkler Dimensions and Cover Installation



All custom color painted cover plates will have an identifying label affixed to the inside of the cover that indicates the custom color and will have a representative sample (a paint dot) of the paint on the label.

Figure 3: Identification of Custom Paint for Concealed Covers



Figure 4: Square Cover Assembly 15394



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

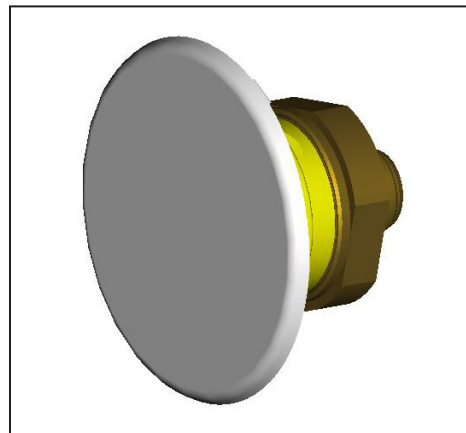
The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

Viking Freedom® Residential Concealed Horizontal Sidewall Sprinkler VK480 is a small high-sensitivity solder link and lever residential sprinkler designed for installation on concealed pipe systems, where the appearance of a smooth wall is desired. The sprinkler orifice design, with a K-Factor of 4.0 (57.7 metric*), allows the sprinkler's efficient use of available water supplies for the hydraulically designed fire-protection system. The operating element and special deflector characteristics meet the challenges of residential sprinkler standards.

The sprinkler is hidden from view by a low profile, small diameter cover plate installed flush to the wall. The cover plate is available in several decorative finishes to meet design requirements. The two-piece design allows installation and testing of the sprinkler prior to installation of the cover plate. After the system has been tested and wall finish has been applied, the push-on design of the cover plate assembly allows easy installation of the cover plate with up to 1/4" (6.4 mm) adjustment. Sprinkler VK480 is provided with a pipe guide to properly locate the sprinkler and allow the 1/4" adjustment of the cover plate.



2. LISTINGS AND APPROVALS

 **UL Listed (C-UL-US-EU):** Category VKKW (VK480)

Refer to the Approval Chart and Design Criteria for C-UL-US-EU Listing requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Available since 2010.

Minimum Operating Pressure: Refer to the Approval Chart.

Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).

Thread size: 1/2" (15 mm) NPT

Nominal K-Factor: 4.0 U.S. (57.7 metric*)

* Metric K-factor measurement shown is in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Available Cover Plate Horizontal Adjustment: 1/4" (6.4 mm)

Overall Length (Sprinkler Body): 2" (50 mm)

Covered by the Following US Patent No: 7,712,218

Material Standards:

Sprinkler Body: QM Brass and Brass UNS-C84400

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Polytetrafluoroethylene (PTFE) Tape

Seat: Brass UNS-C31400

Deflector Ring: Brass UNS-C23000

Deflector Pins: Stainless Steel UNS-S30200

Halo: Brass UNS-C31400 or Phosphor Bronze UNS-C51000

Flow Shaper: Phosphor Bronze UNS-C51000

Lever Bar Ring: Brass UNS-C31400 or Brass UNS-C84400

Compression Screw: 18-8 Stainless Steel

Fusible Link Assembly: Nickel Alloy and Eutectic Solder

Fusible Link Levers: Stainless Steel UNS-S31600

Guide Pin: Stainless Steel UNS-S43000

Shipping Cap: Polyethylene

Cover Assembly Materials:

Cover Plate Assembly: Copper UNS-C11000 and Brass UNS-C26800

Spring: Beryllium Nickel

Solder: Eutectic

Ordering Information: (Also refer to the current Viking price list.)

Viking Freedom® Residential Concealed HSW Sprinkler VK480 and Cover Plate Assembly must be ordered separately:

Sprinkler: Part No. 16116AC (includes a 165 °F (74 °C) rated sprinkler with a protective plastic cap covering the unit).

Viking Technical Data may be found on
The Viking Corporation's Web site at
<http://www.vikinggroupinc.com>.
The Web site may include a more recent
edition of this Technical Data Page.



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Cover Plate Assembly: Base Part No. 16207 (3-5/16" diameter)

Specify finish and temperature rating of the cover plate assembly by adding the appropriate suffixes for the finish and the cover temperature rating to the base part number:

Finish Suffix: White Polyester = M-/W

Temperature Suffix: 135 °F (57 °C) = A

For example, cover 16207 with a White Painted finish and a 135 °F (57 °C) temperature rating = 16207MA/W.

Available Finishes And Temperature Ratings: Refer to Table 1.

Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

Sprinkler Wrenches:**

A. Heavy Duty Wrench Part No. 16208W/R** (available since 2010)

B. Head Cabinet Wrench Part Number 16267*** (available since 2010)

C. Optional Large Concealed Cover Plate Installer Tool Part No. 14867 (available since 2007)

**Requires a ½" ratchet (not available from Viking).

***Ideal for sprinkler cabinets.

Sprinkler Cabinet: Part No. 01731A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, when the temperature around the sprinkler approaches its operating temperature, the cover plate detaches. Continued heating of the exposed sprinkler causes the fusible element to disengage, releasing the sealing assembly. Water flowing through the sprinkler orifice strikes the flow shaper, forming a uniform spray pattern over a specific area of coverage determined by the water supply pressure at the sprinkler to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

Viking Freedom® Residential Concealed Horizontal Sidewall Sprinkler VK480 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.



Identification of Custom Paint Color:
All custom color painted cover plates will have an identifying label affixed to the inside of the cover that indicates custom color and will have a representative sample (a paint dot) of the paint on the label.

**Figure 1: Identification of Custom Paint Color
for Concealed Covers**

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Temperature Rating of the Cover Assembly (Required)	Cover Plate Base Part Number ³
Ordinary	165 °F (74 °C)	100 °F (38 °C)	135 °F (57 °C)	16207

Cover Plate Finish: White Polyester

Footnotes

¹ The sprinkler temperature rating is stamped on the inlet.

² Based on NFPA-13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

³ Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Approval Chart Viking VK480, 4.0 K-Factor Residential Concealed HSW Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria below. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number ¹		SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure						
			Inches	mm	U.S.	metric ²							
16116AC		VK480	1/2	15	4.0	57.7	175 psi (12 bar)						
Max. Coverage Area ⁶ Width X Length Ft. X Ft. (m X m)	Max. Spac- ing Ft. (m)	Ordinary Temp Rating (165 °F/74 °C)		Centerline of Sprinkler to Ceiling	Installation Type	Listings and Approvals ³			Minimum Spacing Ft. (m)				
		Flow ⁶ GPM (L/min)	Pressure ⁶ PSI (bar)			 ⁴	NYC	NSF					
12 X 12 (3.7 X 3.7)	12 (3.7)	11 (41.7)	7.6 (0.52)	4-3/8 to 6-3/8 inches	Concealed with Cover Plate As- sembly	See Foot- note 8 and 9	See Foot- note 5	--	8 (2.4)				
14 X 14 (4.3 X 4.3)	14 (4.3)	13 (49.3)	10.6 (0.73)										
16 X 16 (4.9 X 4.9)	16 (4.9)	16 (60.6)	16 (1.10)										
16 X 18 (4.9 X 5.5)	16 (4.9)	17 (64.4)	18.1 (1.25)										
12 X 12 (3.7 X 3.7)	12 (3.7)	12 (45.5)	9 (0.62)	6-3/8 to 12-3/8 inches									
14 X 14 (4.3 X 4.3)	14 (4.3)	14 (53.0)	12.3 (0.84)										
16 X 16 (4.9 X 4.9)	16 (4.9)	16 (60.6)	16 (1.10)										
16 X 18 (4.9 X 5.5)	16 (4.9)	18 (68.1)	20.3 (1.40)										

Footnotes

¹ For complete part number, also refer to current Viking price list schedule.

² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

³ This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals. Refer also to Design Criteria listed below.

⁴ Sprinkler VK480 is Listed by Underwriter's Laboratories, Inc. for use in the U.S., Canada, and European Union.

⁵ Meets New York City requirements, effective July 1, 2008.

⁶ For areas of coverage smaller than shown, use the "Flow" and "Pressure" for the next larger area listed. Flows and pressures listed are per sprinkler. The distance from sprinklers to walls shall not exceed one-half the sprinkler spacing indicated for the minimum "Flow" and "Pressure" used.

⁷ Other paint colors are available on request with the same listings as the standard finish colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information. Custom colors are indicated on a label inside the cover assembly. Refer to Figure 1.

⁸ Cover Temperature Rating is 135 °F (57 °C). Cover Part No. 16207 ¹.

⁹ Accepted Cover Plate Finishes are: White Polyester ⁷.

DESIGN CRITERIA

(Also refer to the Approval Chart above.)

UL Listing Requirements (C-UL-US-EU):

When using Viking Residential Concealed Horizontal Sidewall Sprinkler VK480 for systems designed to NFPA 13D or NFPA 13R, apply the listed areas of coverage and minimum water supply requirements shown in the Approval Chart above.

For systems designed to NFPA 13: The number of design sprinklers is to be the four contiguous most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in the Approval Chart above for NFPA 13D and NFPA 13R applications for each listed area of coverage, **or**
- Calculated based on a minimum discharge of 0.1 gpm/sq. ft. over the "design area" in accordance with sections 8.5.2.1 or 8.6.2.1.2 of NFPA 13.
- THE TOP OF THE SPRINKLER BODY AND THE TOP OF THE INSTALLATION WRENCH ARE MARKED "TOP".** Orient the top of the sprinkler element parallel with the ceiling as shown in Figure 3.
- Minimum distance between residential sprinklers: 8 ft. (2.4 m).

NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to pages RES1-17 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA and any other similar Authorities Having Jurisdiction, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. Final approval and acceptance of all residential sprinkler installations must be obtained from the Authorities Having Jurisdiction.

Form No. F_121609 Rev 14.1



TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

The internal design of the sprinkler wrench is shaped to fit over the sprinkler and protective cap to ensure that the top of the wrench will be oriented in the same direction as the top of the sprinkler deflector.

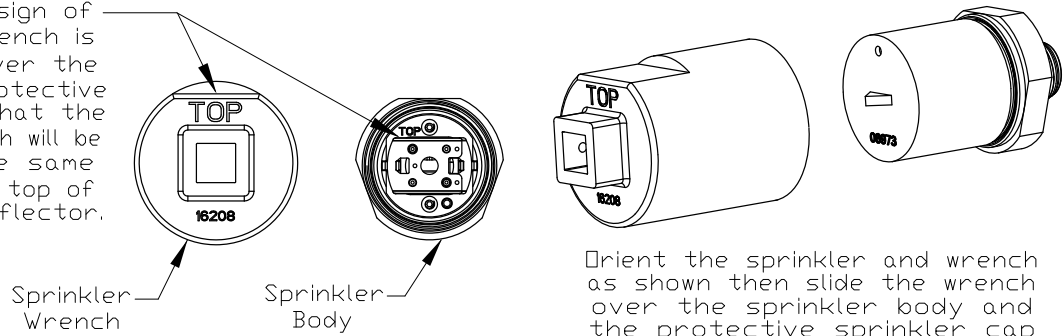


Figure 2: Sprinkler VK480 Installation and Correct Use of Wrench

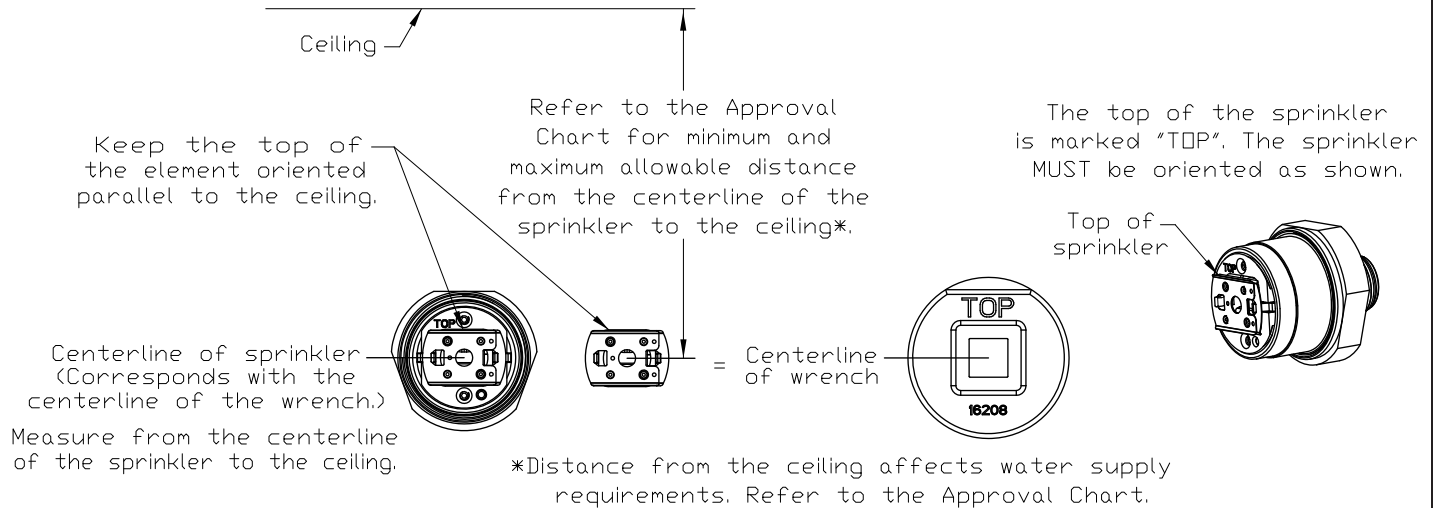


Figure 3: Sprinkler VK480 Correct Deflector Orientation

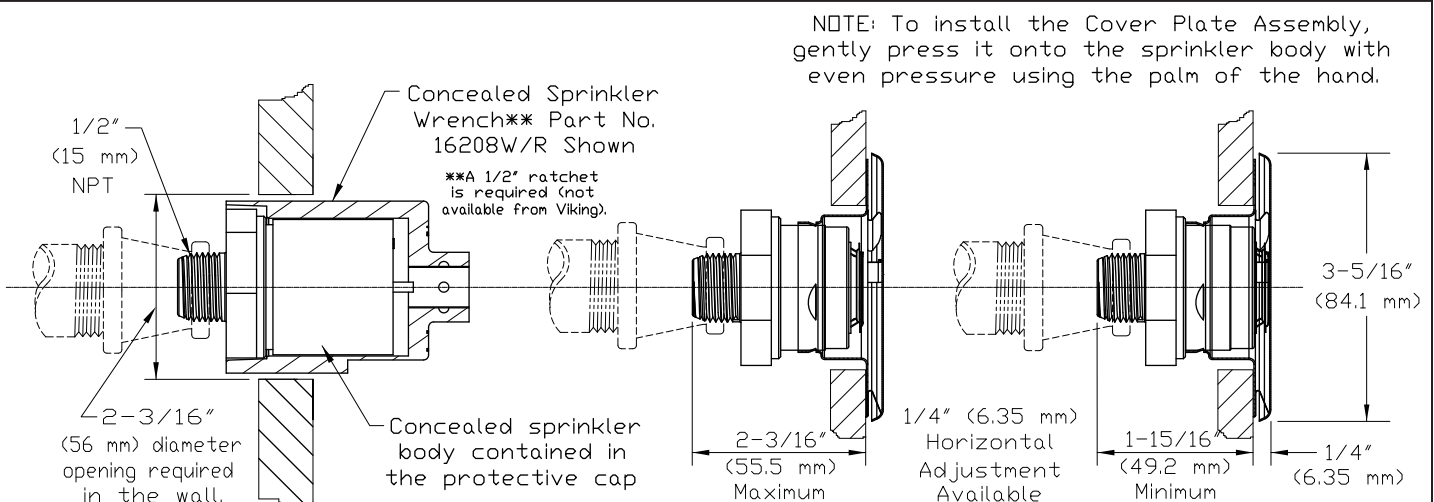


Figure 4: Sprinkler VK480 Dimensions and Cover Installation

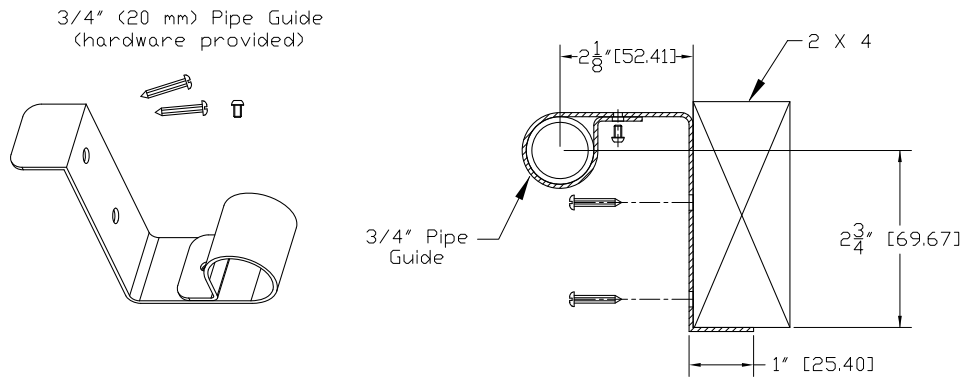


TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

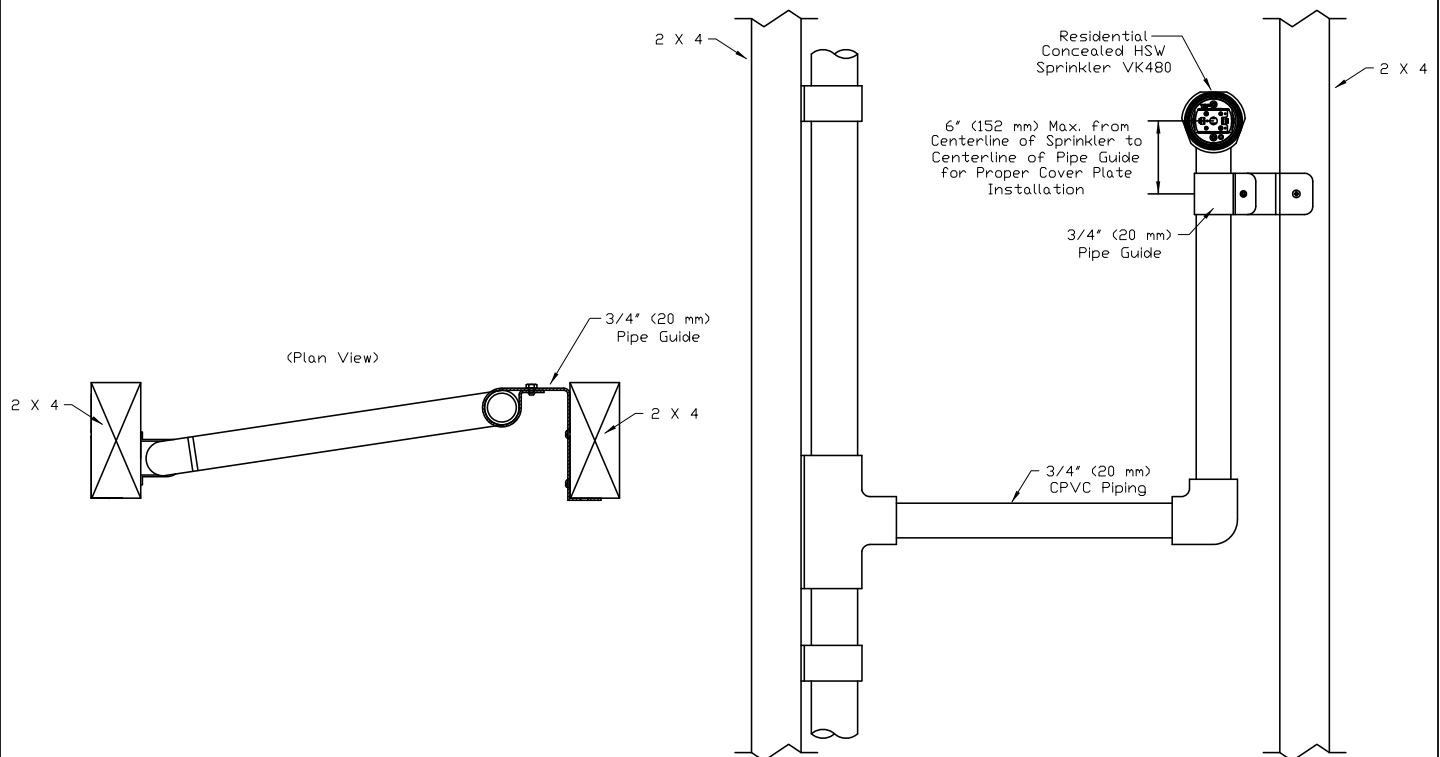
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com



NOTE: To ensure that the sprinkler is located the correct distance from the face of the finished wall, use the pipe guide (included with Sprinkler VK480) and attach it to the 3/4" CPVC pipe and the 2 x 4 inside the wall as shown.

All piping, hangers/bracing must be installed in accordance with NFPA 13.

Figure 5: Sprinkler VK480 Pipe Guide





TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED HORIZONTAL SIDEWALL SPRINKLER VK480

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

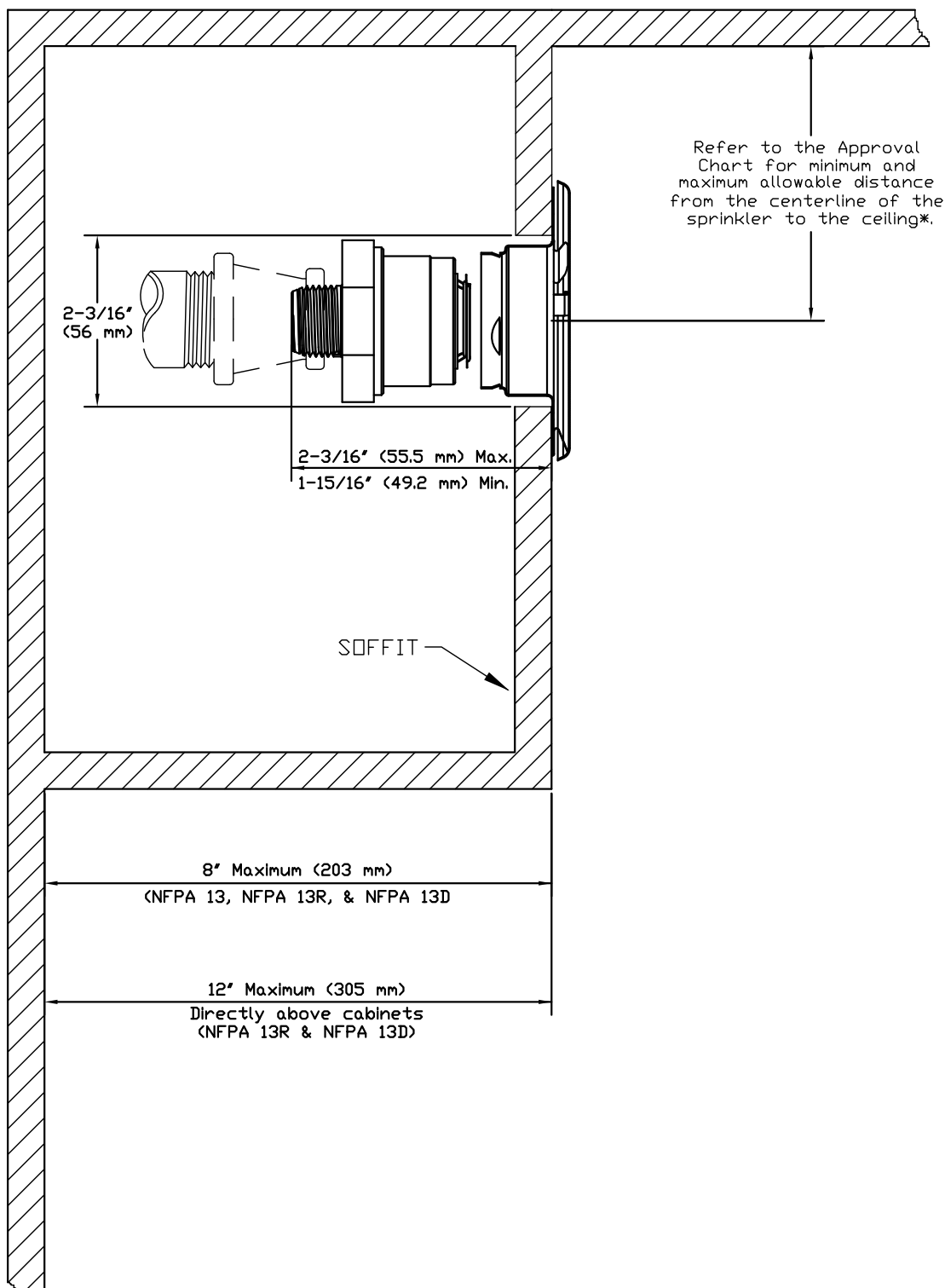


Figure 7: Sprinkler VK480 Installation - Soffit



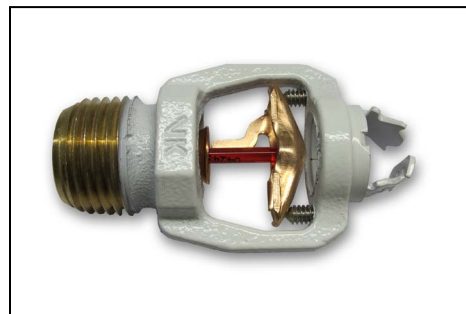
TECHNICAL DATA

FREEDOM® RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER VK486 (K4.0)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
 Visit the Viking website for the latest edition of this technical data page.

1. DESCRIPTION

Viking Freedom® Residential Horizontal Sidewall Sprinkler VK486 is a small, thermosensitive, glass-bulb residential sprinkler available in several different finishes and temperature ratings to meet varying design requirements. The Electroless Nickel PTFE (ENT) coating has been investigated for installation in corrosive atmospheres and is C-UL-US-EU Listed as corrosion resistant as indicated in the Approval Chart. The sprinkler orifice design, with a K-Factor of 4.0 (57.7 metric†), allows efficient use of available water supplies for the hydraulically designed fire-protection system. The glass bulb operating element and special deflector characteristics meet the challenges of residential sprinkler standards.



2. LISTINGS AND APPROVALS

 **UL Listed (C-UL-US-EU):** Category VKKW

 **VdS Approved**

Refer to the Approval Chart and Design Criteria for C-UL-US-EU Listing requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Available since 2011.

Minimum Operating Pressure: Refer to the Approval Chart.

Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).

Thread size: 1/2" (15 mm) NPT

Nominal K-Factor: 4.0 U.S. (57.7 metric†)

† Metric K-factor measurement shown is in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

Overall Length: 2-7/16" (62 mm)

Covered by the following US Patent numbers: 7,854,269 and 7,712,218

Material Standards:

Frame Casting: QM Brass and Brass UNS-C84400

Deflector: Phosphor Bronze UNS-C51000

Bulb: Glass, nominal 3 mm diameter

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

Compression Screws: 18-8 Stainless Steel

Yoke: Phosphor Bronze UNS-C51000

Ordering Information: (Also refer to the current Viking price list.)

Sprinkler: Base Part No. 17315

Order Sprinkler VK486 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/W

Temperature Suffix: 155 °F (68 °C) = B, 175 °F (79 °C) = D

For example, sprinkler VK486 with a Brass finish and a 155 °F (68 °C) temperature rating = Part No. 17315AB.

Available Finishes And Temperature Ratings:

Refer to Table 1.

Accessories: (Also refer to the Viking website.)

Sprinkler Wrenches:

A. Standard Wrench: Part No. 10896W/B (available since 2000)

B. Wrench for recessed sprinklers: Part No. 13655W/B* (available since 2006)

*A 1/2" ratchet is required (not available from Viking).



TECHNICAL DATA

FREEDOM® RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER VK486 (K4.0)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page.

Sprinkler Cabinets:

- A. Six-head capacity: Part No. 01724A (available since 1971)
- B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the yoke, pip cap, and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

Viking Sprinkler VK486 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

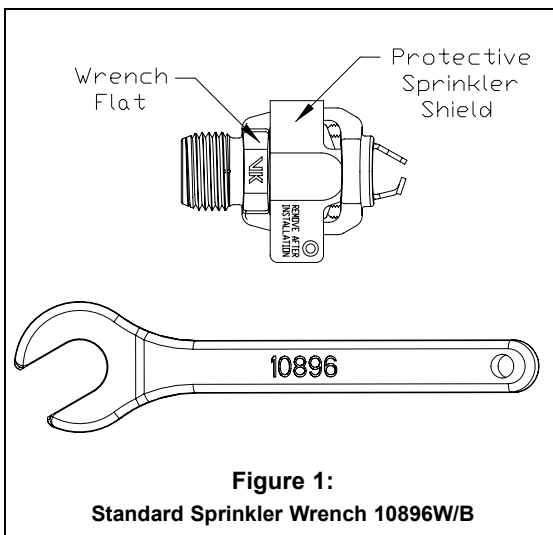
Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Bulb Color
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow

Sprinkler Finishes: Brass, Chrome, White Polyester, and Black Polyester.

Footnotes

¹ The sprinkler temperature rating is stamped on the deflector.

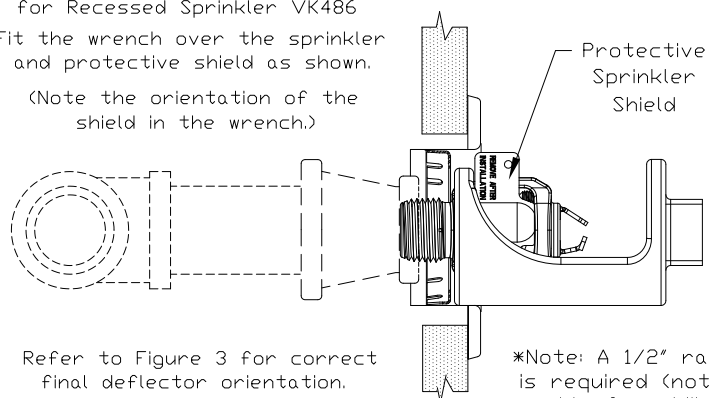
² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.



Sprinkler Wrench Part No. 13655W/B* for Recessed Sprinkler VK486

Fit the wrench over the sprinkler and protective shield as shown.

(Note the orientation of the shield in the wrench.)



Refer to Figure 3 for correct final deflector orientation.

*Note: A 1/2" ratchet is required (not available from Viking).

Figure 2:

Wrench 13655W/B for Recessed Sprinkler VK486



TECHNICAL DATA

FREEDOM® RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER VK486 (K4.0)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
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Approval Chart Viking VK486, 4.0 K-Factor Residential Horizontal Sidewall Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number ¹	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure	Overall Length					
		Inches	mm	U.S.	metric ²		Inches			mm		
17315	VK486	1/2	15	4.0	57.7	175 psi (12 bar)	2-7/16			62		
Max. Coverage Area ³ Width X Length Ft. X Ft. (m X m)	Max. Spac- ing Ft. (m)	Ordinary Temp Rating (155 °F/68 °C)		Intermediate Temp Rating (175 °F/79 °C)		Top of Deflec- tor to Ceiling	Installation Type	Listings and Approvals ⁴				Mini- mum Spacing Ft. (m)
		Flow ³ GPM (L/min)	Pressure ³ PSI (bar)	Flow ³ GPM (L/min)	Pressure ³ PSI (bar)			C- UL- US- EU ⁵	VdS	NYC	NSF ⁹	
12 X 12 (3.7 X 3.7)	12 (3.7)	11 (41.7)	7.6 (0.52)	11 (41.7)	7.6 (0.52)	4 to 6 inches	Standard surface- mounted escutch- eons or the Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Micromat- ic® Model E-1, E-2, E-3, or G-1 Recessed Escutcheon	See Foot- note 6 and 10.	See Foot- note 6.	See Foot- note 7.	See Foot- note 6.	8 (2.4)
14 X 14 (4.3 X 4.3)	14 (4.3)	12 (45.5)	9 (0.62)	12 (45.5)	9 (0.62)							
16 X 16 (4.9 X 4.9)	16 (4.9)	13 (49.3)	10.6 (0.73)	13 (49.3)	10.6 (0.73)							
16 X 18 (4.9 X 5.5)	16 (4.9)	16 (60.6)	16 (1.10)	16 (60.6)	16 (1.10)							
16 X 20 (4.9 X 6.1)	16 (4.9)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)							
16 X 22 (4.9 X 6.7)	16 (4.9)	24 (90.8)	36 (2.48)	24 (90.8)	36 (2.48)							
18 X 18 (5.5 X 5.5)	18 (5.5)	18 (68.1)	20.3 (1.40)	19 (71.9)	22.6 (1.60)							
18 X 20 (5.5 X 6.1)	18 (5.5)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)							
20 X 20 (6.1 X 6.1)	20 (6.1)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)	6 to 12 inches						
12 X 12 (3.7 X 3.7)	12 (3.7)	12 (45.5)	9 (0.62)	12 (45.5)	9 (0.62)							
14 X 14 (4.3 X 4.3)	14 (4.3)	12 (45.5)	9 (0.62)	13 (49.3)	10.6 (0.73)							
16 X 16 (4.9 X 4.9)	16 (4.9)	14 (53.0)	12.3 (0.84)	14 (53.0)	12.3 (0.84)							
16 X 18 (4.9 X 5.5)	16 (4.9)	16 (60.6)	16 (1.10)	16 (60.6)	16 (1.10)							
16 X 20 (4.9 X 6.1)	16 (4.9)	23 (87.1)	33.1 (2.28)	23 (87.1)	33.1 (2.28)							
16 X 22 (4.9 X 6.7)	16 (4.9)	26 (98.4)	42.3 (2.91)	26 (98.4)	42.3 (2.91)							
18 X 18 (5.5 X 5.5)	18 (5.5)	18 (68.1)	20.3 (1.40)	19 (71.9)	22.6 (1.60)							
18 X 20 (5.5 X 6.1)	18 (5.5)	23 (87.1)	33.1 (2.28)	23 (87.1)	33.1 (2.28)							
20 X 20 (6.1 X 6.1)	20 (6.1)	24 (90.8)	36 (2.48)	24 (90.8)	36 (2.48)							

Footnotes

¹ Part number shown is the base part number. For complete part number, refer to Viking's current price schedule.

² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

³ For areas of coverage smaller than shown, use the "Flow" and "Pressure" for the next larger area listed. Flows and pressures listed are per sprinkler. The distance from sprinklers to walls shall not exceed one-half the sprinkler spacing indicated for the minimum "Flow" and "Pressure" used.

⁴ This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals. Refer also to Design Criteria.

⁵ Listed by Underwriter's Laboratories, Inc. for use in the U.S., Canada, and European Union.

⁶ Approved Finishes are: Brass, Chrome, White Polyester, and Black Polyester ⁸

⁷ Meets New York City requirements, effective July 1, 2008.

⁸ Other paint colors are available on request with the same C-UL-US-EU listings as the standard finish colors.

⁹ UL Classified to : NSF/ANSI Standard 61, Drinking Water System Components (MH48034)

¹⁰ Approved finish is Electroless Nickel PTFE (ENT). ENT is C-UL-US-EU Listed as corrosion resistant. ENT is available with standard surface-mounted escutcheons or the Micromatic Model E-1 Recessed Escutcheon.



TECHNICAL DATA

FREEDOM® RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER VK486 (K4.0)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
 Visit the Viking website for the latest edition of this technical data page.

DESIGN CRITERIA

(Also refer to the Approval Chart.)

UL Listing Requirements (C-UL-US-EU):

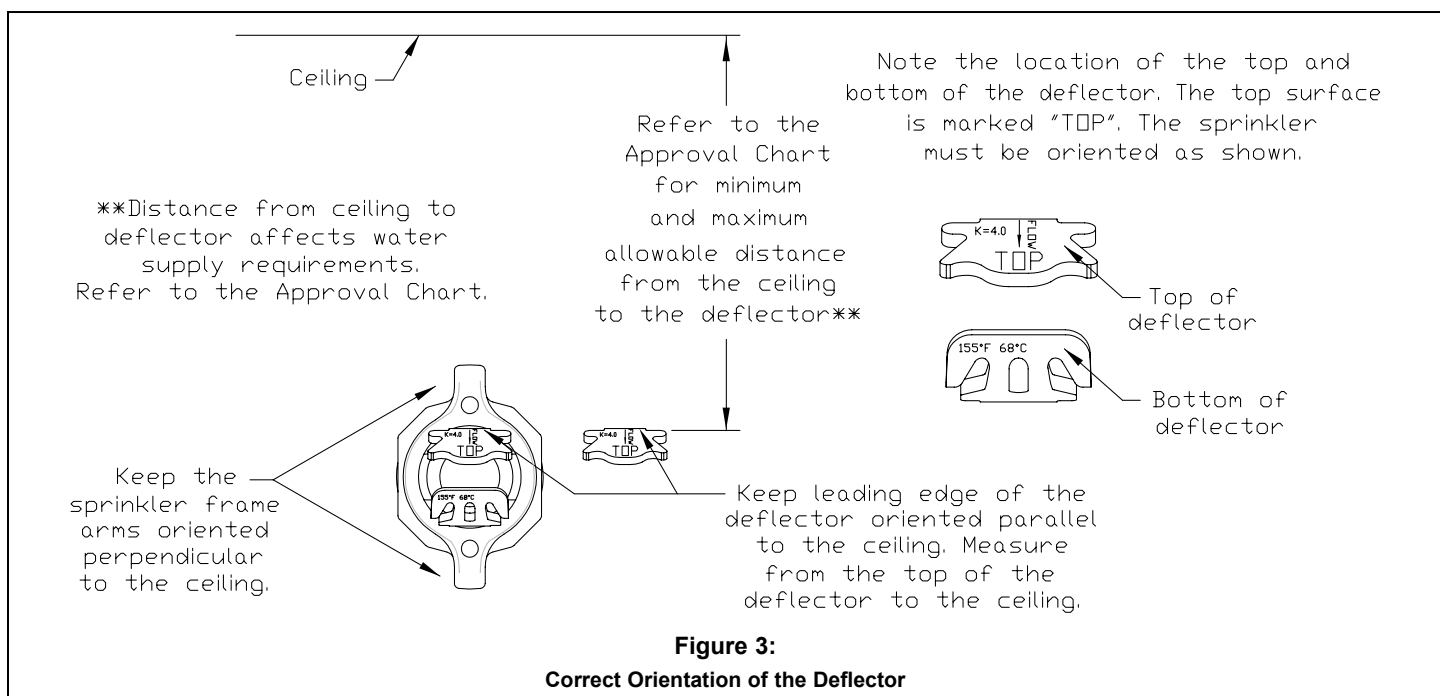
When using Viking Residential Horizontal Sidewall Sprinkler VK486 for systems designed to NFPA 13D or NFPA 13R, apply the listed areas of coverage and minimum water supply requirements shown in the Approval Chart.

For systems designed to NFPA 13: The number of design sprinklers is to be the four contiguous most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in the Approval Chart for NFPA 13D and NFPA 13R applications for each listed area of coverage, **or**
- Calculated based on a minimum discharge of 0.1 gpm/sq. ft. over the "design area" in accordance with sections 8.5.2.1 or 8.6.2.1.2 of NFPA 13.
- Minimum distance between residential sprinklers: 8 ft. (2.4 m).
- The VK486 horizontal sidewall sprinkler deflector shall be located a minimum of 1-1/4" (31.8 mm) and a maximum of 6" (152 mm) from the wall on which it is installed.

DEFLECTOR POSITION: Install sprinkler VK486 with the leading edge of the deflector oriented parallel to the ceiling and the sprinkler frame arms oriented perpendicular to the ceiling (see Figure 4). **THE TOP SURFACE OF THE DEFLECTOR IS MARKED "TOP"**. The sprinkler must be oriented as shown in Figure 3 below.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080416 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, VdS, and any other similar Authorities Having Jurisdiction, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable. Final approval and acceptance of all residential sprinkler installations must be obtained from the Authorities Having Jurisdiction.





TECHNICAL DATA

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Wall Opening Size:
 2-5/16" (58.7 mm) minimum
 2-1/2" (63.5 mm) maximum

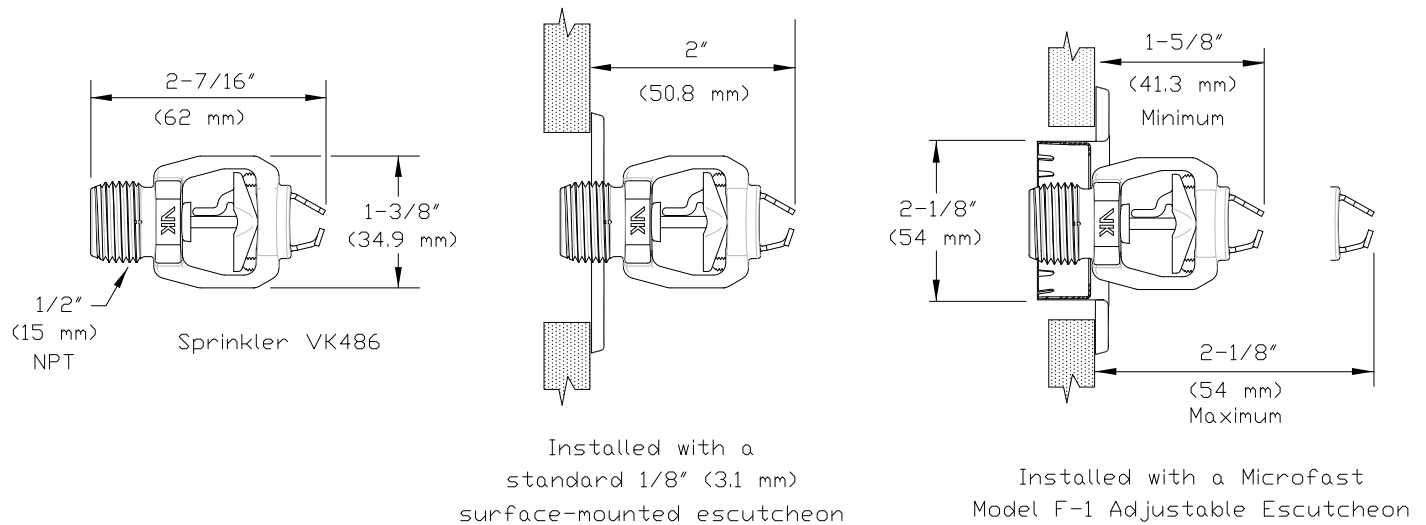


Figure 4:

Sprinkler VK486 Dimensions with a Standard Escutcheon and the Model F-1 Adjustable Escutcheon

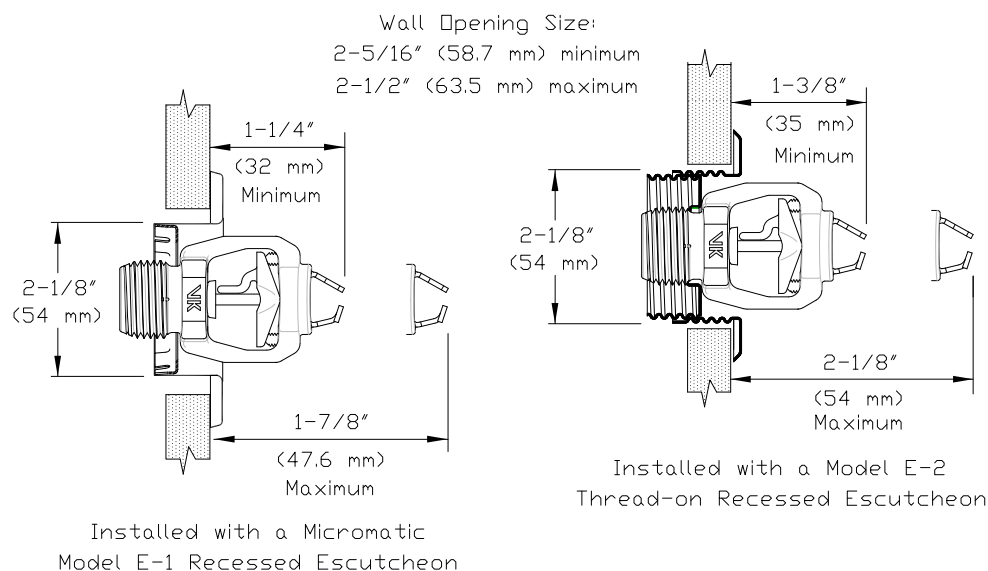


Figure 5:

Sprinkler VK486 Dimensions with the Model E-1 and E-2 Recessed Escutcheons



TECHNICAL DATA

FREEDOM® RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER VK486 (K4.0)

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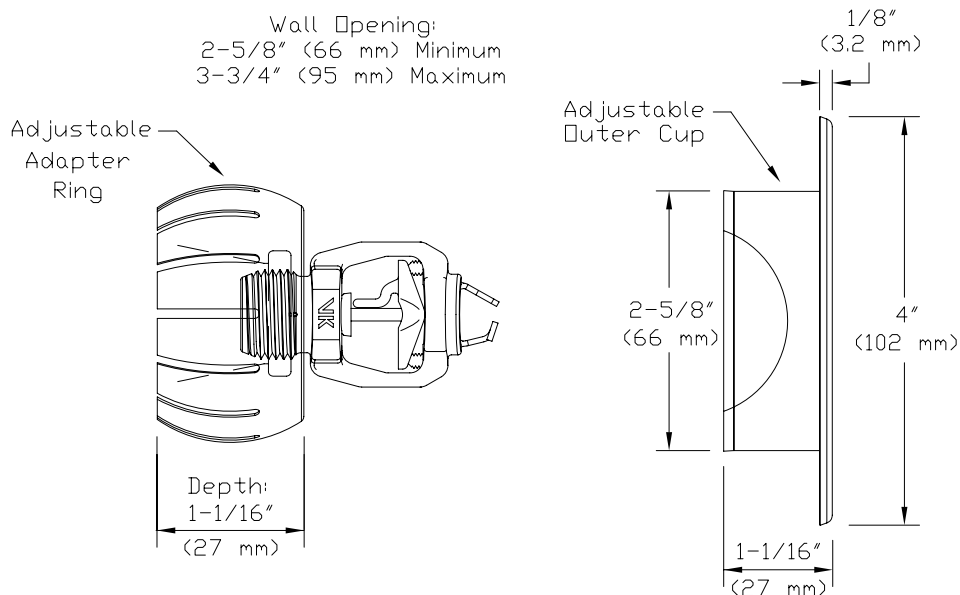


Figure 6: Sprinkler VK486 Dimensions with the Model G-1 Escutcheon



Load Short Form
Entire House
Modular Steel



Job:
Date:
By:



Project Information

For: Erdine Kalendar

Design Information

	Htg	Clg	Infiltration	
Outside db (°F)	-5	95	Method	Simplified
Inside db (°F)	70	75	Construction quality	Semi-loose
Design TD (°F)	75	20	Fireplaces	0
Daily range	-	M		
Inside humidity (%)	50	50		
Moisture difference (gr/lb)	53	8		

HEATING EQUIPMENT

Make
Trade
Model
AHRI ref

Efficiency 80 AFUE

Heating input 0 MBtuh

Heating output 0 Btuh

Temperature rise 0 °F

Actual air flow 1776 cfm

Air flow factor 0.032 cfm/Btuh

Static pressure 0 in H2O

Space thermostat

COOLING EQUIPMENT

Make
Trade
Cond
Coil
AHRI ref

Efficiency 0 SEER

Sensible cooling 0 Btuh

Latent cooling 0 Btuh

Total cooling 0 Btuh

Actual air flow 1776 cfm

Air flow factor 0.053 cfm/Btuh

Static pressure 0 in H2O

Load sensible heat ratio 0.91

ROOM NAME	Area (ft²)	Htg load (Btuh)	Clg load (Btuh)	Htg AVF (cfm)	Clg AVF (cfm)
BED 2A	215	4850	2254	155	119
BATH 1A	47	982	501	31	27
BED 3A	176	3571	1857	114	98
HALL A	105	349	81	11	4
BED 1A	221	5290	2688	169	142
LAUNDRY A	13	41	510	1	27
WIC A	28	91	21	3	1
BATH 2A	45	926	489	30	26
KITCHEN A	145	1848	2609	59	138
LIVING/DINING A	365	7870	4799	252	254
STAIRS A	65	2893	682	93	36
CLOSET A	18	308	60	10	3
BED 2B	215	4731	2472	151	131
BATH 1B	47	956	548	31	29
HALL B	105	291	188	9	10
BED 3B	176	3474	2035	111	108

Bold/italic values have been manually overridden

Calculations approved by ACCA to meet all requirements of Manual J 8th Ed.



Right-Suite® Universal 2012 12.0.13 RSU12338

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Page 1

S:\BREGRE\Heat Loads\Modular Steel- Erdine Kalendar Revised.rup Calc = MJ8 Front Door faces: NW

LAUNDRY B	13	35	22	1	1
WIC B	28	76	49	2	3
BATH 2B	45	901	534	29	28
BED 1B	221	5168	2912	165	154
KITCHEN B	145	1768	2755	57	146
STAIRS B	58	1807	413	58	22
LIVING/DINING B	370	7298	5022	233	266
Entire House	2863	55523	33502	1776	1776
Other equip loads		0	0		
Equip. @ 1.00 RSM			33502		
Latent cooling			3264		
TOTALS	2863	55523	36766	1776	1776



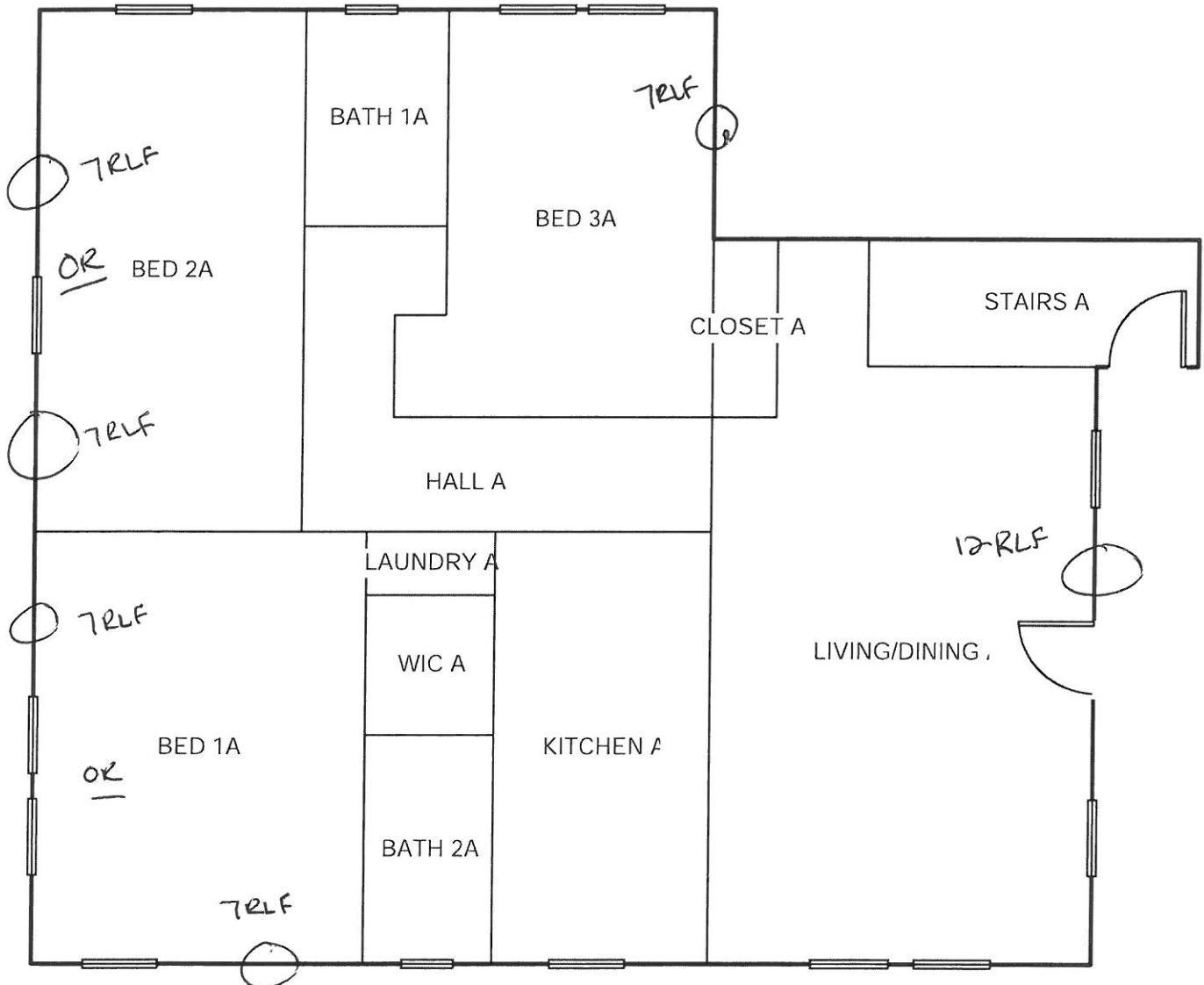
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Calculations approved by ACCA to meet all requirements of Manual J 8th Ed.





FIRST FLOOR



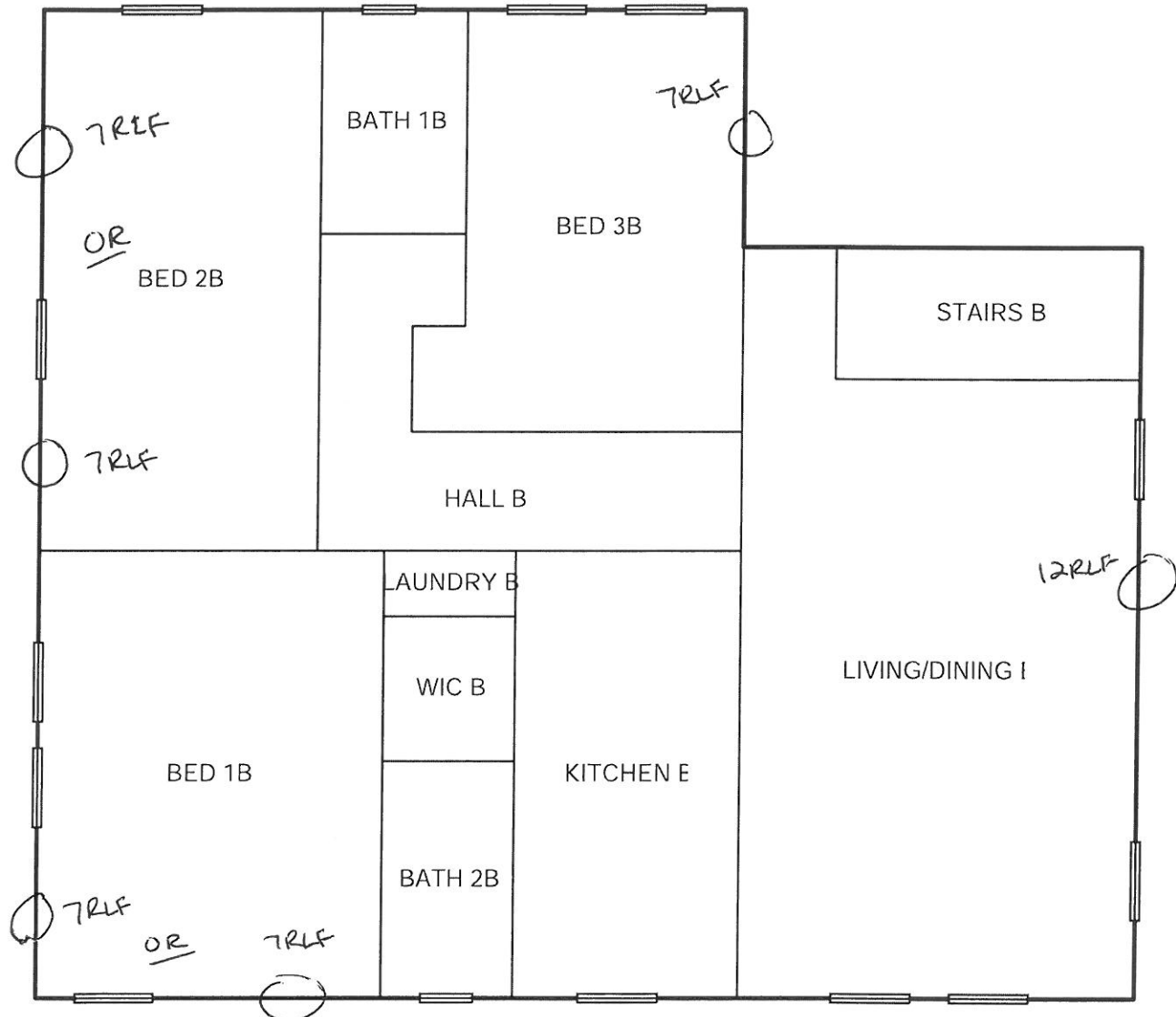
Job #:
Performed for:
Erdine Kalendar

Modular Steel

Scale: 1 : 76
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SECOND FLOOR



Job #:
Performed for:
Erdine Kalendar

Modular Steel

Scale: 1 : 76
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Submittal Data: 36RLXFZH
Inverter Driven Heat Pump

36,000 BTU Multi-Zone System

Job Name: _____

Date: _____

Location: _____

Approval: _____

Engineer: _____

Construction: _____

Submitted to: _____

Unit #: _____

Submitted by: _____

Drawing #: _____

Reference: _____



General Features

- Wired or wireless remote
- Apple catechin filter
- Ion deodorizing filter
- Auto louver: up/down
- Auto louver: 4-way
- Low ambient cooling
- Blue fin coating
- Standard Warranty: 5 years parts, 7 years compressor. Applies to systems purchased before June 1st 2015*
- Extended Warranty: 10 years parts, 10 years compressor. Systems that have been installed on or after June 1st 2015 by licensed contractors and the online Product Registration has been submitted.**
- Elite Contractor Extended Warranty: 12 years parts, 12 years compressor. Systems that have been installed on or after June 1st 2015 by contractors who have met requirements and have been approved for elite contractor status plus, the online Product Registration has been submitted. ***

Model Information

Condenser..... AOU36RLXFZH
 Evaporator[^]..... (ARU) / (AGU) / (AUU) / (ASU) 7, 9, 12, 18, 24RLF(1)
 Connectable indoor units..... 2 - 4
 Total capacity range..... 27,000 – 39,000 Btu/h

Electrical..... 208/230V AC 1ph-60Hz
 Available Voltage Range..... 208/230 +/- 10%
 Minimum Circuit Ampacity..... 31.5 A
 Max Fuse Size..... 40 A

Current

Starting Current..... 12.9 A
 Operating Current..... 26.0 A
 Cooling..... (non-duct) 11.9 A / (ducted) 12.9 A / (mix) 12.4 A
 Heating..... (non-duct) 11.8 A / (ducted) 12.1 A / (mix) 11.8 A

Input Power

Cooling..... (non-duct) 3.52 kW / (ducted) 3.92 kW / (mix) 3.71 kW
 Heating..... (non-duct) 3.00 kW / (ducted) 3.22 kW / (mix) 3.11 kW

Capacity

Nominal Cooling..... 35,200 Btu/h
 Min-Max Cooling..... 12,000 – 39,000 Btu/h
 Nominal Heating..... 36,400 Btu/h
 Min-Max Heating..... 12,000 – 42,000 Btu/h

Compressor

Motor Output..... DC Twin Rotary (inv x1) 2,100 W
 Refrigerant..... R410a
 Pre-Charge..... 8 lbs. 13 oz.
 Oil..... RB68

Fan Motor

Type: DC (condenser)..... Propeller x1
 Motor Output (condenser)..... 100 W
 Type: DC (evaporator)..... (wall-mount) Cross flow
 (compact cassette) Turbo
 (ducted) Sirocco x2 (18 k x3)
 (floor) Cross flow x2

Motor Output (Evaporator)..... (wall) 30-42W (compact cassette) 54W (ducted) 80-81W
 (floor) 16W

Heat Exchanger

Dimensions (condenser)
 (H x W x D) in. (mm)..... 38-1/16 x 36-5/16 x 2-3/16 (966x922x55)
 Fin Pitch..... 1.45 FPI
 Rows x Stages..... 2 x 38
 Pipe Type (Material)..... Grooved H-Pin (Copper)
 Fin Type (Material)..... Aluminum (Blue fin)



Operation Temperature Range

Cooling..... 14°F (-10°C) - 115°F (46°C)
 Heating..... -15°F (-26°C) - 75°F (24°C)

Efficiency

SEER^{^A}..... 20.0 (wall-mount) 18.0 (duct) 19.0 (mix)
 EER (cooling)..... 13.0 Btu/W (wall-mount) 12.0 Btu/W(duct) 12.5 Btu/W(mix)
 COP (heating)..... 4.00 W/W (wall-mount) 3.88 W/W (duct) 3.94 W/W(mix)
 HSPF (heating)..... 10.3 (wall-mount) 9.3 (duct) 9.8 (mix)

Enclosure (condenser)

Material..... Painted galvanized steel
 Color..... Beige (10 YR 7.5/1.0 NN)

Sound Pressure Level

Cooling..... 53 dB(A)
 Heating..... 55 dB (A)

Dimensions

H x W x D (condenser)
 Net in. (mm)..... 39-5/16 x 38-3/16 x 14-9/16 (998x970x370)
 Gross in. (mm)..... 45-3/4 x 45-1/4 x 18-13/16 (1,162x1,150x478)

Connection Pipe

Liquid..... 1/4" (6.35 mm) x4
 Gas..... 3/8" (9.52 mm) x3 + 1/2" (12.70 mm) x1
 Method (Liquid/Gas)..... Brazing
 Pre-charge length (Total)..... 164 ft. (50m)
 Max length (Total)..... 230 ft. (70m)
 Max length (Each)..... 82 ft. (25m)
 Min. length (Total)..... 49 ft. (15m)
 Min length (Each)..... 16 ft. (5m)
 Max Height Difference..... 49 ft. (15m)

Weight

Condenser..... 205 lbs. (93kg)
 Evaporators..... (wall-mount) 19 lbs. - 31 lbs.
 (compact cassette) 33 lbs.
 (ducted) 37 lbs. - 49 lbs.
 (floor) 31 lbs.

Accessories

UTY-DMMUM..... Central wired remote control (backlit, displays room temp.)
 UTY-RNNUM..... Wired remote control
 UTY-RSNUM..... Wired remote control (simple)

Intertek®ETL Number

AOU36RLXFZH..... 91987

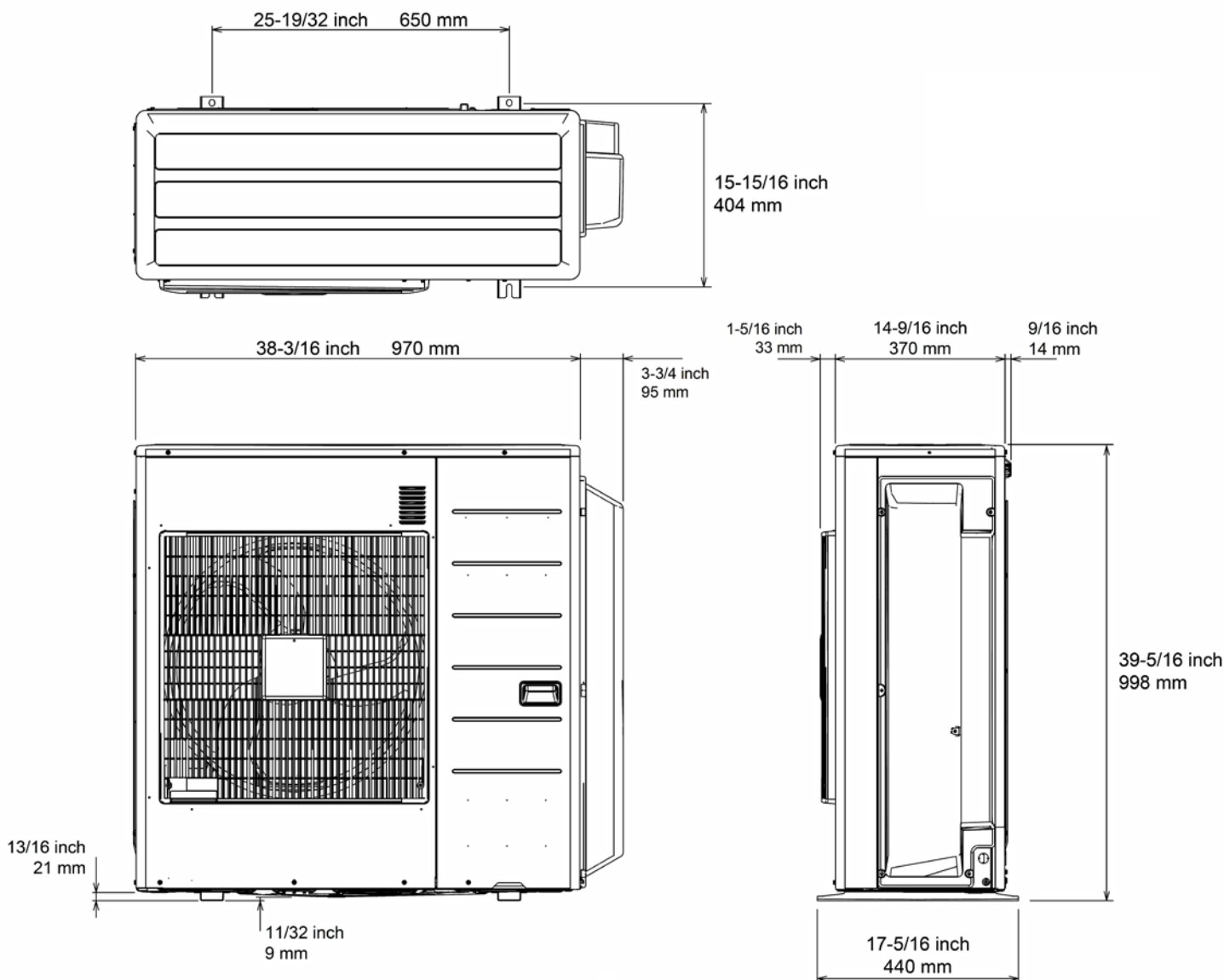
*Reference brochure for approved combinations. ^/Test conditions are based on AHRI 210/240.

Note: Specifications are based on the following conditions. Cooling: Indoor temperature of 80°F (26.7°C) DB/67°F (19.4°C) WB, and outdoor temperature of 95°F (35°C) DB/75°F (23.9°C) WB. Heating: Indoor temperature of 70°F (21.1°C) DB/59°F (15°C) WB, and outdoor temperature of 47°F (8.3°C) DB/43°F (6.1°C) WB. Pipe length: 24ft. fin. (7.5m). Height difference: 0ft. (0m) (Outdoor unit – indoor unit)

(*)Standard warranty / **10 year warranty / ***12 year warranty

Dimensions: 36RLXFZH

[Unit: in. (mm)]



PFS **APPROVED**
DATE **1/31/18**
PFS CORPORATION
Bloomsburg, PA

FUJITSU

Fujitsu General America, Inc.
353 Route 46 West
Fairfield, NJ 07004
Toll Free: 1-888-888-3424
Fax: (973) 836-0447
www.fujitsugeneral.com

**Submittal Data:ASU7RLF1
Inverter Driven Heat Pump**

7,000 BTU Wall Mount Type

Job Name: _____

Date: _____

Location: _____

Approval: _____

Engineer: _____

Construction: _____

Submitted to: _____

Unit #: _____

Submitted by: _____

Drawing #: _____

Reference: _____

General Features

- Refrigerant Type R410A.
- Wired and wireless remote controllers
- Auto changeover
- Weekly timer
- Removable open panel
- Super quiet operation
- Removable air filter
- Program timer
- 5 years standard parts warranty
- Eligible for 10 year or 12 year parts warranty. See warranty statement for details.

Model Information

Evaporator..... ASU7RLF1
Condenser compatibility..... AOU18RLXFZ, AOU18RLXFZH
AOU24RLXFZ, AOU24RLXFZH
AOU36RLXFZ, AOU36RLXFZ1, AOU36RLXFZH
AOU45RLXFZ, AOU48RLXFZ1

Electrical..... 208/230V AC 1ph-60Hz
Available Voltage Range..... 208/230 +/- 10%
Minimum Circuit Ampacity..... 0.18 A
Full Load Amps..... 0.14 A
Input Power 15 W
Running Current..... 0.13 A

Capacity
Nominal Cooling..... 7,000 Btu/h

Fan Motor
Type: DC Cross flow x1
Motor Output..... 30 W
Fan Motor Protection..... off: 221 ± 18°F (105 ± 10°C)
on: 194 ± 18°F (90 ± 10°C)

Airflow Rate
Cooling (High / Medium / Low / Quiet)
330 CFM (560 m3/h) / 294 CFM (500 m3/h) / 253 CFM (430 m3/h) / 182 CFM (310 m3/h)
Heating (High / Medium / Low / Quiet)
330 CFM (560 m3/h) / 294 CFM (500 m3/h) / 253 CFM (430 m3/h) / 194 CFM (330 m3/h)

Heat Exchanger
Dimensions
(H x W x D) in. (mm)..... 12-5/8 x 24-13/16 x 13/16 (320x630x20)
Fin Pitch..... Main 23 FPI / Sub 18 FPI
Rows x Stages..... Main 2 x20 / Sub 1 x4
Pipe Type (Material)..... Copper
Type (Material)..... Aluminum



Temperature Setting Range

Cooling..... 64°F - 90°F (18°C - 32 °C)
Heating..... 60°F - 88°F (16°C - 30°C)

Enclosure

Material.....Galvanized Steel Sheet

Sound Pressure Level

Cooling
High/Medium/Low/Quiet..... 36 dB (A) / 32 dB (A) / 29 dB (A) / 21 dB (A)
Heating
High/Medium/Low/Quiet..... 36 dB (A) / 32 dB (A) / 29 dB (A) / 22 dB (A)

Dimensions

H x W x D
in. (mm).....10-9/16 x 33-1/16 x 8 (268x840x203)

Connection Pipe

Liquid..... 1/4" in. (6.35 mm)
Gas..... 3/8" in. (9.52 mm)
Method (Liquid/Gas)..... Flare
Drain hose
Material..... PP + LLDPE
Size..... Ø9/16 (I.D.), Ø5/8 to Ø11/16 [Ø13.8 (I.D.), Ø15.8 to Ø16.7 O.D.]

Weight

Net..... 19 lbs. (8.5 kg)
Gross..... 23 lbs. (10.5 kg)

Accessories

Wired Remote Controller..... UTY-RNNUM
Backlit Display..... UTY-RVNUM
Simple Remote Controller..... UTY-RSNUM
Dry Contact Wire Kit..... UTY-XWZZX25
Interface Kit..... UTY-XCBXZ2

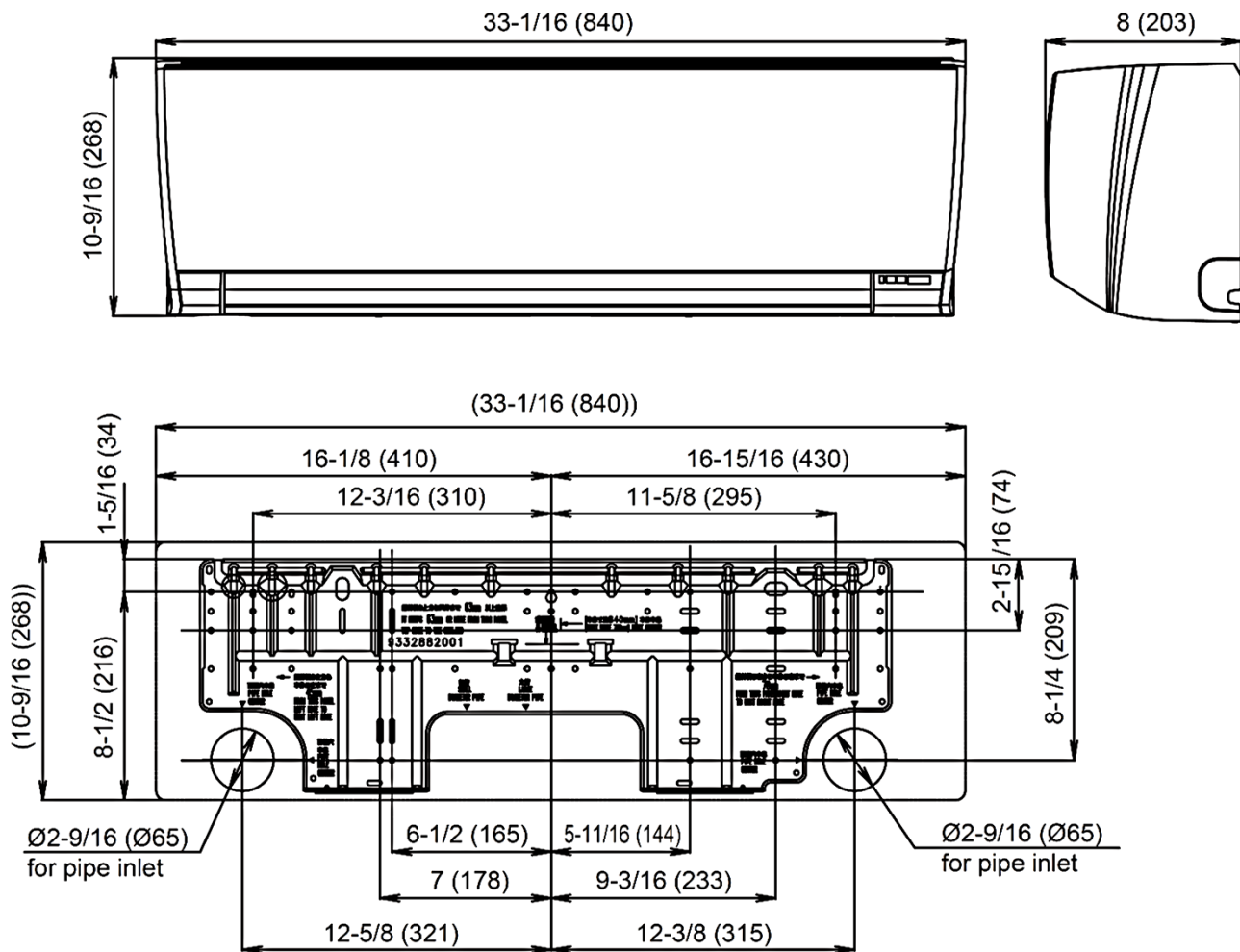
Intertek®ETL Number

ASU7RLF1..... 91986



Dimensions: ASU7RLF1

[Unit: in. (mm)]



Submittal Data:ASU12RLF1 Inverter Driven Heat Pump

12,000 BTU Wall Mount Type

Job Name: _____

Date: _____

Location: _____

Approval: _____

Engineer: _____

Construction: _____

Submitted to: _____

Unit #: _____

Submitted by: _____

Drawing #: _____

Reference: _____

General Features

- Refrigerant Type R410A.
- Wired and wireless remote controllers
- Auto changeover
- Weekly timer
- Removable open panel
- Super quiet operation
- Removable air filter
- Program timer
- 5 years standard parts warranty
- Eligible for 10 year or 12 year parts warranty. See warranty statement for details.

Model Information

Evaporator..... ASU12RLF1
Condenser compatibility..... AOU12RLFW1, AOU18RLXFZ, AOU18RLXFZH
AOU24RLXFZ, AOU24RLXFZH
AOU36RLXFZ, AOU36RLXFZ1, AOU36RLXFZH
AOU45RLXFZ, AOU48RLXFZ1

Electrical..... 208/230V AC 1ph-60Hz
Available Voltage Range..... 208/230 +/- 10%
Minimum Circuit Ampacity..... 0.25 A
Full Load Amps..... 0.20 A
Input Power 22 W
Running Current..... 0.19 A

Capacity
Nominal Cooling..... 12,000 Btu/h

Fan Motor
Type: DC Cross flow x1
Motor Output..... 30 W
Fan Motor Protection..... off: 221 ± 18°F (105 ± 10°C)
on: 194 ± 18°F (90 ± 10°C)

Airflow Rate
Cooling (High / Medium / Low / Quiet)
388 CFM (660 m3/h) / 330 CFM (560 m3/h) / 265 CFM (450 m3/h) / 182 CFM (310 m3/h)
Heating (High / Medium / Low / Quiet)
388 CFM (660 m3/h) / 330 CFM (560 m3/h) / 277 CFM (470 m3/h) / 194 CFM (330 m3/h)

Heat Exchanger
Dimensions
(H x W x D) in. (mm)..... 12-5/8 x 24-13/16 x 13/16 (320x630x20)
Fin Pitch..... Main 23 FPI / Sub 18 FPI
Rows x Stages..... Main 2 x20 / Sub 1 x4
Pipe Type (Material)..... Copper
Type (Material)..... Aluminum



Temperature Setting Range

Cooling..... 64°F - 90°F (18°C - 32 °C)
Heating..... 60°F - 88°F (16°C - 30°C)

Enclosure

Material.....Galvanized Steel Sheet

Sound Pressure Level

Cooling
High/Medium/Low/Quiet..... 40 dB (A) / 36 dB (A) / 30 dB (A) / 21 dB (A)
Heating
High/Medium/Low/Quiet..... 40 dB (A) / 36 dB (A) / 31 dB (A) / 22 dB (A)

Dimensions

H x W x D
in. (mm).....10-9/16 x 33-1/16 x 8 (268x840x203)

Connection Pipe

Liquid..... 1/4" in. (6.35 mm)
Gas..... 3/8" in. (9.52 mm)
Method (Liquid/Gas)..... Flare
Drain hose
Material..... PP + LLDPE
Size..... Ø9/16 (I.D.), Ø5/8 to Ø11/16 [Ø13.8 (I.D.), Ø15.8 to Ø16.7 O.D.]

Weight

Net..... 19 lbs. (8.5 kg)
Gross..... 23 lbs. (10.5 kg)

Accessories

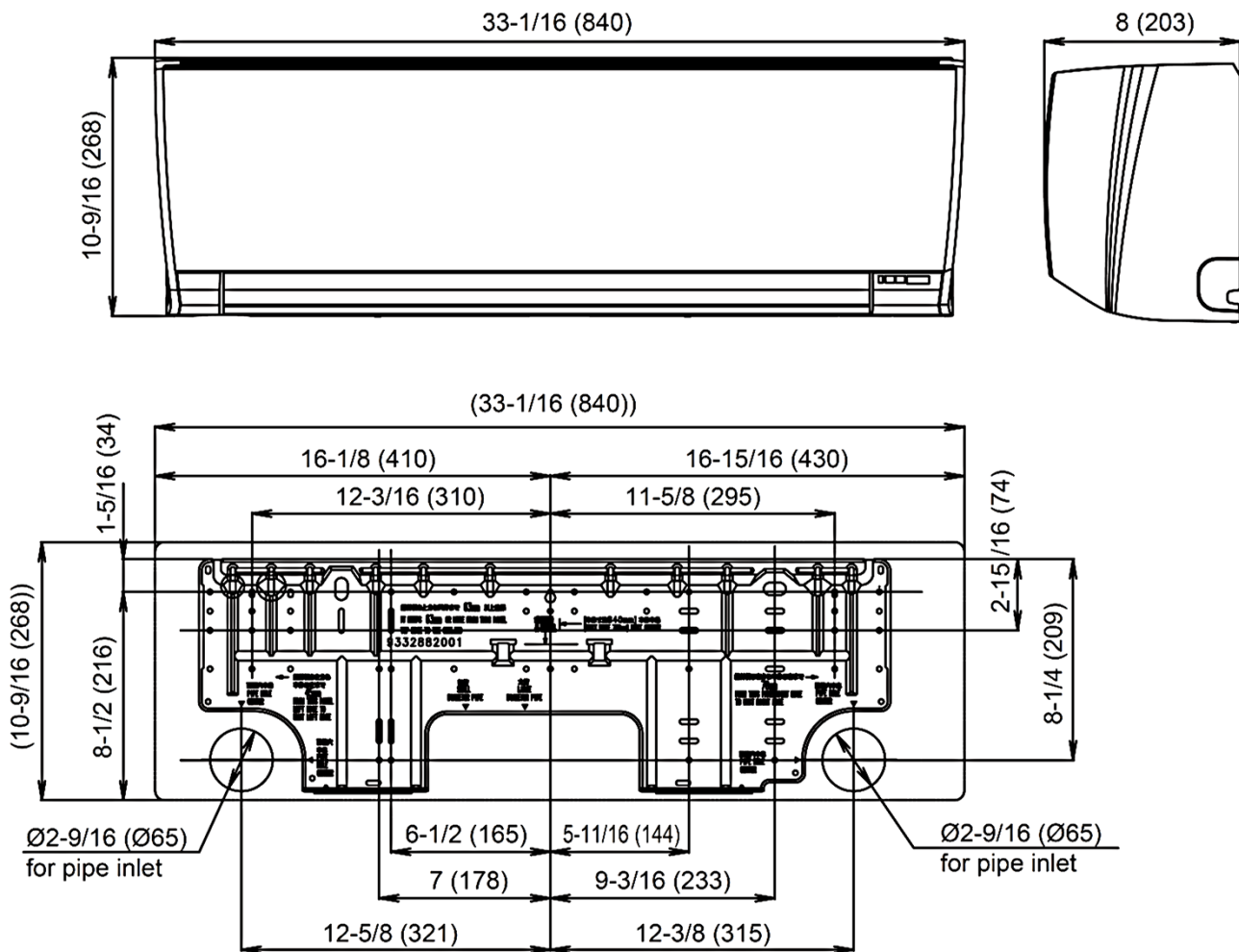
Wired Remote Controller..... UTY-RNNUM
Backlit Display..... UTY-RVNUM
Simple Remote Controller..... UTY-RSNUM
Dry Contact Wire Kit..... UTY-XWXXZ5
Interface Kit..... UTY-XCBXZ2

Intertek®ETL Number

ASU12RLF1..... 91986

Dimensions: ASU12RLF1

[Unit: in. (mm)]



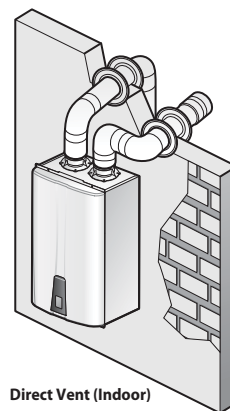
- Certified design according to **ANSI Z21.10.3 - CSA 4.3-2015** standards for both indoor or outdoor installations (with optional Outdoor Vent Kit)
- Compatible with **1/2" gas pipe up to a length of 24 ft*** (*see Installation Manual for additional information)
- Compatible with **2" PVC vent up to 60 ft** and 150 ft** using 3" PVC vent** (**with no elbows)
- Gas Input Ranges
 - NPE-150** - 120,000 to 18,000 BTU/h
 - NPE-180** - 150,000 to 15,000 BTU/h
 - NPE-210** - 180,000 to 19,900 BTU/h
 - NPE-240** - 199,900 to 19,900 BTU/h
- Hot Water Flow Rate Capacity (*based on 35°F temperature rise)
 - NPE-150** - 6.8 GPM
 - NPE-180** - 8.4 GPM
 - NPE-210** - 10.1 GPM
 - NPE-240** - 11.2 GPM
- Dual Primary and Secondary Stainless Steel Heat Exchangers** for optimum efficiency and durability
- Built-in Control Panel** - allows adjustment of temperature settings and displays the operating status and error codes
- ComfortFlow™ Technology** - "A" models come included with built-in 0.5 gallon **Buffer Tank** and **Recirculation Pump** to provide maximum comfort
- INTELLIGENT Preheating** - recognizes hot water usage patterns to intelligently provide hot water when needed (optional for "S" models)
- Temperature Options** - available temperature settings for Residential applications range from 98°F up to 140°F with high temperature Commercial mode capable of up to 182°F
- Ready-Link Cascade Compatible** for up to 16 units for increased hot water production
- Common Vent Compatible** - allows for cascade systems to use a single exhaust and/or intake pipe for up to 8 units with the use of the Common Vent Backflow Damper Collar Kit (#30014367A)
- Compatible with **Navilink™ wi-Fi Control** (#PBCM-AS-001)
- Freeze Protection** - maintains normal operation during freezing ambient temperatures down to -5°F (standard on all models)
- Uniform Energy Factor Ratings** for NG and LP units
 - NPE-180A/210A/240A** - 0.96 UEF (0.97 EF for Canada)
 - NPE-150S** - 0.96 UEF (0.97 EF for Canada)
 - NPE-180S/210S/240S** - 0.97 UEF (0.99 EF for Canada)
- Compatible with **Natural Gas (NG)** and **Propane (LPG)*****
(***) requires installation of included Field Conversion Kit by a qualified gas servicer)
- Approved for Installations on **Mobile/Manufactured Homes**
- Certified by **CSA, NSF 5, AHRI, AB1953 CA Low Lead, SCAQMD**
(Rule 1146.2 Type 1 - Complies with 14 ng/J or 20 ppm NOx @ 3% O2)
- 15-Year Heat Exchanger and 5-Year Parts Warranty (Residential)******
8-Year Heat Exchanger and 5-Year Parts Warranty (Commercial)****
(***) see Navien Limited Warranty)
- Optional accessories** are available (see below)



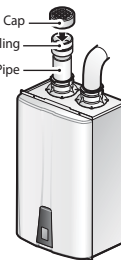
Sleek Design - Compatible with 2" PVC Vent and 1/2" Gas Pipe



Built-In Control Panel with Diagnostics



Direct Vent (Indoor)



Non-Direct Vent (Indoor)

Indoor and Outdoor Venting Options



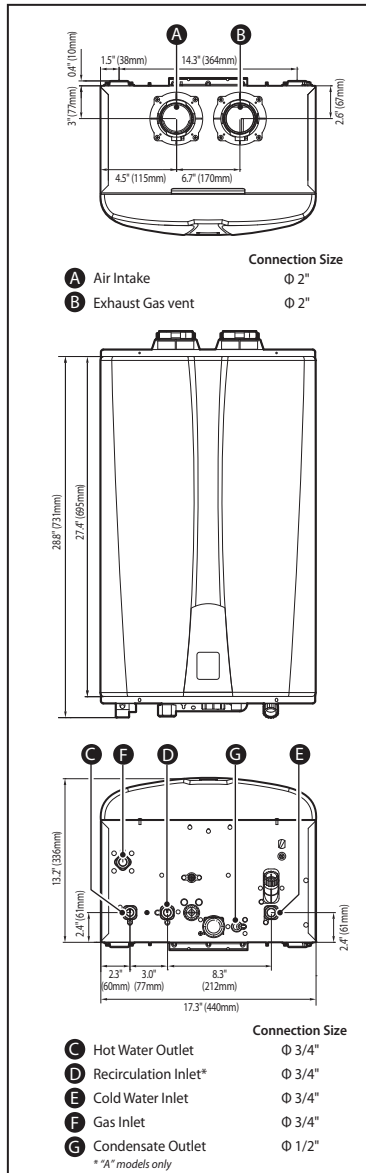
Non-Direct Vent (Outdoor)



Job Name: _____
Location: _____
Engineer: _____
Wholesaler: _____
Contractor: _____
Model No.: _____
Submitted to: _____

Remote Controller NR-20DU (30009757A)	Plumb Easy Valve Set (3/4") (30009323A - Lead Free) (30012581A - for Pipe Cover)	Condensate Neutralizer (GXXX001322 - Single Unit) (GXXX001324 - Up to 6 Units) (GXXX001325 - Up to 16 Units)	Ready-Link Communication Cable (GXXX000546)	Outdoor Vent Kit (30010604A)	External Pump Wire (GXXX001319)	3" Vent Termination Caps and Wall Flanges (GXXX3873B)

Dimensions



Specifications

Item		NPE-150S	NPE-180A	NPE-180S	NPE-210A	NPE-210S	NPE-240A	NPE-240S
Heat Capacity (Input)	Natural Gas	18,000-120,000 BTU/H	15,000-150,000 BTU/H		19,900-180,000 BTU/H		19,900-199,900 BTU/H	
	Propane Gas		15,000-150,000 BTU/H		19,900-180,000 BTU/H		19,900-199,900 BTU/H	
Efficiency Ratings	UEF (for NG & LP)	0.96	0.96	0.97	0.96	0.97	0.96	0.97
	EF (Canada) (for NG & LP)	0.97	0.97	0.99	0.97	0.99	0.97	0.99
Flow Rate (DHW)	35°F(19°C) Temp Rise	6.8 GPM (26 L/m)	8.4 GPM (32 L/m)		10.1 GPM (38 L/m)		11.2 GPM (42 L/m)	
	45°F(25°C) Temp Rise	5.3 GPM (20 L/m)	6.5 GPM (25 L/m)		7.8 GPM (30 L/m)		8.7 GPM (33 L/m)	
	67°F(36°C) Temp Rise	3.2 GPM (12 L/m)	4.3 GPM (16 L/m)	4.2 GPM (16 L/m)	5.0 GPM (19 L/m)	5.2 GPM (20 L/m)	5.6 GPM (21 L/m)	5.7 GPM (22 L/m)
Dimensions		17.3"(W) x 27.4"(H) x 13.2"(D)						
Weight		55 lbs (25kg)	75 lbs (34kg)	67 lbs (30kg)	82 lbs (37 kg)	75 lbs (34kg)	82 lbs (37 kg)	75 lbs (34kg)
Installation Type		Indoor or Outdoor Wall-Hung						
Venting Type		Forced Draft Direct Vent						
Ignition		Electronic Ignition						
Water Pressure		15-150 PSI						
Natural Gas Supply Pressure (from source)		3.5 in WC-10.5 in WC						
Propane Gas Supply Pressure (from source)		8 in WC-13in WC						
Natural Gas Manifold Pressure (min-max)		-0.04 in WC - -0.38 in WC	-0.04 in WC - -0.84 in WC		-0.05 in WC - -0.36 in WC		-0.05 in WC - -0.58 in WC	
Propane Gas Manifold Pressure (min-max)		-0.04 in WC - -0.42 in WC	-0.05 in WC - -0.50 in WC		-0.10 in WC - -0.66 in WC		-0.10 in WC - -0.78 in WC	
Minimum Flow Rate		0.5 GPM (1.9 L/m), < 0.01 GPM (0.04 L/m) option for "A" models*						
Connection Sizes	Cold Water Inlet	3/4 in NPT						
	Hot Water Outlet	3/4 in NPT						
	Gas Inlet	3/4 in NPT						
Power Supply	Main Supply	120V AC, 60Hz						
	Maximum Power Consumption	200W (max 2A), 350W (max 4A) with external pump connected						
Materials	Casing	Cold Rolled Carbon Steel						
	Heat Exchangers	Primary Heat Exchanger: Stainless Steel Secondary Heat Exchanger: Stainless Steel						
Venting	Exhaust	2" or 3" PVC, CPVC, Polypropylene 2" or 3" Special Gas Vent Type BH (Class II, A/B/C)						
	Intake	2" or 3" PVC, CPVC, Polypropylene 2" or 3" Special Gas Vent Type BH (Class II, A/B/C)						
	Vent Clearances	0" to combustibles						
Safety Devices	Flame Rod, APS, Ignition Operation Detector, Water Temperature High Limit Switch, Exhaust Temperature High Limit Sensor, Power Surge Fuse							

* Available for "A" models configured in an optional ComfortFlow recirculation mode. Additional energy use will occur when using recirculation.

Gas-fired, tankless, condensing, wall-mounted water heater(s) shall be direct vent NPE Series models as manufactured by Navien, Inc. and are certified by CSA Group to the latest edition of ANSI standard Z21.10.3/CSA 4.3. Water heater(s) shall have a 15-year limited Heat Exchanger warranty and 5-year limited Parts warranty (8-year Heat Exchanger and 5-year Parts for Commercial use) per Navien Limited Warranty. Unit(s) shall be designed to burn natural gas and can be for use with propane when a Field Conversion Kit is installed. Water heater(s) shall have a nominal flow rate capacity of _____ GPM/GPH at _____°F rise with rated input of _____ BTU/hr. Water heater(s) shall be vented with 2" PVC/CPVC vent pipe at a distance not to exceed 60' (or equivalent) with each elbow equal to 8' of pipe length or 3" PVC/CPVC vent pipe at a distance of 150' (or equivalent) with each elbow equal to 5' of pipe length. Water heater(s) is rated for 150 PSI working water pressure and 300 PSI test pressure. Gas supply pressure shall be 3.5" to 10.5" WC for natural gas and 8.0" to 13.0" WC for propane. Unit(s) shall have a steel case, dual stainless steel heat exchangers, eco premixed burner, negative pressure gas valve, dual venturi, 3/4" inlet gas connection, 3/4" brass inlet/outlet water connections, water holding capacity of 0.6 gallons for the NPE-150S, 1.0 gallon for the NPE-180A model (0.7 gallons for NPE-180S model), 1.2 gallons for the NPE-210A/NPE-240A models (0.7 and 0.9 gallons for NPE-210S and NPE-240S models respectively), and a condensate collector. The NPE-150S model weighs 55 lbs, the NPE-180A model weighs 75 lbs (NPE-180S weighs 67 lbs), and the NPE-210A/NPE-240A models weigh 82 lbs (NPE-210S and NPE-240S weigh 75 lbs). Unit(s) shall include features such as an adjustment for installations at high elevation, temperature lockout, and temperature options from 98-120°F in 1°F intervals and 125-140°F in 5°F intervals. The unit(s) shall include additional temperature options of 150-180°F in 10°F intervals, and 182°F for high temperature commercial applications. All NPE "A" models shall include an internal circulation pump and 0.5 gallon buffer tank. The water heater(s) shall be controlled by an internal circuit board that monitors the inlet and outlet temperatures with installed thermistors, sensing and controlling flow rate to set point temperature with air-fuel ratio controls in order to maintain thermal combustion efficiency. Unit(s) shall include safety features such as flame sensor system, high limit sensors, overheat prevention device, freeze protection mode, and fan motor rotation detector. Multi-system (cascade) applications that require 2 to 16 units shall be installed by connecting the units using cable-only connections (Ready-Link). Cascade systems can be common vented with up to 8 units when a Common Vent Backflow Damper Collar Kit is installed. The water heater(s) exceeds the energy efficiency requirements of ASHRAE 90.1-2013 and is listed by SCAQMD rule 1146.2 (Type 1) for Low NOx that complies with 14 ng/J or 20 ppm NOx requirements @ 3% O2.

*Navien reserves the right to change specifications at any time without prior notice