AcuJoist Specifier's Guide

CANADIAN LIMIT STATES DESIGN

PERFORMANCE RATED I-JOISTS IN FLOOR AND ROOF FRAMING

AcuJoist

AcuJoist

www.acujoist.com

GUARANTEED FOR LIFE

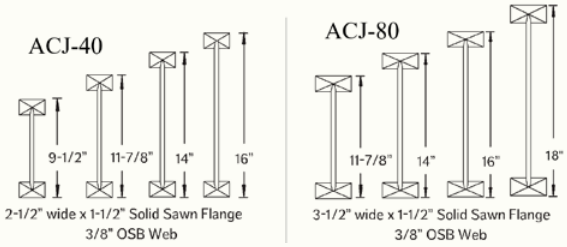
AcuJoist products are guaranteed to meet exact tolerances. Joists will remain straight, warp free, contain no twists or crowns, and will not shrink. This guarantee is extended over the life of the home.

GUARANTEED FOR LIFE GUARANTEED

AcuTruss Industries was founded in 1971 by prominent Vernon BC businessman Dave Marcoux. After celebrating the 27th anniversary of manufacturing roof and floor trusses, AcuTruss began manufacturing the Nascor I-Joist under the new AcuJoist banner. Following 21 years of growing I-Joist sales and production, AcuTruss decided to update the AcuJoist/Nascor joist and modernize the manufacturing process. In 2023, AcuTruss launched the new APA rated ACJ Series I-Joist. Designed and manufactured to the strict Specifications and Quality Assurances set out by APA, this new ACJ Series joist would prove superior to its predecessor in both quality, strength and even more environmentally friendly being assembled with zero VOC adhesive. As well, the AcuJoist flange and OSB web fibre continues to be sourced sustainably with forestry practices conforming to the Sustainable Forestry Initiative (SFI) forest management standard.

By providing complete engineered building solutions like AcuJoist's ACJ Series I-Joist, AcuTruss continues to be your premier manufacturer of engineered wood products in Western Canada.

JOIST DIMENSIONS



AcuJoist

DESIGN PROPERTIES FOR ACJ JOISTS

CCMC EVALUATION 14508-R

CMSA 006

APA PR-L-342(C)

TABLE 1A

FACTORED RESISTANCES OF ACUJOIST ACJ SERIES I-JOISTS[a]

I-Joist Depth, mm (in.)	I-Joist Series	Permitted to Be Labelled as	EI[b], 10^6 kN-mm² (10^6 lbf-in.²)	M_r[c], N-m (lbf-ft)	V_r[d], kN (lbf)	VLC_r[e], kN/m (plf)	K[f], kN (10^6 lbf)
241 (9-1/2)	ACJ-40	PRI-40	528 (184)	6,167 (4,549)	7.86 (1,768)	42.3 (2,900)	21,973 (4.94)
302 (11-7/8)	ACJ-40	PRI-40	898 (313)	7,994 (5,896)	9.97 (2,241)	42.3 (2,900)	27,489 (6.18)
	ACJ-80	PRI-80	1,487 (518)	15,649 (11,543)	9.97 (2,241)	42.3 (2,900)	27,489 (6.18)
356 (14)	ACJ-40	PRI-40	1,317 (459)	9,854 (7,268)	12.01 (2,699)	42.3 (2,900)	32,381 (7.28)
	ACJ-80	PRI-80	2,169 (756)	18,852 (13,904)	12.01 (2,699)	42.3 (2,900)	32,381 (7.28)
406 (16)	ACJ-40	PRI-40	1,794 (625)	11,432 (8,432)	13.83 (3,109)	42.3 (2,900)	37,007 (8.32)
	ACJ-80	PRI-80	2,939 (1,024)	21,851 (16,116)	13.83 (3,109)	42.3 (2,900)	37,007 (8.32)
457 (18)	ACJ-80	C1	3,814 (1,329)	24,578 (18,129)	17.55 (3,946)	37.0 (2,538)	51,241 (11.52)

For Imperial: 1 mm = 0.0394 in., 1 N = 0.2248 lbf, 1 kN/m = 5.71 lbf/in.

(a) All factored resistance values include the resistance factor specified in CSA-086. The tabulated values are for the standard term of load duration. (K_D = 1.0). All values, except for EI, VL_r, and K, are permitted to be adjusted for other load durations as permitted by the code.
(b) Bending stiffness (EI) of the I-joist
(c) Factored moment resistance (M_r) of the I-joist.
(d) Factored shear resistance (V_r) of the I-joist.
(e) Factored uniform vertical load resistance (VLC_r) of the I-joist.
(f) Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joists in a simple-span application, use Eqs. 1 and 2.

Uniform Load: $$\delta = \frac{5\,wL^4}{384\,EI} + \frac{wL^2}{K} \quad (1)$$

Center-Point Load: $$\delta = \frac{PL^3}{48\,EI} + \frac{2\,PL}{K} \quad (2)$$

Where: δ = calculated deflection (mm or in.),
P = unfactored concentrated load (kN or lbf),
EI = bending stiffness of the I-joist (kN-mm² or lbf-in²),
w = unfactored uniform load (kN/mm or lbf/in.),
L = design span (mm or in.),
K = coefficient of shear deflection (kN or lbf).

TABLE 1B

ADDITIONAL FACTORED RESISTANCES OF ACUJOIST ACJ SERIES I-JOISTS[a] [b] [c]

I-Joist Depth, mm (in.)	I-Joist Series	Permitted to be Labelled as	Factored End Reactions, kN (lbf)				Factored Intermediate Reactions, kN (lbf)
			44 mm (1-3/4 in.) Bearing		102 mm (4 in.) Bearing		89 mm (3-1/2 in.) Bearing
			No Brg. Stiffeners	With Brg. Stiffeners	No Brg. Stiffeners	With Brg. Stiffeners	No Brg. Stiffeners
241 (9-1/2)	ACJ-40	PRI-40	7.58 (1,705)	7.58 (1,705)	7.86 (1,768)	7.86 (1,768)	15.16 (3,409)
302 (11-7/8)	ACJ-40	PRI-40	8.42 (1,894)	8.42 (1,894)	9.97 (2,241)	9.97 (2,241)	17.55 (3,946)
	ACJ-80	PRI-80	8.99 (2,020)	8.99 (2,020)	9.97 (2,241)	9.97 (2,241)	19.38 (4,356)
356 (14)	ACJ-40	PRI-40	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	12.01 (2,699)	17.55 (3,946)
	ACJ-80	PRI-80	8.99 (2,020)	8.99 (2,020)	10.88 (2,447)	12.01 (2,699)	21.20 (4,767)
406 (16)	ACJ-40	PRI-40	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	13.83 (3,109)	17.55 (3,946)
	ACJ-80	PRI-80	8.99 (2,020)	8.99 (2,020)	10.88 (2,447)	13.83 (3,109)	21.20 (4,767)
457 (18)	ACJ-80	C1	9.83 (2,210)	14.29 (3,212)	11.41 (2,565)	16.81 (3,780)	23.55 (5,296)

For Imperial: 1 mm = 0.0394 in., 1 N = 0.2248 lbf

(a) The tabulated values are for the standard term of load duration (Kd= 1.0). All values are permitted to be adjusted for other load durations as permitted by the code provided that the adjusted values do not exceed the factored compressive resistance perpendicular to grain (Qr) of the bearing plate supporting the I-joist in accordance with CSA 086.
(b) Interpolation between bearing lengths is permitted
(c) Bearing stiffeners shall be installed in accordance with the recommendations provided by the manufacturer and APA E715 CA

TABLE 2

Limit States Design
CSA O86-19 A.5.4.5.1

ACJ-40 RESIDENTIAL ALLOWABLE FLOOR CLEAR SPANS (1,2,3,4,5,6)

L/480 Live load, L/240 Total Load Deflection					5/8" Subfloor Glued & Nailed			3/4" Subfloor Glued & Nailed			
					Joist Spacing (in)			Joist Spacing (in)			
	Depth	Series	Floor	Span	12	16	19.2	12	16	19.2	24
40 psf Live Load, 15 psf Dead Load	9-1/2"	ACJ-40 PRI-40	A	Single	15'-1"	14'-4"	13'-10"	15'-5"	14'-7"	14'-0"	13'-5"
			B	Single	15'-10"	15'-0"	14'-7"	16'-2"	15'-3"	14'-9"	14'-1"
			C	Single	16'-7"	15'-9"	15'-3"	17'-0"	16'-0"	15'-5"	14'-9"
	11-7/8"	ACJ-40 PRI-40	A	Single	17'-6"	16'-7"	16'-0"	17'-10"	16'-10"	16'-3"	15'-6"
			B	Single	18'-4"	17'-5"	16'-10"	18'-9"	17'-8"	17'-0"	16'-3"
			C	Single	19'-3"	18'-3"	17'-8"	19'-8"	18'-6"	17'-10"	17'-1"
	14"	ACJ-40 PRI-40	A	Single	19'-2"	18'-2"	17'-7"	19'-7"	18'-6"	17'-10"	17'-1"
			B	Single	20'-2"	19'-1"	18'-6"	20'-7"	19'-5"	18'-9"	17'-11"
			C	Single	21'-1"	20'-0"	19'-4"	21'-7"	20'-4"	19'-8"	18'-9"
	16"	ACJ-40 PRI-40	A	Single	20'-7"	19'-7"	19'-0"	21'-1"	19'-11"	19'-3"	18'-5"
			B	Single	21'-8"	20'-7"	19'-11"	22'-1"	20'-11"	20'-2"	19'-4"
			C	Single	22'-8"	21'-7"	21'-10"	23'-2"	21'-11"	21'-2"	20'-3"

TABLE 3

ACJ-80 RESIDENTIAL ALLOWABLE FLOOR CLEAR SPANS (1,2,3,4,5,6)

L/480 Live load, L/240 Total Load Deflection					5/8" Subfloor Glued & Nailed			3/4" Subfloor Glued & Nailed			
					Joist Spacing (in)			Joist Spacing (in)			
	Depth	Series	Floor	Span	12	16	19.2	12	16	19.2	24
40 psf Live Load, 15 psf Dead Load	11-7/8"	ACJ-80 PRI-80	A	Single	19'-3"	18'-3"	17'-8"	19'-8"	18'-7"	17'-11"	17'-1"
			B	Single	20'-2"	19'-2"	18'-6"	20'-7"	19'-6"	18'-9"	18'-0"
			C	Single	21'-2"	20'-1"	19'-5"	21'-7"	20'-5"	19'-8"	18'-10"
	14"	ACJ-80 PRI-80	A	Single	21'-2"	20'-1"	19'-6"	21'-8"	20'-6"	19'-9"	18'-11"
			B	Single	22'-3"	21'-2"	20'-5"	22'-9"	21'-6"	20'-9"	19'-10"
			C	Single	23'-4"	22'-2"	21'-5"	23'-10"	22'-6"	21'-9"	20'-10"
	16"	ACJ-80 PRI-80	A	Single	22'-11"	21'-9"	21'-1"	23'-6"	22'-2"	21'-5"	20'-6"
			B	Single	24'-1"	22'-11"	22'-2"	24'-8"	23'-4"	22'-6"	21'-6"
			C	Single	25'-3"	24'-0"	23'-3"	25'-10"	24'-5"	23'-7"	22'-7"
	18"	ACJ-80 C1	A	Single	24'-9"	23'-7"	22'-10"	25'-4"	24'-0"	23'-2"	22'-2"
			B	Single	26'-0"	24'-9"	23'-11"	26'-7"	25'-2"	24'-4"	23'-3"
			C	Single	27'-3"	25'-11"	25'-1"	27'-10"	26'-5"	25'-6"	24'-5"

Floor Assembly Definitions:

A Glued and nailed subfloor with no additional components added

B Glued and nailed subfloor with 1/2" thick gypsum board applied to the bottom of the I-joist

C Glued and nailed subfloor with Blocking at 6'5" o/c max. and 1/2" thick gypsum board applied to the bottom of the I-joist

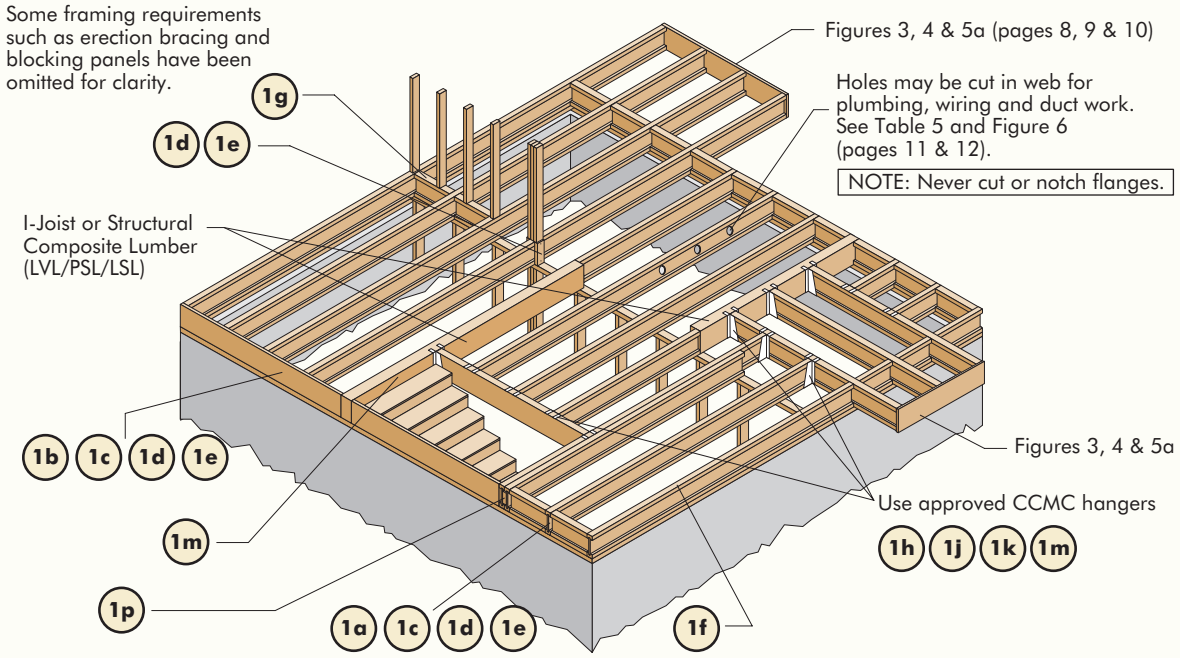
Notes:

1. The spans have been determined using Limit States Design (LSD) in accordance with NBCC 2015 / BCBC 2018 and Design/ Vibration methodology in accordance with CSA O86-19 - A.5.4.5.1
2. Clear spans are applicable to residential construction with a designed dead load of 15 psf and live load of 40 psf. For loads other than uniformly distributed loads, engineering analysis may be required
3. Deflection is limited to a live load deflection of L/480 and total load of L/240
4. The spans are based on a composite floor with glue-nailed OSB sheathing. Adhesive shall meet the requirements given in ASTM D3490 1/8" P/O Class
5. The minimum end bearing shall be 1-3/4"
6. Spans are measured as clear distance between bearing supports

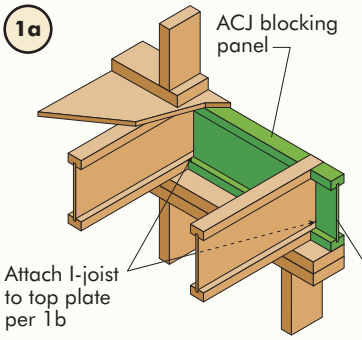
FIGURE 1

TYPICAL PERFORMANCE RATED I-JOIST FLOOR FRAMING AND CONSTRUCTION

Click on circled numbers for enlarged view of detail.



1a

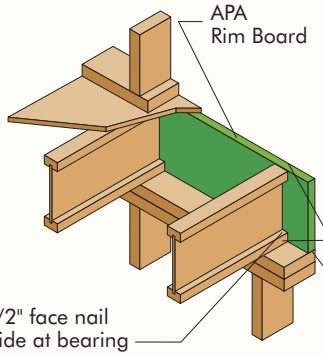


Blocking Panel or Rim Joist	Maximum Factored Uniform Vertical Load* (plf)
ACJ Joists	3300

*The uniform vertical load is limited to a joist depth of 16 inches or less and is based on standard term load duration. It shall not be used in the design of a bending member, such as joist, header, or rafter. For concentrated vertical load transfer capacity, see 1d.

2-1/2" nails @ 6" o.c. to top plate (when used for lateral shear transfer, nail to bearing plate with same nailing as required for decking)

1b



Blocking Panel or Rim Joist	Maximum Factored Uniform Vertical Load* (plf)
1-1/8" APA Rim Board Plus	8090
1-1/8" APA Rim Board	7340
1" APA Rim Board	5500

*The uniform vertical load capacity is limited to a rim board depth of 16 inches or less and is based on standard term load duration. It shall not be used in the design of a bending member, such as joist, header, or rafter. For concentrated vertical load transfer capacity, see 1d.

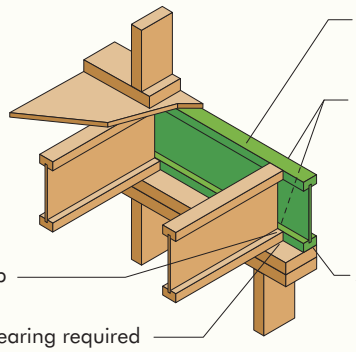
One 2-1/2" nail at top and bottom flange

Attach APA Rim Board to top plate using 2-1/2" common or box toenails @ 6" o.c.

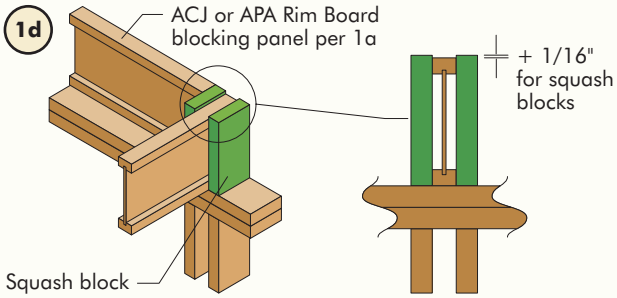
To avoid splitting flange, start nails at least 1-1/2" from end of I-joist. Nails may be driven at an angle to avoid splitting of bearing plate.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

1c



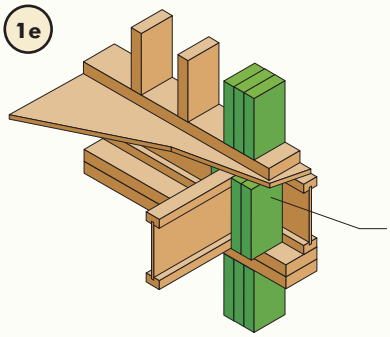
1d



Pair of Squash Blocks	Maximum factored vertical load per pair of squash blocks (lb)	
	3-1/2" wide	5-1/2" wide
2x lumber	5800	9500
1-1/8" APA Rim Board, Rim Board Plus, or Rated ACJ 48 oc	4500	5800
1" APA Rim Board or Rated ACJ 32 oc	4000	5800

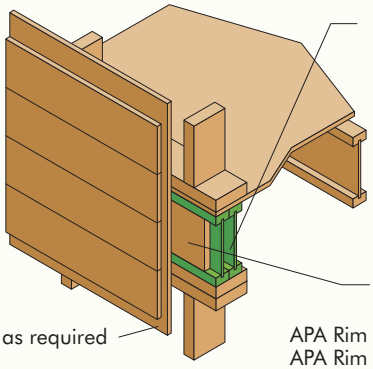
Provide lateral bracing per 1a, 1b, or 1c

1e



Transfer load from above to bearing below. Install squash blocks per 1d. Match bearing area of blocks below to post above.

1f



For joist depths up to and including 16" deep, use single I-joist for factored loads up to 3300 plf, double I-joists for loads up to 6600 plf (filler block not required). Attach I-joist to top plate using 2-1/2" nails at 6" o.c.

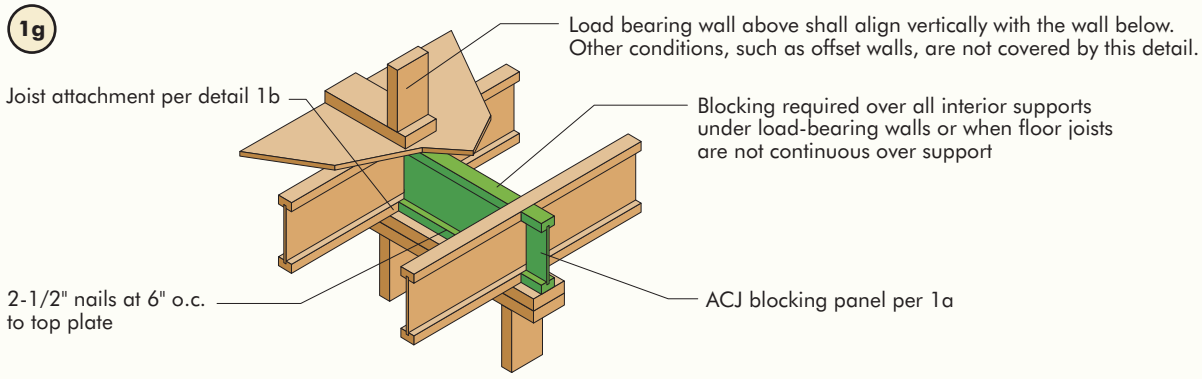
Provide backer for siding attachment unless nailable sheathing is used

Wall sheathing, as required

APA Rim Board may be used in lieu of I-joists. Backer is not required when APA Rim Board is used.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

1g



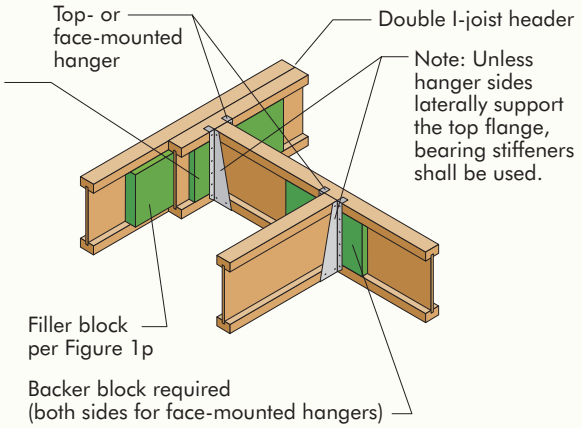
1h

Backer block (use if factored hanger load exceeds 360 lbs.)
Before installing a backer block to a double I-joist, drive 3 additional 3" nails through the webs and filler block where the backer block will fit. Clinch. Install backer tight to top flange. Use twelve 3" nails, clinched when possible. Maximum factored resistance for hanger for this detail = 1620 lbs.

BACKER BLOCKS (Blocks must be long enough to permit required nailing without splitting)

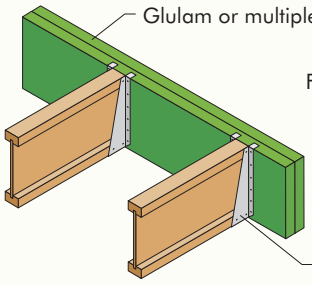
Flange Width	Material Thickness Required*	Minimum Depth**
2-1/2"	1"	5-1/2"
3-1/2"	1-1/2"	7-1/4"

* Minimum grade for backer block material shall be SPF NLGA #2 or better for solid sawn lumber and Rated Sheathing grade for wood structural panels.
** For face-mount hangers use net joist depth minus 3-1/4"



For hanger capacity see hanger manufacturer's recommendations. Verify double I-joist capacity to support concentrated loads.

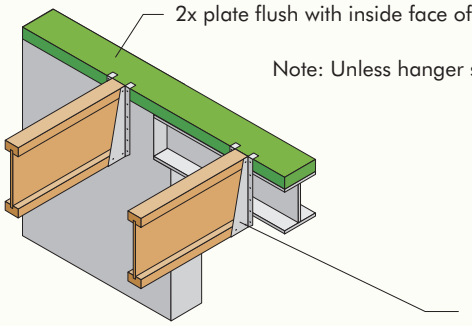
1j



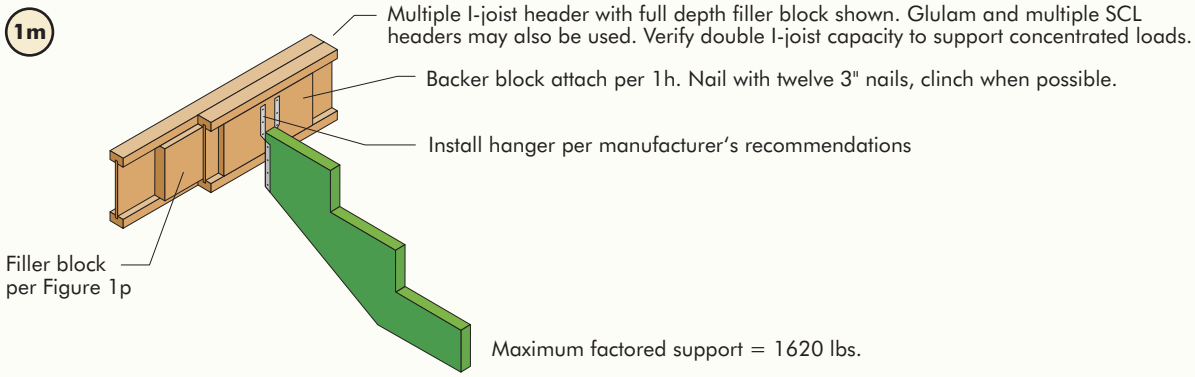
Note: Unless hanger sides laterally support the top flange, bearing stiffeners shall be used.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

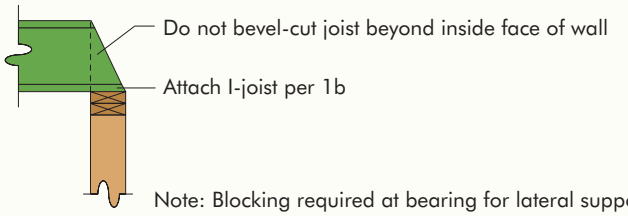
1k



1m

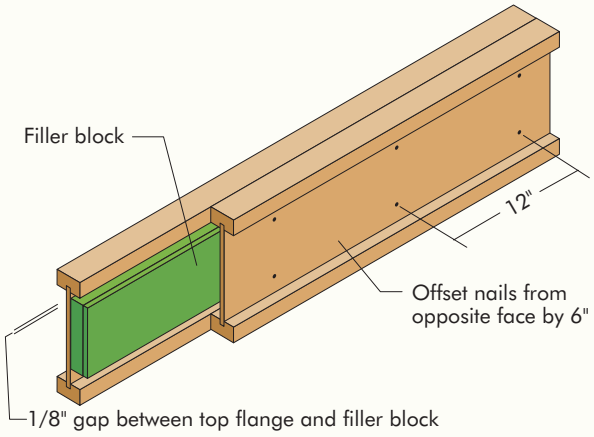


1n



1p **FILLER BLOCK REQUIREMENTS FOR DOUBLE I-JOIST CONSTRUCTION**

Flange Width	Net Depth	Filler Block Size
2-1/2" (ACJ-40)	9-1/2"	2-1/8" x 6"
	11-7/8"	2-1/8" x 8"
	14"	2-1/8" x 10"
	16"	2-1/8" x 12"
3-1/2" (ACJ-80)	11-7/8"	3" x 8"
	14"	3" x 10"
	16"	3" x 12"
	18"	3" x 14"



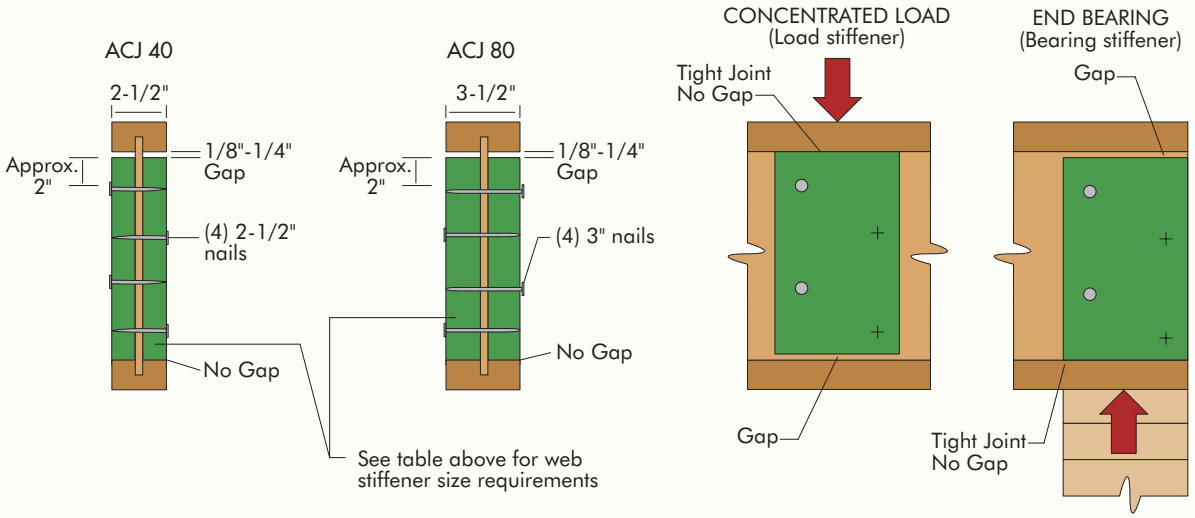
Notes:

1. Support back of I-joist web during nailing to prevent damage to web/flange connection.
2. Leave a 1/8-inch gap between top of filler block and bottom of top I-joist flange.
3. Filler block is required between joists for full length of span.
4. Nail joists together with two rows of 3" nails at 12 inches o.c. (clinched when possible) on each side of the double I-joist. Total of 4 nails per foot required. if nails can be clinched, only 2 nails per foot are required.
5. The maximum factored load that may be applied to one side of the double joist using this detail is 860 lbf/ft.

All nails shown in the details above are assumed to be common nails unless otherwise noted.
Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

FIGURE 2

WEB STIFFENER INSTALLATION DETAILS



STIFFENER SIZE REQUIREMENTS

ACJ Flange Width	Web Stiffener Size Each Side of Web
2-1/2" (ACJ-40)	1" x 2-5/16" minimum width
3-1/2" (ACJ-80)	1-1/2" x 2-5/16" minimum width

FIGURE 3

I-JOIST CANTILEVER DETAIL FOR BALCONIES

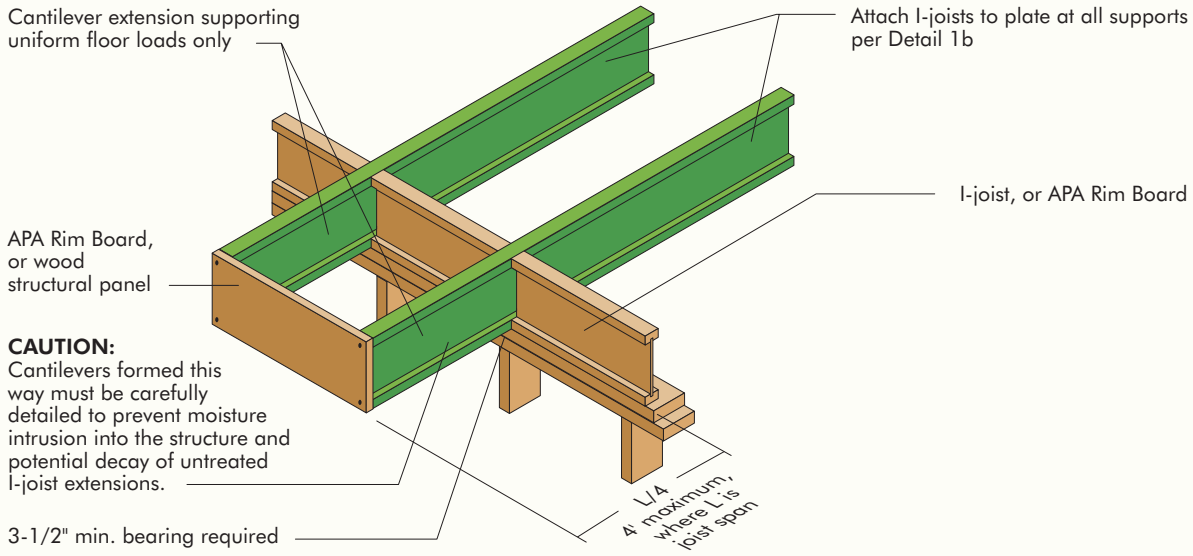
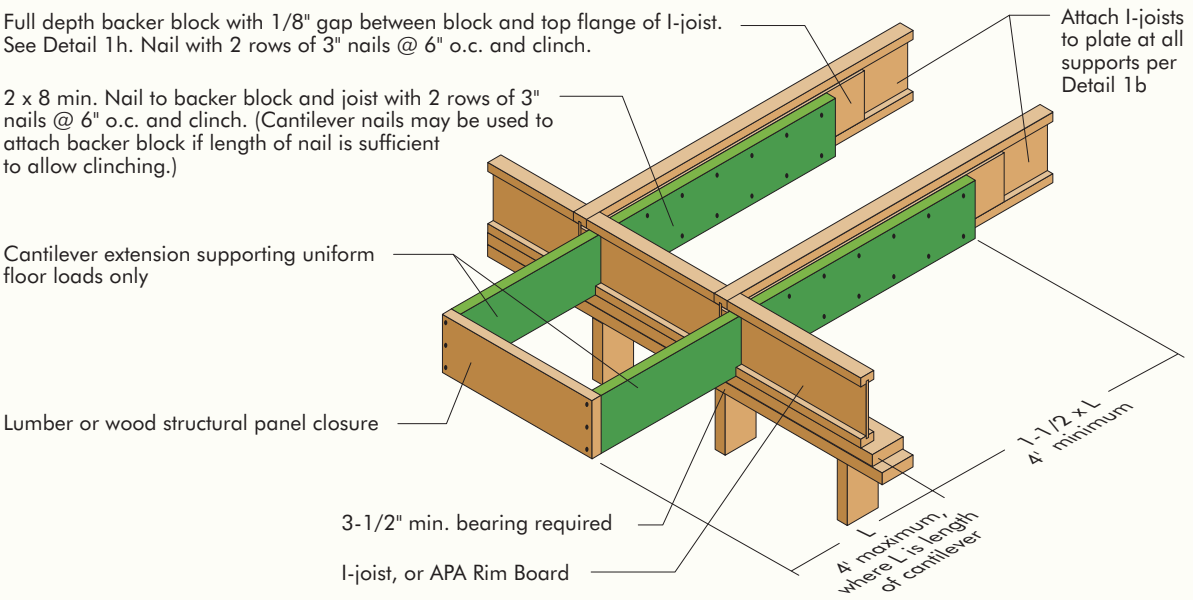


FIGURE 4

LUMBER CANTILEVER DETAIL FOR BALCONIES

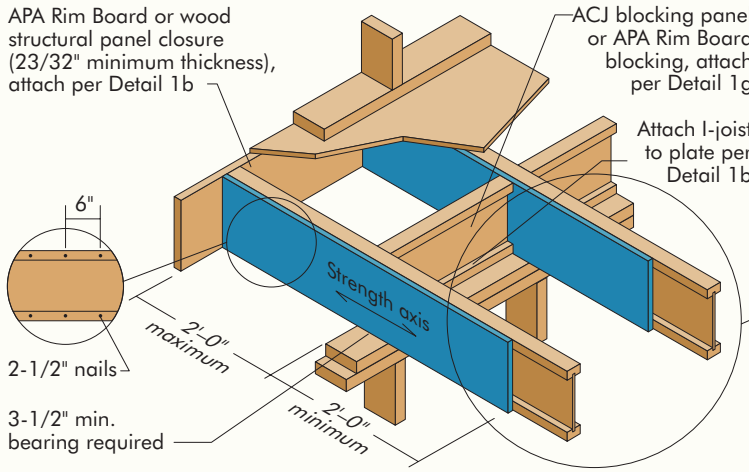


Note: This detail is applicable to cantilevers supporting a maximum specified uniform live load of 60 psf.

FIGURE 5a

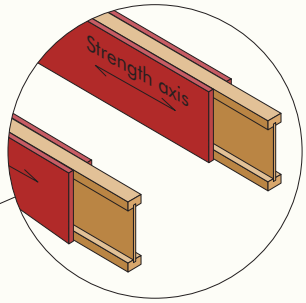
CANTILEVER DETAIL FOR VERTICAL BUILDING OFFSET

Method 1
SHEATHING REINFORCEMENT ONE SIDE



Method 2
SHEATHING REINFORCEMENT TWO SIDES

Use same installation as Method 1 but reinforce both sides of I-joist with sheathing or APA Rim Board.



Use nailing pattern shown for Method 1 with opposite face nailing offset by 3"

Note: APA RATED SHEATHING 48/24 (minimum thickness 23/32") required on sides of joist. Depth shall match the full height of the joist. Nail with 2-1/2" nails at 6" o.c., top and bottom flange. Install with face grain horizontal. Attach I-joist to plate at all supports per Detail 1b

Alternate Method 2
DOUBLE I-JOIST

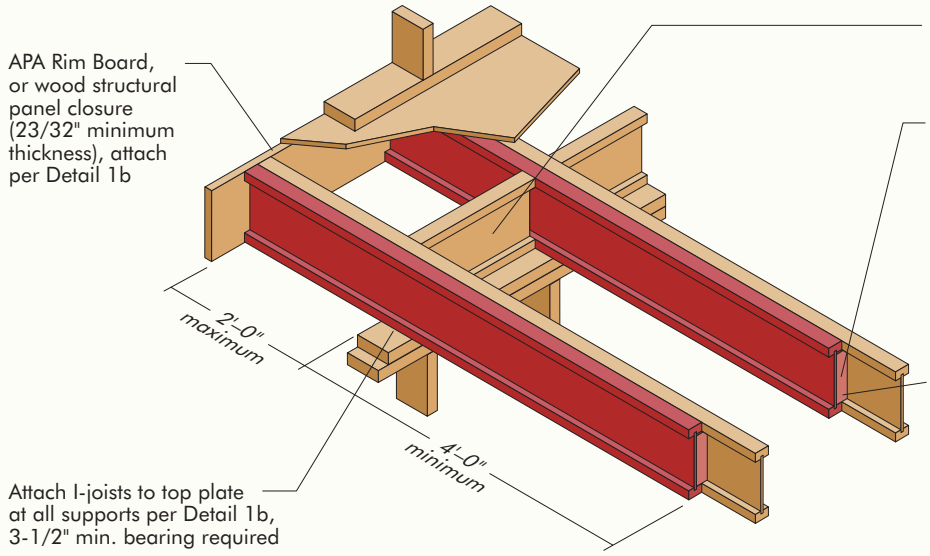
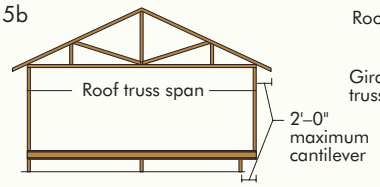
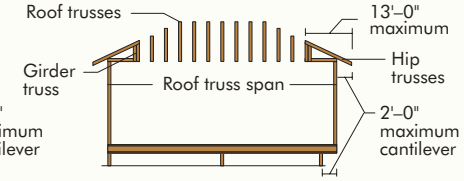


FIGURE 5b



See Table below for APA ACJ reinforcement requirements at cantilever.



For hip roofs with the hip trusses running parallel to the cantilevered floor joists, the I-joist reinforcement requirements for a span of 26 ft. shall be permitted to be used.

TABLE 4

ACJ CANTILEVER REINFORCEMENT IN ACCORDANCE WITH FIGURE 5a

Joist Depth (in.)	Roof Truss Span (ft)	ROOF LOADINGS: TL = 35 psf, LL not to exceed 20 psf — Joist Spacing (in.) 12	16	19.2	24	TL = 45 psf, LL not to exceed 30 psf — Joist Spacing (in.) 12	16	19.2	24	TL = 55 psf, LL not to exceed 40 psf — Joist Spacing (in.) 12	16	19.2	24
9-1/2	26	N	N	N	1	N	N	1	2	N	1	2	X
	28	N	N	1	1	N	N	1	2	N	1	2	X
	30	N	N	1	1	N	1	1	2	N	1	2	X
	32	N	N	1	2	N	1	1	X	N	1	2	X
	34	N	N	1	2	N	1	2	X	N	2	X	X
	36	N	N	1	2	N	1	2	X	N	2	X	X
11-7/8	26	N	N	1	1	N	1	1	1	N	1	1	2
	28	N	N	1	1	N	1	1	1	N	1	1	2
	30	N	N	1	1	N	1	1	2	N	1	1	2
	32	N	N	1	1	N	1	1	2	N	1	1	2
	34	N	N	1	1	N	1	1	2	N	1	2	2
	36	N	N	1	1	N	1	1	2	1	1	2	2
	38	N	1	1	2	N	1	1	2	1	1	2	X
14	26	N	N	N	1	N	N	1	1	N	1	1	2
	28	N	N	N	1	N	N	1	1	N	1	1	2
	30	N	N	1	1	N	1	1	1	N	1	1	2
	32	N	N	1	1	N	1	1	1	N	1	1	2
	34	N	N	1	1	N	1	1	2	N	1	1	2
	36	N	N	1	1	N	1	1	2	N	1	1	2
	38	N	N	1	1	N	1	1	2	N	1	2	2
	40	N	1	1	1	N	1	1	2	1	1	2	2
16	26	N	N	1	1	N	N	1	1	N	1	1	2
	28	N	N	1	1	N	1	1	1	N	1	1	2
	30	N	N	1	1	N	1	1	2	N	1	1	2
	32	N	N	1	1	N	1	1	2	N	1	1	2
	34	N	N	1	1	N	1	1	2	N	1	1	2
	36	N	N	1	1	N	1	1	2	N	1	2	2
	38	N	1	1	1	N	1	1	2	1	1	2	X
	40	N	1	1	2	N	1	1	2	1	1	2	X
	42	N	1	1	2	N	1	1	2	1	1	2	X

Notes

(1) N = No reinforcement required.
1 = ACJs reinforced with 23/32" wood structural panel on one side only.
2 = ACJs reinforced with 23/32" wood structural panel on both sides or double I-joist.
X = Try a deeper joist or closer spacing.

(2) Color coding in Table is matched to details in Figure 5a.

(3) Maximum load shall be: 15 psf roof dead load, 50 psf floor total load, and 80 plf wall load. Wall load is based on 3'-0" maximum width window or door openings. For larger openings, or multiple 3'-0" width openings spaced less than 6'-0" o.c., additional joists beneath the opening's cripple studs may be required.

(4) Table applies to joists 12" to 24" o.c. Use 12" o.c. requirements for lesser spacings.

(5) For conventional roof construction using a ridge beam, the Roof Truss Span column above is equivalent to the distance between the supporting wall and the ridge beam. When the roof is framed using a ridge board, the Roof Truss Span is equivalent to the distance between the supporting walls as if a truss is used.

(6) Cantilevered joists supporting girder trusses or roof beams may require additional reinforcing.

WEB HOLE SPECIFICATIONS

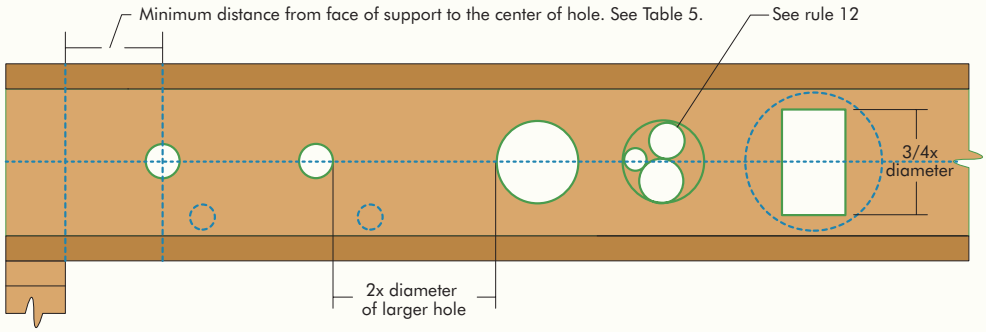
One of the benefits of using I-joists in residential floor construction is that holes may be cut in the joist webs to accommodate electrical wiring, plumbing lines and other mechanical systems, therefore minimizing the depth of the floor system.

Rules for cutting holes in AcuJoists ACJ-40 & ACJ-80 I-Joists

1. The distance between the inside edge of the support and the centerline of any hole shall be in compliance with the requirements of Table 5.
2. I-joist top and bottom flanges must NEVER be cut, notched, or otherwise modified.
3. Whenever possible field-cut holes should be centered on the middle of the web.
4. The maximum size hole that can be cut into an I-joist web shall equal the clear distance between the flanges of the I-joist minus 1/4 inch. A minimum of 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 should 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 shall 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 5.
7. Holes measuring 1-1/2 inches shall be permitted anywhere in a cantilevered section of a ACJ Joist. Holes of greater size may be permitted subject to verification.
8. A 1-1/2-inch hole can be placed anywhere in the web provided that it meets the requirements of Rule number 6 above.
9. All holes shall be cut in a workman-like manner in accordance with the restrictions listed above and as illustrated in Figure 6.
10. Limit 3 maximum size holes per span.
11. A group of round holes at approximately the same location shall be permitted if they meet the requirements for a single round hole circumscribed around them.

FIGURE 6

ACJ JOIST TYPICAL HOLES



Cutting the Hole

- Never drill, cut or notch the flange, or over-cut the web.
- Holes in webs should be cut with a sharp saw.
- For rectangular holes, avoid over cutting the corners, as this can cause unnecessary stress concentrations. Slightly rounding the corners is recommended. Starting the rectangular hole by drilling a 1" diameter hole in each of the 4 corners and then making the cuts between the holes is another good method to minimize damage to I-joist.

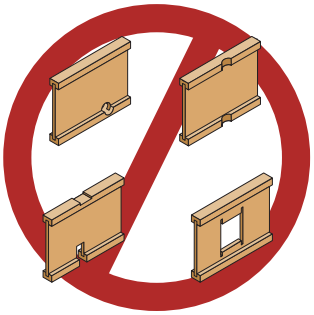


TABLE 5

LOCATION OF CIRCULAR HOLES IN ACJ JOIST WEBS
Single Span for Loads up to 40 psf Live and 15 psf Dead designed to CSA086-19 A.5.4.5.1[(1)(2)(3)(4)]

Joist Depth	Joist	SAF[(5)]	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	13	14	14-3/4
9-1/2"	ACJ-40	13'-5"	0'-11"	0'-11"	1'-0"	1'-7"	2'-9"	3'-1"												
11-7/8"	ACJ-40	15'-5"	1'-1"	1'-2"	1'-2"	1'-3"	1'-3"	1'-3"	2'-1"	3'-4"	4'-2"									
	ACJ-80	17'-1"	1'-1"	1'-2"	1'-2"	1'-3"	1'-9"	2'-0"	2'-11"	4'-2"	5'-0"									
14"	ACJ-40	17'-1"	1'-3"	1'-4"	1'-4"	1'-5"	1'-5"	1'-6"	1'-6"	1'-6"	2'-3"	2'-9"	4'-0"	4'-0"						
	ACJ-80	18'-11"	1'-3"	1'-4"	1'-4"	1'-5"	1'-5"	1'-6"	1'-6"	2'-5"	3'-7"	3'-8"	4'-11"	5'-11"						
16"	ACJ-40	18'-7"	1'-5"	1'-6"	1'-6"	1'-7"	1'-7"	1'-7"	1'-8"	1'-8"	1'-9"	1'-9"	2'-3"	3'-3"	3'-6"	4'-10"	5'-9"			
	ACJ-80	20'-6"	1'-5"	1'-6"	1'-6"	1'-7"	1'-7"	1'-7"	1'-8"	1'-8"	1'-9"	1'-11"	3'-3"	4'-2"	4'-6"	5'-9"	6'-9"			
18"	ACJ-80	22'-2"	1'-7"	1'-8"	1'-8"	1'-9"	1'-9"	1'-9"	1'-10"	1'-10"	1'-11"	1'-11"	1'-11"	2'-0"	2'-0"	3'-2"	4'-3"	4'-7"	6'-1"	7'-2"

Notes: (1) Above tables may be used for I-joist spacing of 24 inched on centre or less.
(2) Hole location distance is measured from inside face of supports to centre of hole.
(3) Distances in this chart are based on uniformly loaded joists.
(4) This chart accounts for the worst case created by the allowable Single spans shown on Tables 2 and 3 in this guide. Hole sizes and/or locations that fall outside the scope of this table may be acceptable based on analysis of the actual hole size, span, spacing and loading conditions.
(5) SAF = Span Adjustment Factor, used as defined below:

OPTIONAL:

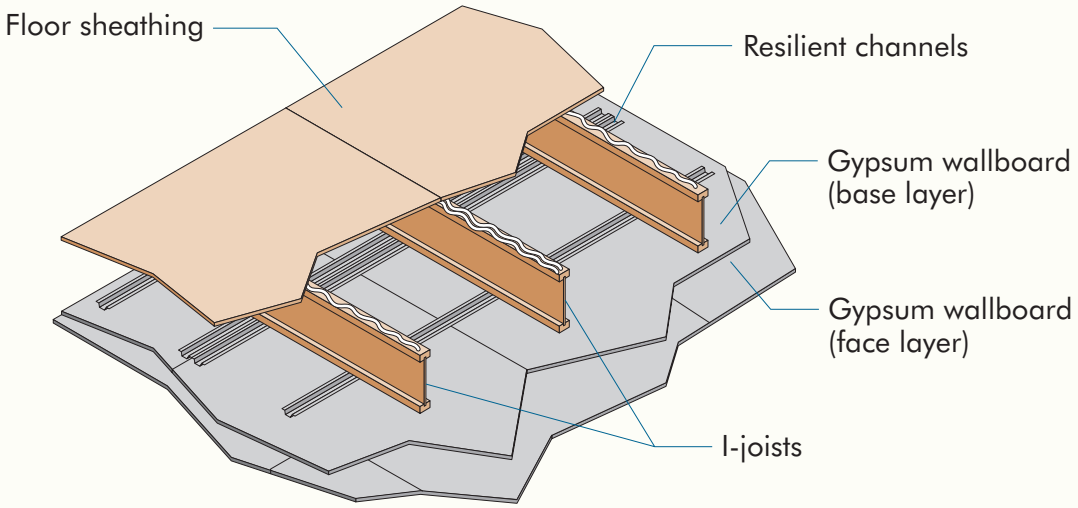
Table 5 is based on the I-Joists being used at their maximum span. If the I-Joists are placed at less than their full allowable span, the maximum distance from the centreline of the hole to the face of any support (D) as given above may be reduced as follows: $D_{reduced} = \frac{L_{actual}}{SAF} \times D$

Where: $D_{reduced}$ = Distance from the inside face of any support to centre of hole, reduced for less-than-maximum span applications (ft). The reduced distance shall not be less than the joist depth from the face of support to edge of the hole.
L_{actual} = The actual measured span between the inside face of supports (ft).
SAF = Span Adjustment Factor given in Table 5.
D = The minimum distance from the inside face of any support to the centre of the hole from Table 5 above.

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

FIGURE 5.6

ONE-HOUR COMBUSTIBLE FLOOR-CEILING ASSEMBLY WITH ACJ JOISTS*



A. BASIC ASSEMBLIES

1. Floor topping (optional}: Varies (reference sound ratings if applicable).
2. Floor sheathing: Min. 23/32-inch (18-mm) T&G wood structural panel. The sheets shall be installed with their long edge perpendicular to the joists with end joints centered over the top flange of joists. Floor sheathing must be installed per code requirements.
3. Structural members: Min. 9-1/2 inches (241 mm) deep I-joists. Max. 24 inch (610 mm) on center spacing. Min. flange thickness of 1-5/16 inches (33 mm) and each flange area of at least 1.95 inches^2 (1,258 mm^2). Min. web thickness of 3/8 inch (9.5 mm).
4. Resilient channels†: Min. 0.019-inch (0.5-mm) galvanized resilient channels. Attached perpendicular to the bottom flange of the I-joist with 1-1/4-inch (32-mm) Type S drywall screws. Channels are spaced a max. of 16 inches (406 mm) on center (24 inches or 610 mm when I-joists are spaced a max. of 16 inches or 406 mm on center), are doubled at each base layer wallboard end joint and extend to the next joist beyond each joint.
5. Ceiling: Two layers of 1/2-inch (13-mm) Type X gypsum wallboard.
   a. Base layer: Install with long dimension perpendicular to resilient channels. Attach to the resilient channels using 1-1/4 inch (32-mm) Type S drywall screws at 12 inches (305 mm) on center. The end joints of the wallboard must be staggered.
   b. Face layer: Install with long dimension perpendicular to resilient channels. Attach to the resilient channels through the base layer using 1-5/8-inch (41-mm) Type S drywall screws spaced at 12 inches (305 mm) on center. The longitudinal joints of this layer must be offset 24 inches (610 mm) from those of the base layer. Additionally, face layer end joints are attached to the base layer with 1-1/2-inch (38-mm) Type G drywall screws at 8 inches (203 mm) on center placed 1-1/2 inches (38 mm) either side of the joint.
   c. Finish: The face layer joints must be covered with tape and coated with joint compound. Screw heads must also be covered with joint compound.

B. SOUND RATING[a,b]

	Without Gypsum Concrete				With 1-in. (25-mm) Gypsum Concrete			
	Cushioned Vinyl		Carpet & Pad		Cushioned Vinyl		Carpet & Pad	
Joist/RC Spacing[c]	STC	IIC	STC	IIC	STC	IIC	STC	IIC
24"/16" o.c.	46	44	46	61	58	47 (51)	58	67
16"/24" o.c.	47	43	47	64	60	49 (52)	60	67

a. Sound ratings from the American Wood Council publication Design for Code Acceptance (DCA) 3, available from www.awc.org.
b. STC and IIC values established by engineering analysis. Values in parentheses are based on laminate wood flooring over a 0.08-in. (2-mm) closed-cell foam underlay, in lieu of cushioned vinyl flooring.
c. STC and IIC values for 16-inch (406-mm) on center joist spacing are applicable to 19.2-inch (488-mm) on center joist spacing.

C. SIMILAR ASSEMBLIES

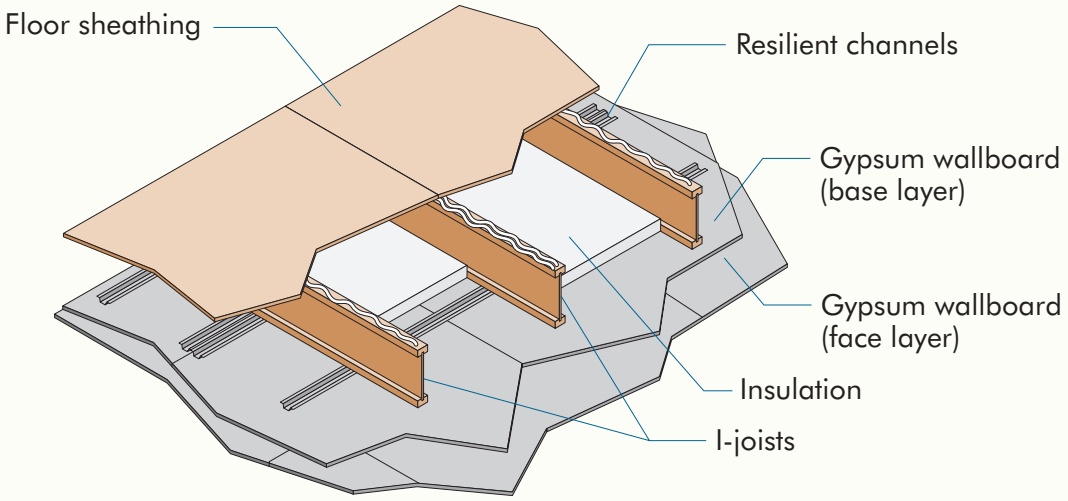
1. 2012/2015/2018/2021 IBC Table 721.1(3) Item 27-1.1, and DCA 3 WIJ-1.6.
2. Assemblies that meet the fire-resistance rating in accordance with NBC Table 9.10.3.1.-B or the calculation method specified in NBC Appendix D-2.3.

* *This assembly may also be used in a fire-rated roof/ceiling assembly, but only when constructed exactly as described.*

† *Direct attachment of gypsum wallboard in lieu of attachment to resilient channels is typically deemed acceptable. When gypsum wallboard directly attached to the I-joists, the wallboard shall be installed with the long dimension perpendicular to the 1-ioists and sound rating for assembly in Figure 5.5 shall be used.*

FIGURE 5.7

ONE-HOUR COMBUSTIBLE FLOOR-CEILING ASSEMBLY WITH ACJ JOISTS*



A. BASIC ASSEMBLIES

1. Floor topping (optional}: Varies (reference sound ratings if applicable).
2. Floor sheathing: Min. 23/32-inch (18-mm) T&G wood structural panel. The sheets shall be installed with their long edge perpendicular to the joists with end joints centered over the top flange of joists. Floor sheathing must be installed per code requirements.
3. Insulation: Glass fiber insulation. Installed between I-joists and supported by resilient channels.
4. Structural members: Min. 9-1/2 inches (241 mm) deep I-joists. Max. 24 inches (610 mm) on center spacing. Min. flange thickness of 1-1/2 inches (38 mm) and each flange area of at least 2.25 inches^2 (1,452 mm^2). Min. web thickness of 3/8 inch (9.5 mm).
5. Resilient channels: Min. 0.019-inch (0.5-mm) galvanized resilient channels. Attached perpendicular to the bottom flange of the I-joist with 1-1/4 inch (32-mm) Type S drywall screws. Channels are spaced a max. of 16 inches (406 mm) on center (24 inches or 610 mm when I-joists are spaced a max. of 16 inches or 406 mm on center), are doubled at each base layer wallboard end joint and extend to the next joist beyond each joint.
6. Ceiling: Two layers of 1/2-inch (13-mm) Type X gypsum wallboard
   a. Base layer: Install with long dimension perpendicular to resilient channels. Attach to the resilient channels using 1-1/4 inch (32-mm) Type S drywall screws at 12 inches (305 mm) on center. The end joints of the wallboard must be staggered.
   b. Face layer: Install with long dimension perpendicular to resilient channels. Attach to the resilient channels through the base layer using 1-5/8-inch (41-mm) Type S drywall screws spaced at 12 inches (305 mm) on center. The longitudinal joints of this layer must be offset 24 inches (610 mm) from those of the base layer. Additionally, face layer end joints are attached to the base layer with 1-1/2-inch (38-mm) Type G drywall screws at 8 inches (203 mm) on center placed 1-1/2 inches (38 mm) either side of the joint.
   c. Finish: The face layer joints must be covered with tape and coated with joint compound. Screw heads must also be covered with joint compound.

B. SOUND RATING[a,b]

	Without Gypsum Concrete				With 1-in. (25-mm) Gypsum Concrete			
	Cushioned Vinyl		Carpet & Pad		Cushioned Vinyl		Carpet & Pad	
Joist/RC Spacing[c]	STC	IIC	STC	IIC	STC	IIC	STC	IIC
24"/16" o.c.	56	51	56	69	64	53	64	71
16"/24" o.c.	55	48 (51)	55	67	64	54	64	67

a. Sound ratings from the American Wood Council publication Design for Code Acceptance (DCA) 3, available from www.awc.org.
b. STC and IIC values established by engineering analysis based on 3.5-inch (89-mm) thick glass fiber insulation. Values in parentheses are based on laminate wood flooring over a 0.08-inch (2-mm) closed-cell foam underlay, in lieu of cushioned vinyl flooring.
c. STC and IIC values for 16-inch (406-mm) on center joist spacing are applicable to 19.2-inch (488-mm) on center joist spacing.

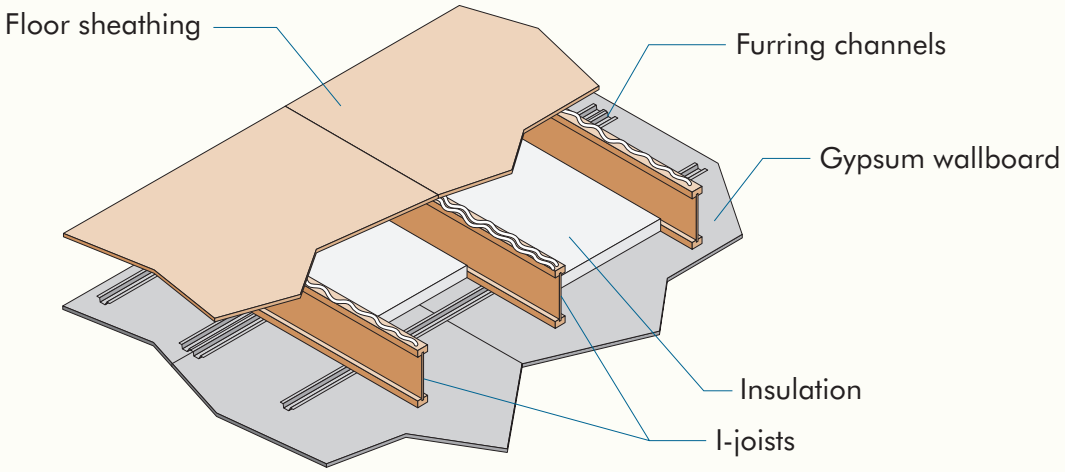
C. SIMILAR ASSEMBLIES

1. 2015/2018/2021 IBC Table 721.1(3) Item 30-1.1 and DCA3 WIJ-1.7.
2. Assemblies that meet the fire-resistance rating in accordance with NBC Table 9.10.3.1.-B or the calculation method specified in NBC Appendix D-2.3.

* *This assembly may also be used in a fire-rated roof/ceiling assembly, but only when constructed exactly as described.*

FIGURE 5.1 *(Figure 5.1 applies only to ACJ-80 series joists)*

ONE-HOUR COMBUSTIBLE FLOOR-CEILING ASSEMBLY WITH ACJ-80 JOISTS*



A. BASIC ASSEMBLIES

1. Floor topping (optional}: Varies (reference sound ratings if applicable).
2. Floor sheathing: Min. 23/32-inch (18-mm) T&G wood structural panel. A construction adhesive must be applied to the top of the joists prior to placing sheathing. The sheets shall be installed with their long edge perpendicular to the joists with end joints centered over the top flange of joists. Floor sheathing must be installed per code requirements.
3. Insulation: Min. 1-1/2-inch (38-mm) mineral wool insulation batts (min. 2.5 pcf). Installed adjacent to the bottom flange of the I-joist and supported by the furring channels. Ends of batts shall be centered over furring channels.
4. Structural members: Min. 9-1/4 inches (235 mm) deep I-joists. Max. 24 inches (610 mm) on center spacing. Min. flange thickness of 1-1/2 inches (38 mm) and each flange area of at least 5.25 inches^2 (3,387 mm^2). Min. web thickness of 3/8 inch (9.5 mm).
5. Furring channels: Min. 0.026-inch (0.66-mm) hat shaped galvanized steel channels attached perpendicular to the bottom flange of the I-joist with 1-5/8-inch (41-mm) Type S drywall screws. Channels are spaced a max. of 16 inches (406 mm) on center, are doubled at each wallboard end joint, and extend to the next joist beyond each joint.
6. Ceiling: One layer of 5/8-inch (16-mm) Type C gypsum wallboard. Installed with long dimension perpendicular to furring channels and fastened with min. 1-1/8-inch (29-mm) Type S drywall screws spaced at 12 inches (305 mm) on center on intermediate joists and 8 inches (203 mm) on center at end joints, and 3/4 inch (19 mm) from wallboard edges and ends. The end joints of the wallboard must be staggered.
   a. Finish: The face layer joints must be covered with tape and coated with joint compound. Screw heads must also be covered with joint compound.

B. SOUND RATING[a,b]

	Without Gypsum Concrete				With 1-in. (25-mm) Gypsum Concrete			
	Cushioned Vinyl		Carpet & Pad		Cushioned Vinyl		Carpet & Pad	
Joist/RC Spacing[c]	STC	IIC	STC	IIC	STC	IIC	STC	IIC
24"/16" o.c.	48 (51)	42 (43)	48 (51)	61 (63)	63 (65)	50 (52)	63 (65)	65 (67)
16"/24" o.c.	44 (46)	37 (39)	44 (46)	60 (61)	56 (57)	46 (47)	56 (57)	58 (59)

a. Sound ratings from the American Wood Council publication Design for Code Acceptance (DCA) 3, available from www.awc.org.
b. STC and IIC values established by engineering analysis based on 1.5-inch (38-mm) thick mineral wool batt insulation. Values in parentheses are based on 3.5-inch (89-mm) thick mineral wool batt insulation.
c. STC and IIC values for 16-inch (406-mm) on center joist spacing are applicable to 19.2-inch (488-mm) on center joist spacing.

C. SIMILAR ASSEMBLIES

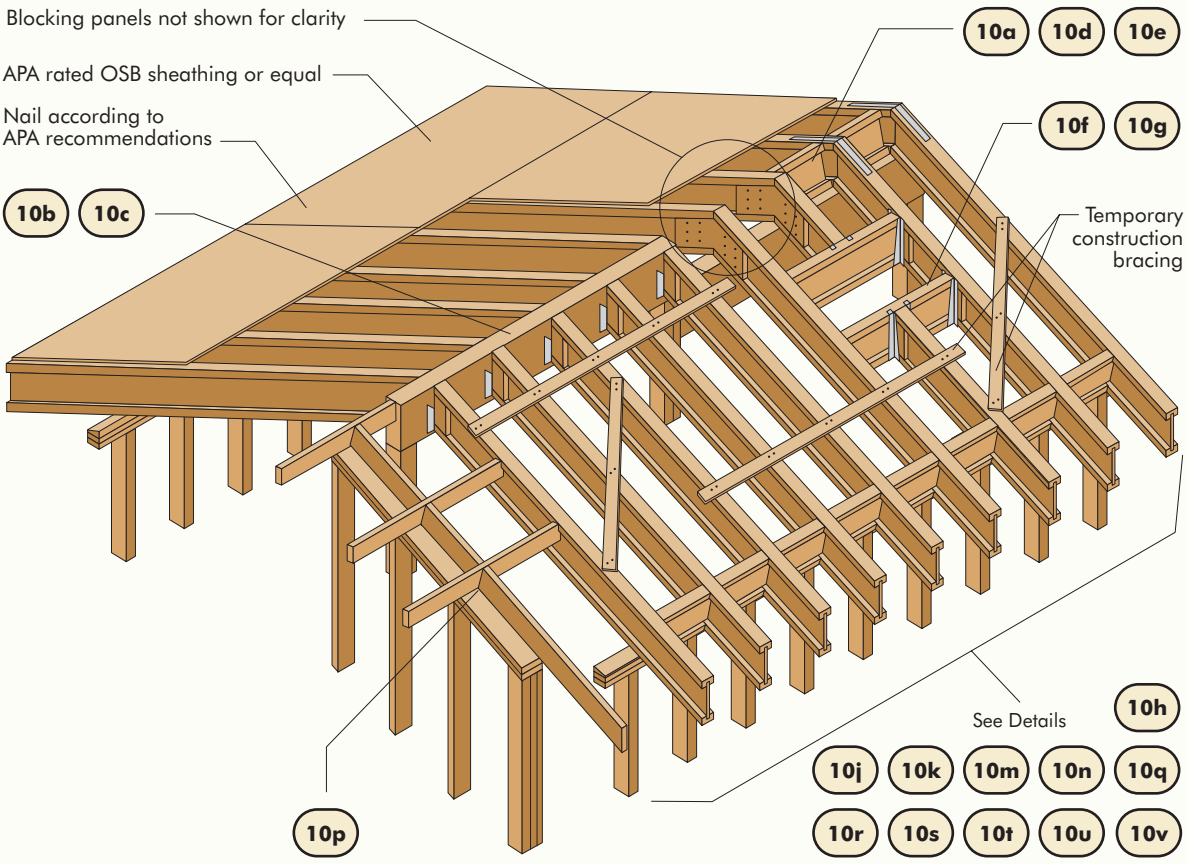
1. 2012/2015/2018/2021 IBC Table 721.1(3) Item 24-1.1 and DCA 3 WIJ-1.1.
2. Assemblies that meet the fire-resistance rating in accordance with NBC Table 9.10.3.1.-B or the calculation method specified in NBC Appendix D-2.3.

* *This assembly may also be used in a fire-rated roof/ceiling assembly, but only when constructed exactly as described.*

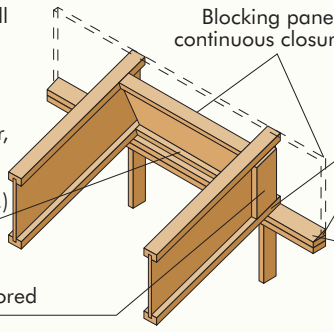
FIGURE 10

TYPICAL PERFORMANCE RATED I-JOIST ROOF FRAMING AND CONSTRUCTION

Click on circled numbers for enlarged view of detail.



10a Upper End, Bearing on Wall



Blocking panel, x-bridging, or 23/32" APA Rated Sheathing 48/24 as continuous closure. (Validate use of x-bridging with local building code.)

2-1/2" nails at 6" o.c. – minimum 3 - 2-1/2" nails per blocking panel. (When used for lateral shear transfer, match nail type and sheathing edge nailing ("boundary nailing" for engineered diaphragm applications.) Use minimum 2-1/2" nails.

Minimum attachment: For slope 1/4:12, one 3" box nail, face nail at each side of bearing. For slope > 1/4:12 design joist attachment to beveled plate to transfer lateral thrust.

Attach beveled plate to framing with 1 - 3-1/2"

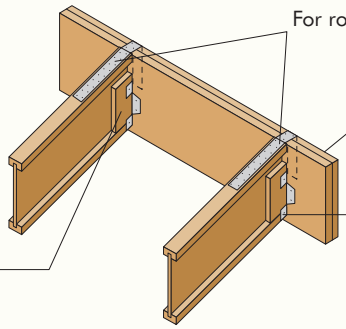
Beveled plate for slopes greater than 1/4:12. Code-recognized connectors may be substituted. For slopes greater than 4:12 connectors are required to resist lateral thrust.

Bearing stiffener required when factored end reaction exceeds 2440 lbs.

Note: Additional connection may be required for wind uplift.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

10b Peak Connection



For roof slopes between 1/4:12 and 12:12, provide a strap tie nailed at a minimum of 3" spacing or in accordance with the recommendation of the strap manufacturer

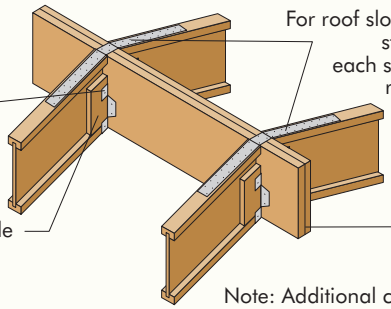
Ridge beam (Glulam or LVL)

Adjustable Slope Hanger with a minimum factored uplift resistance of 450 lbs.

Beveled bearing stiffener required each side

Note: Additional connection may be required for wind uplift.

10c I-Joist to Ridge Beam Connection



For roof slopes between 1/4:12 and 12:12, provide a strap nailed at a minimum of 3" spacing on each side of roof slope or in accordance with the recommendation of the strap manufacturer

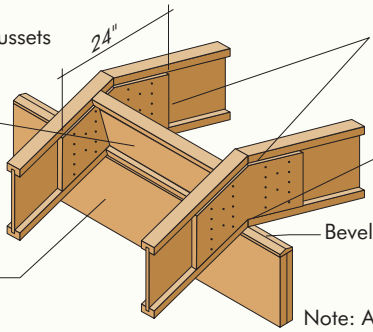
Adjustable Slope Hanger with a minimum factored uplift resistance of 450 lbs.

Beveled bearing stiffener required each side

Ridge beam (Glulam or LVL)

Note: Additional connection may be required for wind uplift.

10d I-Joist Connection with Wood Structural Panel Gussets



23/32" x 2'-0" wood structural panel (front and back sides) with 12 - 2-1/2" nails into each joist with nails clinched. When unfactored roof live load exceeds 40 psf, horizontal orientation of gusset strong axis is required. Gap 1/8" at top.

Blocking panel or x-bridging. Attach per 10a.

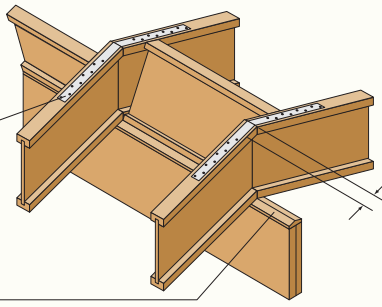
Attach per 10a

Beveled bearing plate

Support beam or wall

Note: Additional connection may be required for wind uplift.

10e I-Joist Connection with Tie Strap



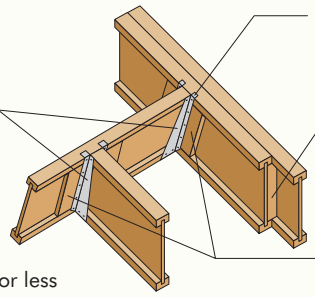
Tie strap nailed at a minimum of 3" spacing or in accordance with manufacturer's recommendations

Strap nails: Leave 2-3/8" minimum end distance

Beveled bearing plate

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

10f Roof Opening
Top Mounted Hangers



Top mounted hanger per manufacturer's recommendations

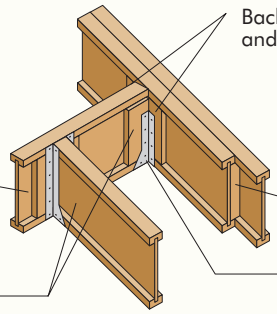
Filler blocking per Figure 1p

Bearing stiffeners required when hanger does **NOT** support I-joist top flange

Backer block. If top-mounted hanger is fully supported by top flange, backer block only required on hanger side. If face nailing is required, then second backer block (filler block if multiple I-joist) is required. Nail with 10 - 3" nails for flanges up to 1-3/4" wide. Use 12 - 3" nails for flanges wider than 1-3/4".

Application limited to 4:12 slope or less

10g Roof Opening, Face-Mounted Hangers



Backer block on both sides of web (or backer block and filler block, if multiple I-joists), nail with 12 - 3" nails, clinch when possible

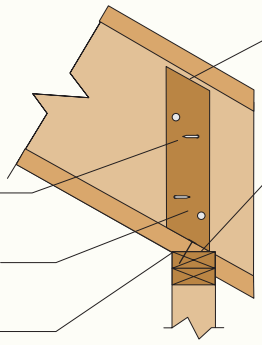
Header may be I-joist, LVL, glulam, or lumber

Filler blocking per Figure 1p

Bearing stiffeners required when hanger does not support I-joist top flange

Face-mount hanger per hanger manufacturer's recommendations

10h Birdsmouth Cut & Bevel Cut Bearing Stiffener



1/8" gap at top

Permitted on low end of I-joist only

One 3" box nail, face nail at each side of bearing (face nail where flange is 7/8" to 1" thick)

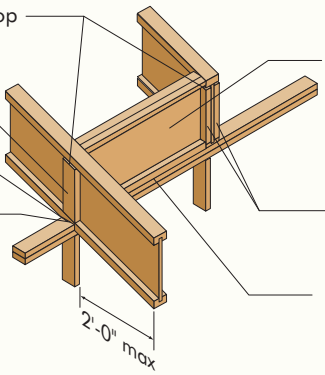
Bearing stiffeners required each side of I-joist. Bevel-cut bearing stiffener to match roof slope.

4 - 2-1/2" nails (two each side) clinched when possible

Birdsmouth cut shall bear fully and not overhang the inside face of plate

Note: Additional connection may be required for wind uplift.

10j Birdsmouth Cut with Overhang
(Permitted on low end of I-joist only)



1/8" gap at top

Blocking I-joist or panel or x-bridging. (Validate use of x-bridging with local building code.) See 10u for vent holes.

Bearing stiffener required each side (attach per 10h)

Attach joist to top plate per 10h

Bearing stiffeners

Birdsmouth cut at bearing

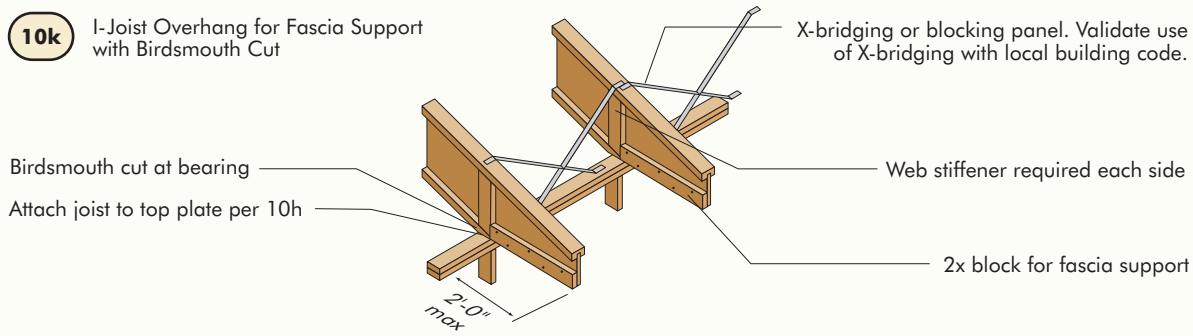
Attach blocking per 10a

Note: Additional connection may be required for wind uplift.

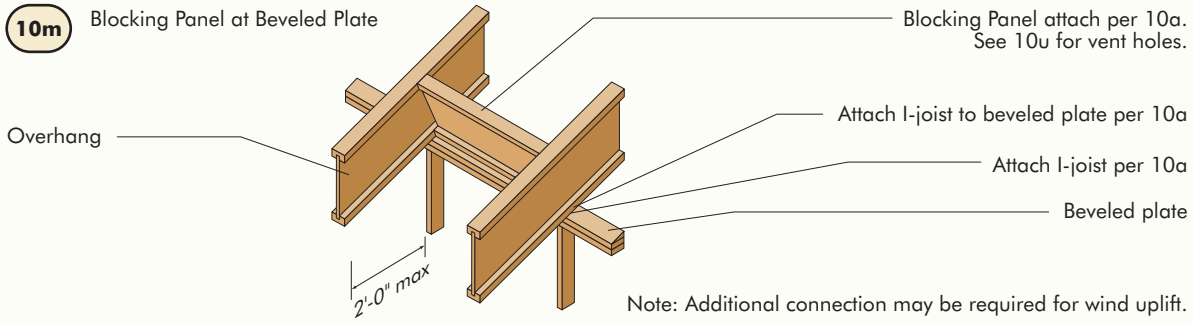
Note: Outside corner of blocking panel may be trimmed if it interferes with roof sheathing. In such cases, position blocking panel on top plate to minimize trimming and still allow required nailing into top plate.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

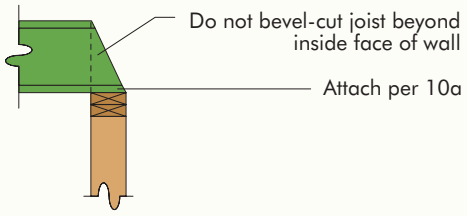
10k I-Joist Overhang for Fascia Support with Birdsmouth Cut



10m Blocking Panel at Beveled Plate



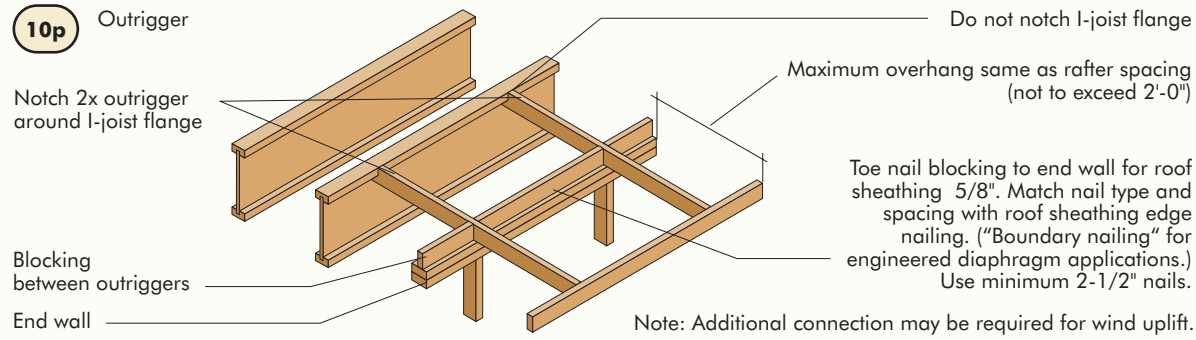
10n I-Joist with Bevel-Cut End



Note: Blocking or x-bridging required at bearing for lateral support, not shown for clarity.

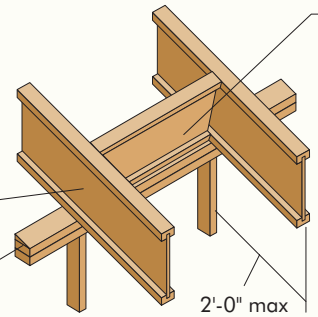
Note: Additional connection may be required for wind uplift.

10p Outrigger

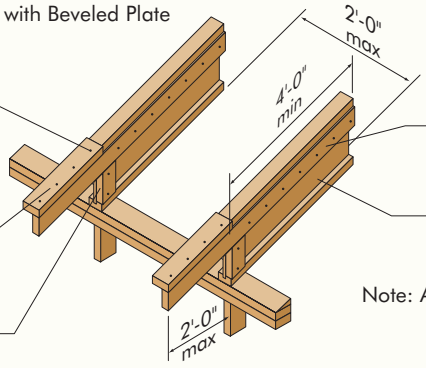


All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

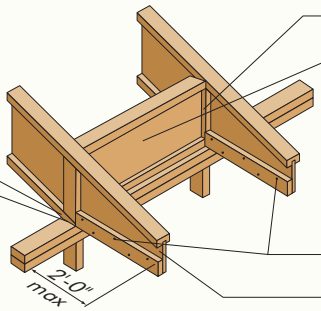
10q I-Joist Overhang with Beveled Plate



10r Lumber Overhang with Beveled Plate

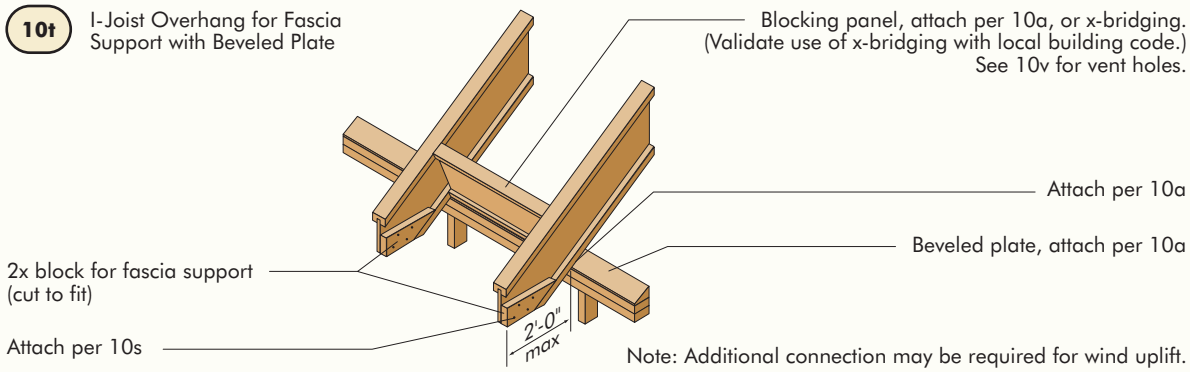


10s I-Joist Overhang for Fascia Support with Birdsmouth Cut

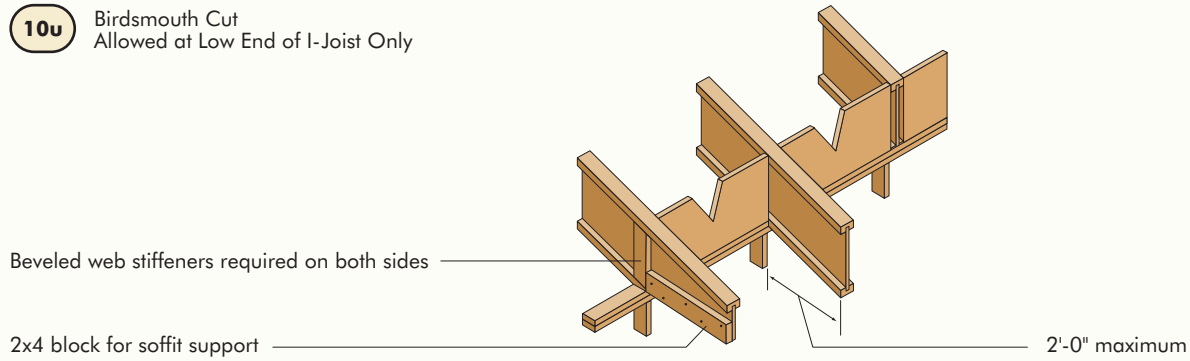


All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

10t I-Joist Overhang for Fascia Support with Beveled Plate

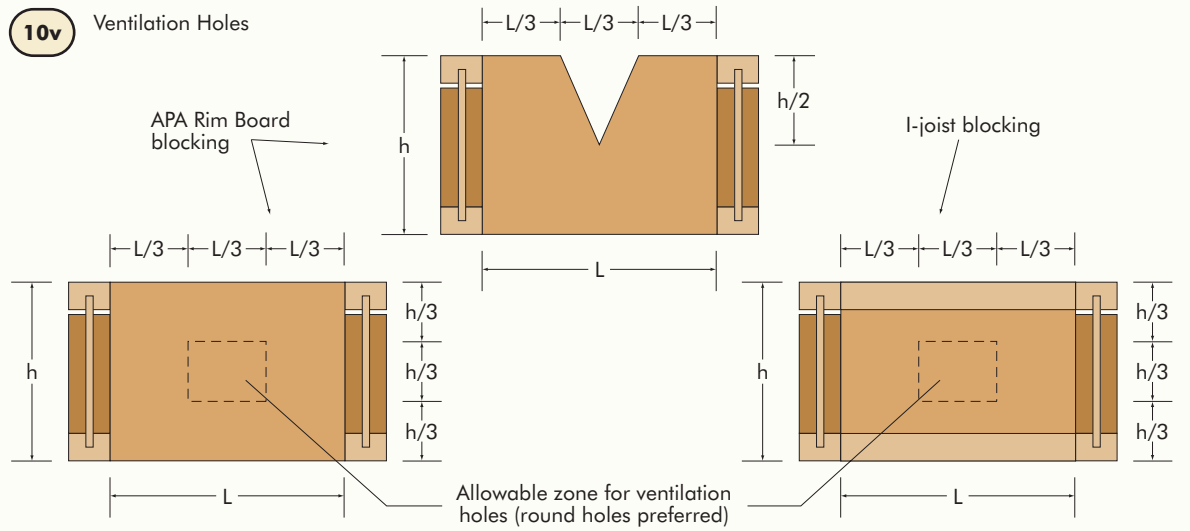


10u Birdsmouth Cut Allowed at Low End of I-Joist Only



Note: Corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material shall cover the ventilation holes per code.

10v Ventilation Holes



Note: Corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material shall cover the ventilation holes per code.

All nails shown in the details above are assumed to be common nails unless otherwise noted. Framing lumber assumed to be Spruce-Pine-Fir. Individual components not shown to scale for clarity.

AcuJoist Construction Details

For additional assistance, contact us:

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