

Cantilever I-Joist Resistances for Vertical Building Offset

Design Criteria

Cantilever length:	From half the I-joist depth to 2 feet
Minimum bearing length:	3-1/2 inches
Reinforcement on one side:	Nail with 2-1/2-inch nails at 6 inches on centre, top and bottom flange.
Reinforcement on both sides:	Nail with 2-1/2-inch nails at 6 inches on centre, top and bottom flange, offset by 3 inches on the opposite side.
Reinforcement type:	Wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) Depth shall match the full height of the joist. Install with face grain horizontal.
Reinforcement back span:	2 feet minimum

Design Properties

Joist depth	Joist series	Unreinforced I-joist		Reinforcement on one side		Reinforcement on both sides	
		$V_r^{(a)}$ (lbf)	$R_r^{(b)}$ (lbf)	$V_{r,increase}^{(c)}$ (lbf)	$R_{r,increase}^{(d)}$ (lbf)	$V_{r,increase}^{(c)}$ (lbf)	$R_{r,increase}^{(d)}$ (lbf)
9-1/2"	NI-20	1,770	3,800	310	1,010	620	2,020
	NI-40x	1,890	3,800	310	1,010	620	2,020
	NI-60	1,890	3,810	310	1,020	620	2,040
	NI-80	1,890	3,810	310	730	620	1,460
11-7/8"	NI-20	2,240	4,740	490	1,260	980	2,520
	NI-40x	2,340	4,740	490	1,260	980	2,520
	NI-60	2,480	4,740	490	1,260	980	2,520
	NI-80	2,510	4,740	490	900	980	1,800
	NI-90	3,040	5,300	490	1,010	980	2,020
14"	NI-40x	2,760	4,940	680	1,320	1,360	2,640
	NI-60	2,760	4,960	680	1,320	1,360	2,640
	NI-80	2,900	5,260	680	1,000	1,360	2,000
	NI-90	3,350	5,300	680	1,010	1,360	2,020
16"	NI-60	3,160	5,150	890	1,370	1,780	2,740
	NI-80	3,270	5,750	890	1,090	1,780	2,180
	NI-90	3,680	5,750	890	1,090	1,780	2,180

a) Factored shear resistance, V_r , of the unreinforced I-joist.

b) Factored reaction resistance, R_r , of the unreinforced I-joist.

c) Factored shear resistance increase, $V_{r,increase}$, due to cantilever reinforcement on one or both sides.

d) Factored reaction resistance increase, $R_{r,increase}$, due to cantilever reinforcement on one or both sides.

Notes:

- The tabulated design values are for standard-term duration of load ($K_D = 1.0$).
- Design of I-joists shall be in accordance with CSA O86.
- All nails are assumed to be common nails and shall have a diameter not less than 0.131 inch.

Design Criteria

Cantilever length:	Up to half the I-joist depth
Minimum bearing length:	3-1/2 inches
Reinforcement on one side:	Minimum 12-inch-long sheathing reinforcement, attach to top and bottom flanges with 2-1/2-inch nails at 4 inches on centre (total of 6 nails per reinforcement).
Reinforcement on both sides:	Minimum 18-inch-long sheathing reinforcement, attach to top and bottom flanges with 2-1/2-inch nails at 6 inches on centre, offset nails on opposite side (total of 6 nails per side)
Reinforcement type:	Wood structural panel with a minimum thickness of 23/32 inch (for OSB, panel mark 48/24) Depth shall match the full height of the joist. Install with face grain horizontal.

Design Properties

Joist depth	Joist series	Unreinforced I-joist			Reinforcement on one side		Reinforcement on both sides	
		$V_r^{(a)}$	$R_r^{(b)}$		$V_{r,increase}^{(c)}$	$R_{r,increase}^{(d)}$	$V_{r,increase}^{(c)}$	$R_{r,increase}^{(d)}$
			ER_r	$IR_{r,90}$				
		(lbf)	(lbf)	(lbf)	(lbf)	-	(lbf)	-
9-1/2"	NI-20	1,770	1,739	3,420	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-40x	1,890	1,881	3,420	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-60	1,890	1,881	3,429	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-80	1,890	1,890	3,429	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
11-7/8"	NI-20	2,240	2,180	4,266	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-40x	2,340	2,267	4,266	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-60	2,480	2,352	4,266	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-80	2,510	2,379	4,266	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
	NI-90	3,040	2,809	4,770	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
14"	NI-40x	2,760	2,370	4,446	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-60	2,760	2,377	4,464	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-80	2,900	2,479	4,734	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
	NI-90	3,350	2,829	4,770	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
16"	NI-60	3,160	2,401	4,635	540	$0.266 \cdot R_r$	1,080	$0.533 \cdot R_r$
	NI-80	3,270	2,512	5,175	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$
	NI-90	3,680	2,862	5,175	540	$0.190 \cdot R_r$	1,080	$0.381 \cdot R_r$

a) Factored shear resistance, V_r , of the unreinforced I-joist.

b) Factored reaction resistance, R_r , of the unreinforced I-joist, calculated as follows:

$$R_r = ER_r + (IR_{r,90} - ER_r) \cdot (2 \cdot L_o / d)$$

Where:

ER_r = Factored reaction resistance of the unreinforced I-joist without a cantilever (lbf)

$IR_{r,90}$ = Factored reaction resistance of the unreinforced I-joist with a cantilever length equal to half the I-joist depth (lbf)

L_o = Cantilever length (in.)

d = Joist depth (in.)

c) Factored shear resistance increase, $V_{r,increase}$, due to cantilever reinforcement on one or both sides.

d) Factored reaction resistance increase, $R_{r,increase}$, due to cantilever reinforcement on one or both sides.

Notes:

- The tabulated design values are for standard-term duration of load ($K_D = 1.0$).
- Design of I-joists shall be in accordance with CSA O86.
- All nails are assumed to be common nails and shall have a diameter not less than 0.131 inch.