Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

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New Castle Steel® Deck System

Trade Secret Report Holder:

New Castle Steel®, Inc.

Phone: 888-960-0808 Website: www.ncsteel.com Email: info@ncsteel.com

CSI Designations:

DIVISION: 05 00 00 - METALS

Section: 05 40 00 - Cold-Formed Metal Framing

Section: 05 42 00 - Cold-Formed Metal Joist Framing

1 Innovative Product Evaluated[1]

1.1 New Castle Steel Deck Framing System

2 Product Description and Materials

2.1 The innovative product evaluated in this report is shown in **Figure 1**.

Figure 1. New Castle Steel Deck Framing System

2.2 New Castle Steel Deck Framing System is a light-gauge cold-formed steel substructure designed for residential and commercial decks and patios.

2.2.1 The substructure are comprised of cold-formed steel structural members (joists, tracks, beams, and posts) manufactured with no punch-outs, and secured together with cold-formed steel connectors/brackets, and fasteners.

2.2.2 All structural members have a hot-dipped galvanized coating conforming to ASTM A653 G60 minimum with an additional proprietary coating. See **Figure 2**.

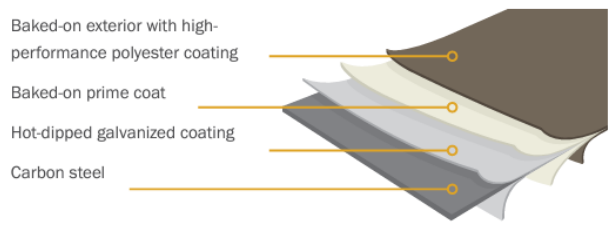

Figure 2. New Castle Steel Coating Layer Diagram

2.2.3 Specifications for the cold-formed steel structural members are provided in **Table 1.**

Table 1. Specifications for New Castle Steel (NCS) Deck Framing Components[1]

Component	Nominal Thickness	Steel Grade	Minimum Thickness (in)	Design Thickness (in)	Standard Length (in)
NCS Joist, 1 5/8" x 8"	18-gauge	ASTM A653 SS Grade 33	0.0440	0.0451	144, 192, 240
NCS Joist, 2" x 8"	14-gauge	ASTM A653 SS Grade 50, Class 1	0.0670	0.0670	
NCS Track, 1 1/4" x 8"					
NCS Post, 6" x 6"	1/8"	ASTM A500 Grade B/C	0.110	0.116	120
SI: 1 in = 25.4 mm 1. See **Figure 3** through **Figure 6.**					

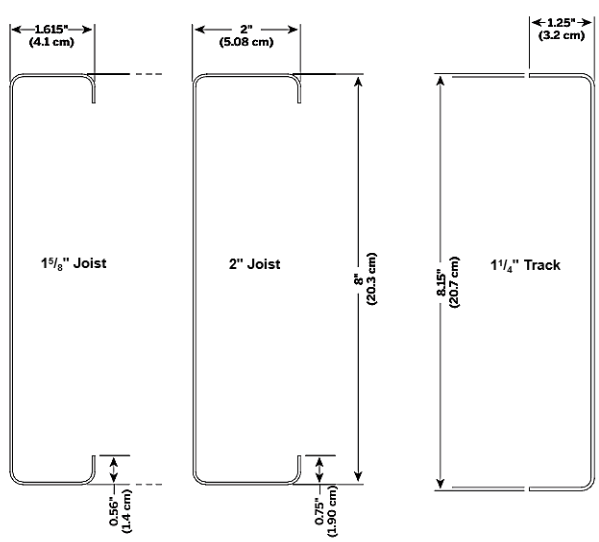

Figure 3. New Castle Steel Components – Joists & Track

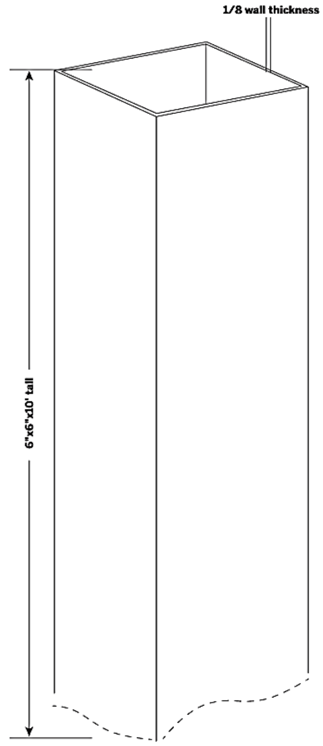

Figure 4. New Castle Steel Component – Post (top section)

2.2.4 Structural cold-formed steel joists and tracks can be assembled into single or double box beams.

2.2.4.1 Single box beams are factory-assembled and comprised of one 2″ flange joist and one 1$^{1}/_{4}$″ track.

2.2.4.1.1 The track overlaps the joist component, and the components are secured together with #10 x $^{3}/_{4}$″ self-tapping screws fastened 12″ on center through the top and bottom flanges. See **Figure 5**.

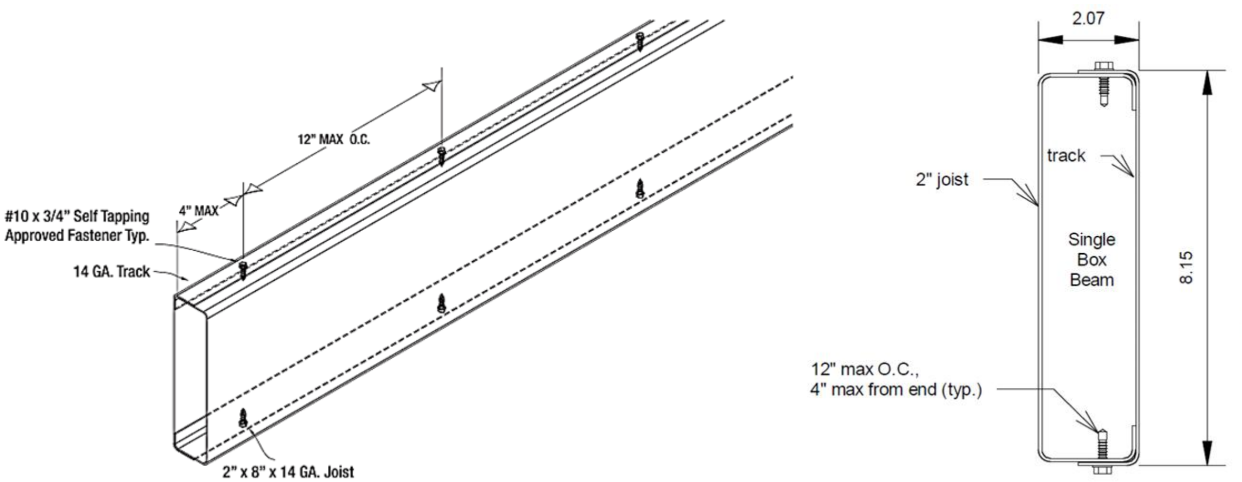

Figure 5. New Castle Steel Single Box Beam

2.2.4.2 Double box beams are comprised of two single box beams fastened together through the webs of the joists with #10 x $^3/_4$″ self-tapping screws fastened 24″ on center through the webs.

2.2.4.2.1 1$^1/_4$" tracks are installed in the same fashion as for single box beams. See **Figure 6**.

2.2.4.2.2 Double box beams are field assembled.

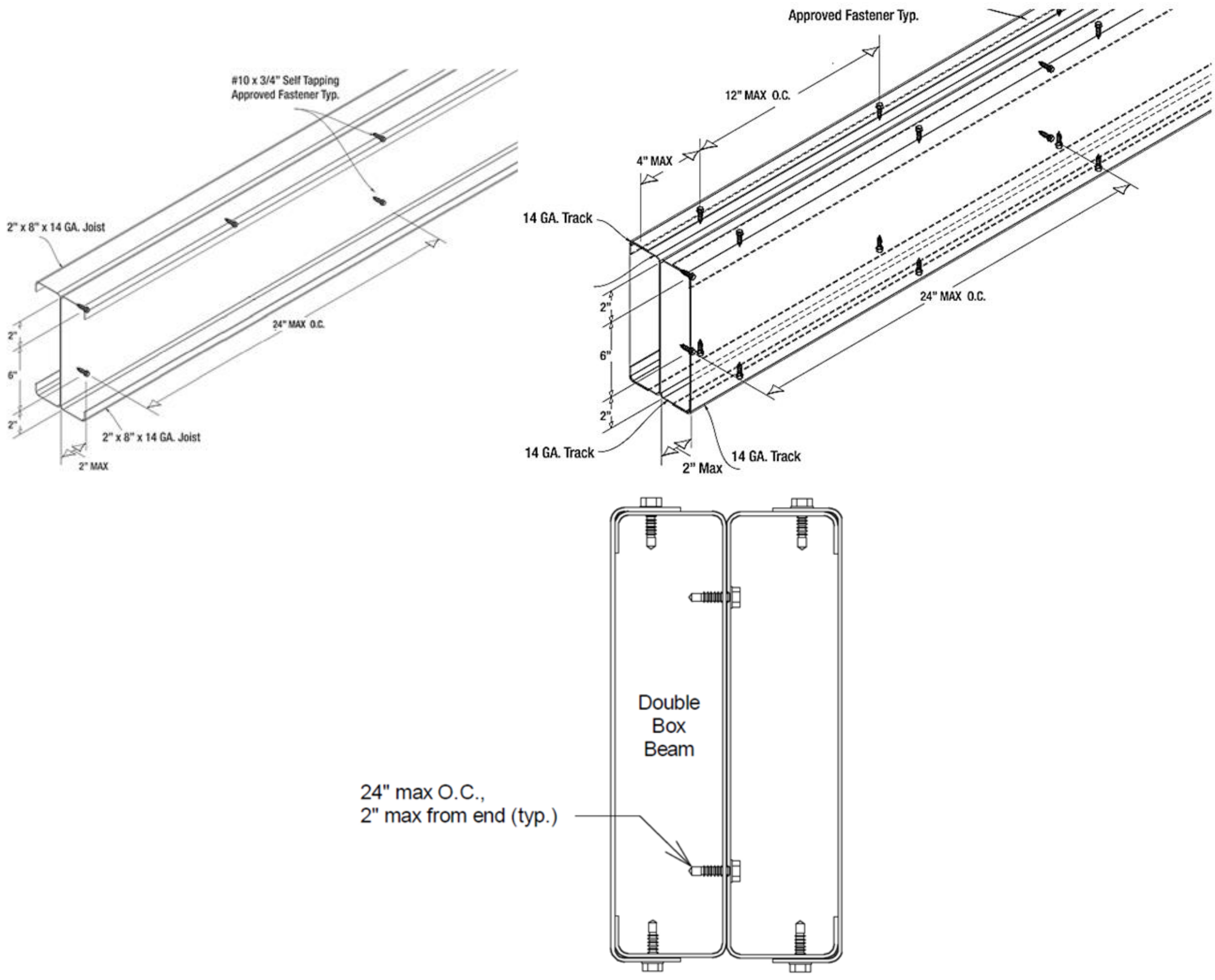

Figure 6. New Castle Steel Double Box Beam

2.2.4.3 Open beams (doubled joists) are comprised of two 2″ joists fastened together through the webs of the joists with #10 x $^{3}/_{4}$″ self-tapping screws fastened 24″ on center through the webs. See **Figure 7**.

2.2.4.3.1 Webs are oriented back-to-back.

2.2.4.3.2 Open beams may be used when longer joist spans are desired at higher loads. See **Table 3** and **Table 4**.

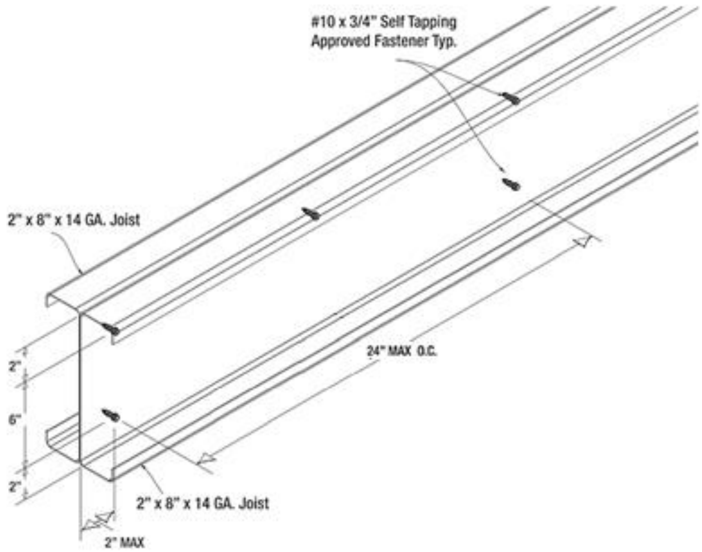

Figure 7. New Castle Steel Open Beam (Doubled Joist)

2.2.5 New Castle Steel Post is a 6″ by 6″ hollow structural section (HSS) with a wall thickness of $^{1}/_{8}$″ secured to a 10″ diameter, $^{1}/_{2}$″ thick round steel base plate.

2.2.5.1 Base plate material conforms to ASTM A36 and serves as the footing for the NCS Post.

2.2.5.1.1 Base plate contains two 6″ long, 4″ x 4″ x 0.12″ steel angles.

2.2.5.1.2 Steel angles are welded onto the base plate ($^{1}/_{4}$″ fillet welds, inside of angles).

2.2.5.1.3 NCS Post is screw-fastened to these angles with $^{1}/_{4}$″ diameter screws (provided by manufacturer).

2.2.5.2 See **Figure 8** for details of the post base.

2.2.5.3 See **Section 9.3.2** for installation details.

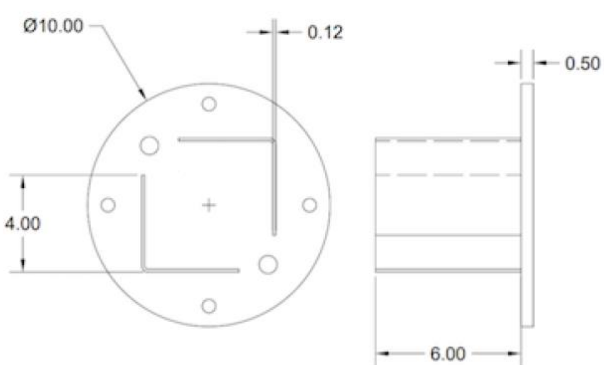

Figure 8. New Castle Steel Post Base

2.3 As needed, review material properties for design in **Section 6** and to regulatory evaluation in **Section 8**.

3 Definitions

3.1 New Materials[2] are defined as building materials, equipment, appliances, systems or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[3] The design strengths and permissible stresses shall be established by tests[4] and/or engineering analysis.[5]

3.2 Duly authenticated reports[6] and research reports[7] are test reports and related engineering evaluations, which are written by an approved agency[8] and/or an approved source.[9]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[10]

3.3 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is *"approved"* when a professional engineer (i.e., Registered Design Professional) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[11]

3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body and/or a licensed Registered Design Professional (RDP).

3.5.1 The Center for Building Innovation (CBI) is ANAB[12] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[13] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[14] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[15]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory where recognition of certificates, validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope, shall be approved.[16] Therefore, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.[17]

3.9 Approval equity is a fundamental commercial and legal principle.[18]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[19]

4.1 *Standards*

4.1.1 *AISI S100: North American Specification for the Design of Cold-Formed Steel Structural Members*

4.1.2 *ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

4.2 *Regulations*

4.2.1 *IBC – 15, 18, 21: International Building Code®*

4.2.2 *IRC – 15, 18, 21: International Residential Code®*

5 Listed[20]

5.1 Equipment, materials, products or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), approved agency (i.e., CBI and DrJ), and/or approved source (i.e., DrJ) or other organization concerned with product evaluation (i.e., DrJ) that maintains periodic inspection (i.e., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *General*

6.1.1 Section properties and design values of the framing members are provided in **Table 2**.

Table 2. Material and Section Properties of the Components used in New Castle Steel Deck Framing System

Component	Design Thickness (in)	Yield Strength, F_y (ksi)	Gross I_x (in^4)	Effective I_x (in^4)	EI (in^4)	Moment Capacity (kip-in)	Shear Capacity (kip)
Joist, $1^5/_8$" x 8"	0.0451	33	4.541	4.095	120,810,000	27.38	1.55
Joist, 2" x 8"	0.0670	50	7.827	7.395	218,150,000	77.42	5.09
Track, $1^1/_4$" x 8"	0.0670	50	5.428	4.620	136,280,000	44.16	5.00
Single Box Beam	0.0670	50	13.255	12.015	354,430,000	135.1	10.09
Double Box Beam	0.0670	50	26.510	24.029	708,870,000	270.2	20.18
SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm							

6.1.1.1 Design capacities were determined in accordance with Section F in AISI S100.

6.1.1.1.1 Capacities are for use with Load and Resistance Factor Design method (LRFD).

6.1.1.1.1.1 The listed moment capacities assume adequate compression flange bracing to prevent lateral torsional building; therefore, allowing the member to reach yield moment.

6.1.1.2 As applicable, the design of members shall address web crippling, and combined loading conditions in accordance with AISI S100.

6.1.1.2.1 Joists shall be stiffened.

6.1.1.2.1.1 Standard blocking may be used as web stiffeners.

6.1.1.2.1.1.1 Blocking shall be placed in alternate bays directly above the support beams.

6.2 *Structural Applications*

6.2.1 Maximum allowable spans for the $1^5/_8$″ joist and 2″ joist are provided in **Table 3** and **Table 4**.

6.2.2 Maximum allowable spans for single box beams and double box beams are provided in **Table 6** through **Table 11** with respect to various joist spans and cantilever lengths.

6.2.2.1 For maximum allowable spans under a total load of 50 psf, see **Table 6**.

6.2.2.2 For maximum allowable spans under a total load of 75 psf, see **Table 7**.

6.2.2.3 For maximum allowable spans under a total load of 100 psf, see **Table 8**.

6.2.2.4 For maximum allowable spans under a total load of 125 psf, see **Table 9**.

6.2.2.5 For maximum allowable spans under a total load of 150 psf, see **Table 10**.

6.2.2.6 For maximum allowable spans under a total load of 200 psf, see **Table 11**.

6.2.3 See **Figure 9** for definition of joist span, cantilever length, and box beam span.

6.2.4 Maximum allowable beam overhangs are provided in **Table 5**.

6.2.4.1 For Single Box Beams, a NCS Track shall be used as a web stiffener.

6.2.4.2 Double Box Beams do not require a web stiffener.

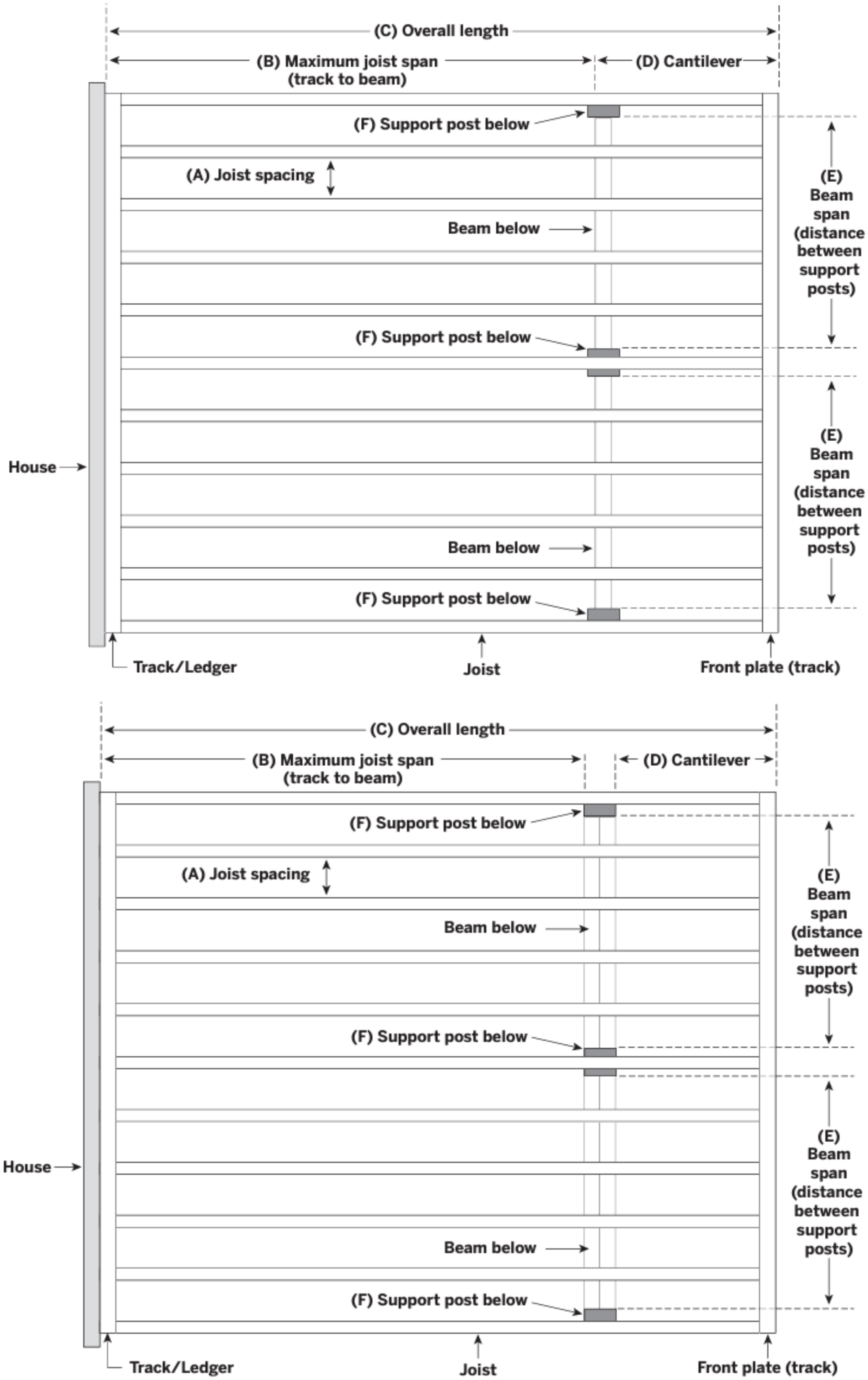

Figure 9. New Castle Steel Deck Frame – Single Box Beam (Top), Double Box Beam (Bottom)

Table 3. Maximum 1 5/8″ Joist Span and Cantilever Length (ft) for Various Total Loads (TL)[1,2,3]

Unfactored Total Load (psf)	1 5/8" (Single)				1 5/8" (Every Other Doubled)				1 5/8" (Doubled)			
	12" o.c. Joist Spacing		16" o.c. Joist Spacing		12" o.c. Joist Spacing		16" o.c. Joist Spacing		12" o.c. Joist Spacing		16" o.c. Joist Spacing	
	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length
50	15' 0"	4' 0"	13' 5"	4' 0"	17' 2"	6' 0"	15' 7"	5' 0"	18' 10"	6' 0"	17' 2"	6' 0"
75	14' 4"	4' 0"	12' 5"	4' 0"	17' 2"	5' 0"	15' 3"	4' 0"	18' 10"	6' 0"	17' 2"	5' 0"
100	12' 9"	4' 0"	11' 1"	3' 0"	15' 8"	4' 0"	13' 7"	3' 0"	17' 6"	5' 0"	15' 8"	4' 0"
125	11' 0"	3' 0"	9' 6"	2' 0"	13' 5"	3' 0"	11' 7"	3' 0"	15' 6"	4' 0"	13' 5"	4' 0"
150	9' 9"	2' 6"	8' 5"	1' 6"	11' 11"	3' 0"	10' 4"	3' 0"	13' 9"	4' 0"	11' 11"	4' 0"
200	8' 2"	1' 0"	7' 1"	0' 6"	10' 0"	3' 0"	8' 8"	2' 0"	11' 7"	4' 0"	10' 0"	3' 0"

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows:
   - 50 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 0 psf
   - 75 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 25 psf
   - 100 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 50 psf
   - 125 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 75 psf
   - 150 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 100 psf
   - 200 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 150 psf
2. Factored load combinations were determined as follows:
   - When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   - When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Deflection limits for joists are determined using IRC Section R505 - Live load deflection is limited to L/480, total deflection is limited to L/240, where L is the span length.

Table 4. Maximum 2″ Joist Span and Cantilever Length (ft) for Various Total Loads (TL)[1,2,3]

Unfactored Total Load (psf)	2" (Single)				2" (Every Other Doubled)				2" (Doubled)			
	12" o.c. Joist Spacing		16" o.c. Joist Spacing		12" o.c. Joist Spacing		16" o.c. Joist Spacing		12" o.c. Joist Spacing		16" o.c. Joist Spacing	
	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length	Joist Span	Cantilever Length
50	18' 3"	6' 0"	16' 7"	6' 0"	20' 10"	6' 0"	19' 0"	6' 0"	23' 0"	6' 0"	20' 10"	6' 0"
75	18' 3"	6' 0"	16' 7"	5' 0"	20' 10"	6' 0"	19' 0"	6' 0"	23' 0"	6' 0"	20' 10"	6' 0"
100	16' 11"	5' 0"	15' 5"	5' 0"	19' 4"	6' 0"	17' 7"	6' 0"	21' 4"	6' 0"	19' 4"	6' 0"
125	15' 9"	5' 0"	14' 3"	4' 0"	18' 0"	6' 0"	16' 4"	5' 0"	19' 10"	6' 0"	18' 0"	6' 0"
150	14' 9"	4' 0"	13' 5"	4' 0"	16' 11"	5' 0"	15' 5"	5' 0"	18' 8"	6' 0"	16' 11"	5' 0"
200	13' 5"	4' 0"	11' 11"	3' 0"	15' 5"	5' 0"	14' 0"	4' 0"	16' 11"	5' 0"	15' 5"	5' 0"

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows:
   - 50 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 0 psf
   - 75 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 25 psf
   - 100 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 50 psf
   - 125 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 75 psf
   - 150 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 100 psf
   - 200 psf: Dead Load (DL) = 10 psf, Live Load (LL) = 40 psf, Snow Load (SL) = 150 psf
2. Factored load combinations were determined as follows:
   - When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   - When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Deflection limits for joists are determined using IRC Section R505 - Live load deflection is limited to L/480, total deflection is limited to L/240, where L is the span length.

Table 5. Maximum Beam Cantilever Length (in) for Various Total Loads (TL)[1]

Unfactored Total Load (psf)	Single Box Beam		Double Box Beam
	Unstiffened	Stiffened	
50	5	32	47
75	1	31	45
100	-	24	43
125	-	16	37
150	-	11	28
200	-	7	20

SI: 1 in = 25.4 mm

1. Maximum Beam Cantilever Length shall not exceed 50% of the Beam Span.

Table 6. Maximum Allowable Spans for Single and Double Box Beam – 50 psf TL[1,2,3,4,5]

Single Box Beam

Cant. (ft)	Deck Span (ft) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	29' 8"	23' 7"	20' 7"	18' 8"	17' 4"	16' 4"	15' 6"	14' 10"	14' 3"	13' 9"	13' 4"	12' 11"	12' 7"	12' 3"	11' 10"	11' 5"	11' 1"	10' 10"	10' 6"	10' 3"	10' 0"	9' 9"	9' 7"
1/2	22' 8"	20' 3"	18' 7"	17' 3"	16' 3"	15' 6"	14' 10"	14' 3"	13' 9"	13' 4"	12' 11"	12' 7"	12' 3"	11' 10"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"	10' 0"	9' 9"	9' 7"	9' 4"
1		18' 0"	17' 0"	16' 1"	15' 4"	14' 9"	14' 2"	13' 8"	13' 3"	12' 11"	12' 7"	12' 2"	11' 9"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"	10' 0"	9' 9"	9' 7"	9' 4"	9' 2"
1 1/2			15' 8"	15' 1"	14' 7"	14' 1"	13' 7"	13' 3"	12' 10"	12' 6"	12' 2"	11' 9"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"	10' 0"	9' 9"	9' 6"	9' 4"	9' 2"	9' 0"
2				14' 3"	13' 10"	13' 6"	13' 1"	12' 9"	12' 5"	12' 1"	11' 8"	11' 4"	11' 0"	10' 9"	10' 5"	10' 2"	9' 11"	9' 9"	9' 6"	9' 4"	9' 2"	8' 11"	8' 9"
2 1/2					13' 3"	12' 11"	12' 8"	12' 4"	11' 11"	11' 7"	11' 3"	10' 11"	10' 8"	10' 5"	10' 2"	9' 11"	9' 8"	9' 6"	9' 3"	9' 1"	8' 11"	8' 9"	8' 7"
3						12' 5"	12' 1"	11' 9"	11' 5"	11' 2"	10' 10"	10' 7"	10' 4"	10' 1"	9' 10"	9' 8"	9' 5"	9' 3"	9' 1"	8' 11"	8' 9"	8' 7"	8' 5"
3 1/2							11' 6"	11' 3"	11' 0"	10' 9"	10' 6"	10' 3"	10' 0"	9' 10"	9' 7"	9' 5"	9' 3"	9' 1"	8' 11"	8' 9"	8' 7"	8' 5"	8' 4"
4								10' 10"	10' 7"	10' 4"	10' 2"	9' 11"	9' 9"	9' 6"	9' 4"	9' 2"	9' 0"	8' 10"	8' 8"	8' 6"	8' 5"	8' 3"	8' 2"
4 1/2									10' 2"	10' 0"	9' 10"	9' 7"	9' 5"	9' 3"	9' 1"	8' 11"	8' 9"	8' 8"	8' 6"	8' 4"	8' 3"	8' 1"	8' 0"
5										9' 8"	9' 6"	9' 4"	9' 2"	9' 0"	8' 10"	8' 9"	8' 7"	8' 5"	8' 4"	8' 2"	8' 1"	8' 0"	7' 10"
5 1/2											9' 3"	9' 1"	8' 11"	8' 10"	8' 8"	8' 6"	8' 5"	8' 3"	8' 2"	8' 0"	7' 11"	7' 10"	7' 9"
6												8' 10"	8' 8"	8' 7"	8' 5"	8' 4"	8' 3"	8' 1"	8' 0"	7' 11"	7' 9"	7' 8"	7' 7"

Double Box Beam

Cant. (ft)	Deck Span (ft) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	37' 5"	29' 8"	25' 11"	23' 7"	21' 10"	20' 7"	19' 6"	18' 8"	18' 0"	17' 4"	16' 10"	16' 4"	15' 11"	15' 6"	15' 2"	14' 10"	14' 6"	14' 3"	14' 0"	13' 9"	13' 6"	13' 4"	13' 2"
1/2	28' 6"	25' 7"	23' 5"	21' 9"	20' 6"	19' 6"	18' 8"	17' 11"	17' 4"	16' 9"	16' 4"	15' 11"	15' 6"	15' 2"	14' 10"	14' 6"	14' 3"	14' 0"	13' 9"	13' 6"	13' 4"	13' 1"	12' 11"
1		22' 8"	21' 5"	20' 3"	19' 4"	18' 7"	17' 10"	17' 3"	16' 9"	16' 3"	15' 10"	15' 6"	15' 1"	14' 10"	14' 6"	14' 3"	14' 0"	13' 9"	13' 6"	13' 4"	13' 1"	12' 11"	12' 9"
1 1/2			19' 9"	19' 0"	18' 4"	17' 9"	17' 2"	16' 8"	16' 2"	15' 10"	15' 5"	15' 1"	14' 9"	14' 6"	14' 2"	13' 11"	13' 9"	13' 6"	13' 4"	13' 1"	12' 11"	12' 9"	12' 7"
2				18' 0"	17' 5"	17' 0"	16' 6"	16' 1"	15' 8"	15' 4"	15' 0"	14' 9"	14' 5"	14' 2"	13' 11"	13' 8"	13' 6"	13' 3"	13' 1"	12' 11"	12' 9"	12' 7"	12' 5"
2 1/2					16' 8"	16' 4"	15' 11"	15' 7"	15' 3"	14' 11"	14' 8"	14' 5"	14' 1"	13' 11"	13' 8"	13' 5"	13' 3"	13' 1"	12' 11"	12' 9"	12' 7"	12' 4"	12' 2"
3						15' 8"	15' 5"	15' 1"	14' 10"	14' 7"	14' 4"	14' 1"	13' 10"	13' 7"	13' 5"	13' 3"	13' 0"	12' 10"	12' 8"	12' 6"	12' 4"	12' 2"	11' 11"
3 1/2							14' 11"	14' 8"	14' 5"	14' 2"	14' 0"	13' 9"	13' 7"	13' 4"	13' 2"	13' 0"	12' 10"	12' 8"	12' 6"	12' 4"	12' 1"	11' 11"	11' 8"
4								14' 3"	14' 1"	13' 10"	13' 8"	13' 6"	13' 3"	13' 1"	12' 11"	12' 9"	12' 7"	12' 5"	12' 3"	12' 1"	11' 10"	11' 8"	11' 6"
4 1/2									13' 8"	13' 6"	13' 4"	13' 2"	13' 0"	12' 10"	12' 8"	12' 7"	12' 5"	12' 2"	12' 0"	11' 10"	11' 7"	11' 5"	11' 3"
5										13' 3"	13' 1"	12' 11"	12' 9"	12' 8"	12' 6"	12' 4"	12' 1"	11' 11"	11' 9"	11' 7"	11' 5"	11' 3"	11' 1"
5 1/2											12' 10"	12' 8"	12' 7"	12' 5"	12' 3"	12' 0"	11' 10"	11' 8"	11' 6"	11' 4"	11' 2"	11' 0"	10' 11"
6												12' 5"	12' 3"	12' 1"	11' 11"	11' 9"	11' 7"	11' 5"	11' 3"	11' 2"	11' 0"	10' 10"	10' 8"

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=0 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

Table 7. Maximum Allowable Spans for Single and Double Box Beam – 75 psf TL[1,2,3,4,5]

Single Box Beam																							
Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	27' 7"	21' 10"	19' 1"	17' 4"	16' 1"	15' 2"	14' 5"	13' 9"	13' 3"	12' 9"	12' 4"	12' 0"	11' 8"	11' 4"	10' 11"	10' 7"	10' 4"	10' 0"	9' 9"	9' 6"	9' 3"	9' 1"	8' 10"
1/2	21' 0"	18' 10"	17' 3"	16' 0"	15' 1"	14' 4"	13' 9"	13' 2"	12' 9"	12' 4"	12' 0"	11' 8"	11' 4"	10' 11"	10' 7"	10' 3"	10' 0"	9' 9"	9' 6"	9' 3"	9' 1"	8' 10"	8' 8"
1		16' 8"	15' 9"	14' 11"	14' 3"	13' 8"	13' 2"	12' 9"	12' 4"	12' 0"	11' 8"	11' 4"	10' 11"	10' 7"	10' 3"	10' 0"	9' 9"	9' 6"	9' 3"	9' 1"	8' 10"	8' 8"	8' 6"
1 1/2			14' 7"	14' 0"	13' 6"	13' 1"	12' 8"	12' 3"	11' 11"	11' 8"	11' 3"	10' 11"	10' 7"	10' 3"	10' 0"	9' 8"	9' 6"	9' 3"	9' 0"	8' 10"	8' 8"	8' 6"	8' 4"
2				13' 3"	12' 10"	12' 6"	12' 2"	11' 10"	11' 7"	11' 2"	10' 10"	10' 6"	10' 2"	9' 11"	9' 8"	9' 5"	9' 3"	9' 0"	8' 10"	8' 8"	8' 6"	8' 4"	8' 2"
2 1/2					12' 3"	12' 0"	11' 9"	11' 5"	11' 1"	10' 9"	10' 5"	10' 2"	9' 11"	9' 8"	9' 5"	9' 2"	9' 0"	8' 9"	8' 7"	8' 5"	8' 3"	8' 2"	8' 0"
3						11' 7"	11' 3"	10' 11"	10' 7"	10' 4"	10' 1"	9' 10"	9' 7"	9' 4"	9' 2"	8' 11"	8' 9"	8' 7"	8' 5"	8' 3"	8' 1"	8' 0"	7' 10"
3 1/2							10' 8"	10' 5"	10' 2"	9' 11"	9' 9"	9' 6"	9' 3"	9' 1"	8' 11"	8' 9"	8' 6"	8' 5"	8' 3"	8' 1"	7' 11"	7' 10"	7' 8"
4								10' 0"	9' 10"	9' 7"	9' 5"	9' 2"	9' 0"	8' 10"	8' 8"	8' 6"	8' 4"	8' 2"	8' 1"	7' 11"	7' 9"	7' 8"	7' 7"
4 1/2									9' 5"	9' 3"	9' 1"	8' 11"	8' 9"	8' 7"	8' 5"	8' 3"	8' 2"	8' 0"	7' 11"	7' 9"	7' 8"	7' 6"	7' 5"
5										8' 11"	8' 10"	8' 8"	8' 6"	8' 4"	8' 3"	8' 1"	8' 0"	7' 10"	7' 9"	7' 7"	7' 6"	7' 5"	7' 3"
5 1/2										"	8' 6"	8' 5"	8' 3"	8' 2"	8' 0"	7' 11"	7' 9"	7' 8"	7' 7"	7' 5"	7' 4"	7' 3"	7' 2"
6												8' 2"	8' 1"	7' 11"	7' 10"	7' 9"	7' 7"	7' 6"	7' 5"	7' 4"	7' 2"	7' 1"	7' 0"
Double Box Beam																							
Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	34' 9"	27' 7"	24' 1"	21' 10"	20' 3"	19' 1"	18' 2"	17' 4"	16' 8"	16' 1"	15' 7"	15' 2"	14' 9"	14' 5"	14' 1"	13' 9"	13' 6"	13' 3"	13' 0"	12' 9"	12' 7"	12' 4"	12' 2"
1/2	26' 6"	23' 9"	21' 8"	20' 2"	19' 0"	18' 1"	17' 4"	16' 8"	16' 1"	15' 7"	15' 2"	14' 9"	14' 5"	14' 1"	13' 9"	13' 6"	13' 3"	13' 0"	12' 9"	12' 7"	12' 4"	12' 2"	12' 0"
1		21' 0"	19' 10"	18' 10"	18' 0"	17' 3"	16' 7"	16' 0"	15' 6"	15' 1"	14' 8"	14' 4"	14' 0"	13' 9"	13' 6"	13' 2"	13' 0"	12' 9"	12' 7"	12' 4"	12' 2"	12' 0"	11' 10"
1 1/2			18' 4"	17' 8"	17' 0"	16' 5"	15' 11"	15' 5"	15' 0"	14' 8"	14' 4"	14' 0"	13' 8"	13' 5"	13' 2"	12' 11"	12' 9"	12' 6"	12' 4"	12' 2"	12' 0"	11' 10"	11' 8"
2				16' 8"	16' 2"	15' 9"	15' 4"	14' 11"	14' 7"	14' 3"	13' 11"	13' 8"	13' 5"	13' 2"	12' 11"	12' 9"	12' 6"	12' 4"	12' 2"	12' 0"	11' 10"	11' 8"	11' 6"
2 1/2					15' 6"	15' 1"	14' 9"	14' 5"	14' 2"	13' 10"	13' 7"	13' 4"	13' 1"	12' 11"	12' 8"	12' 6"	12' 4"	12' 1"	11' 11"	11' 10"	11' 8"	11' 6"	11' 3"
3						14' 7"	14' 3"	14' 0"	13' 9"	13' 6"	13' 3"	13' 1"	12' 10"	12' 8"	12' 5"	12' 3"	12' 1"	11' 11"	11' 9"	11' 8"	11' 5"	11' 3"	11' 1"
3 1/2							13' 10"	13' 7"	13' 5"	13' 2"	13' 0"	12' 9"	12' 7"	12' 5"	12' 3"	12' 1"	11' 11"	11' 9"	11' 7"	11' 5"	11' 3"	11' 0"	10' 10"
4								13' 3"	13' 0"	12' 10"	12' 8"	12' 6"	12' 4"	12' 2"	12' 0"	11' 10"	11' 8"	11' 7"	11' 4"	11' 2"	11' 0"	10' 10"	10' 8"
4 1/2									12' 9"	12' 7"	12' 5"	12' 3"	12' 1"	11' 11"	11' 10"	11' 8"	11' 6"	11' 4"	11' 1"	10' 11"	10' 9"	10' 7"	10' 6"
5										12' 3"	12' 2"	12' 0"	11' 10"	11' 9"	11' 7"	11' 5"	11' 3"	11' 1"	10' 11"	10' 9"	10' 7"	10' 5"	10' 3"
5 1/2											11' 11"	11' 9"	11' 8"	11' 6"	11' 4"	11' 2"	11' 0"	10' 10"	10' 8"	10' 6"	10' 4"	10' 3"	10' 1"
6											"	11' 6"	11' 4"	11' 3"	11' 1"	10' 11"	10' 9"	10' 7"	10' 5"	10' 4"	10' 2"	10' 1"	9' 11"

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=25 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

Table 8. Maximum Allowable Spans for Single and Double Box Beam – 100 psf TL[1,2,3,4,5]

Single Box Beam

Cant. (ft)	Deck Span (ft) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	25' 0"	19' 10"	17' 4"	15' 9"	14' 7"	13' 9"	13' 1"	12' 6"	12' 0"	11' 7"	11' 3"	10' 11"	10' 6"	10' 1"	9' 9"	9' 5"	9' 2"	8' 11"	8' 8"	8' 5"	8' 3"		
½	19' 1"	17' 1"	15' 8"	14' 7"	13' 9"	13' 0"	12' 6"	12' 0"	11' 7"	11' 3"	10' 11"	10' 5"	10' 1"	9' 9"	9' 5"	9' 2"	8' 11"	8' 8"	8' 5"	8' 3"	8' 1"		
1		15' 2"	14' 4"	13' 7"	12' 11"	12' 5"	11' 11"	11' 7"	11' 2"	10' 10"	10' 5"	10' 1"	9' 9"	9' 5"	9' 2"	8' 11"	8' 8"	8' 5"	8' 3"	8' 0"	7' 10"		
1½			13' 3"	12' 9"	12' 3"	11' 10"	11' 6"	11' 2"	10' 9"	10' 5"	10' 0"	9' 8"	9' 5"	9' 1"	8' 10"	8' 8"	8' 5"	8' 3"	8' 0"	7' 10"	7' 8"		
2				12' 0"	11' 8"	11' 4"	11' 0"	10' 8"	10' 3"	9' 11"	9' 8"	9' 4"	9' 1"	8' 10"	8' 7"	8' 5"	8' 2"	8' 0"	7' 10"	7' 8"	7' 6"		
2½					11' 2"	10' 10"	10' 6"	10' 2"	9' 10"	9' 7"	9' 3"	9' 0"	8' 9"	8' 7"	8' 4"	8' 2"	8' 0"	7' 10"	7' 8"	7' 6"	7' 4"		
3						10' 3"	10' 0"	9' 8"	9' 5"	9' 2"	8' 11"	8' 9"	8' 6"	8' 4"	8' 1"	7' 11"	7' 9"	7' 8"	7' 6"	7' 4"	7' 2"		
3½							9' 6"	9' 3"	9' 1"	8' 10"	8' 8"	8' 5"	8' 3"	8' 1"	7' 11"	7' 9"	7' 7"	7' 5"	7' 4"	7' 2"	7' 1"		
4								8' 11"	8' 9"	8' 6"	8' 4"	8' 2"	8' 0"	7' 10"	7' 8"	7' 7"	7' 5"	7' 3"	7' 2"	7' 0"	6' 11"		
4½									8' 5"	8' 3"	8' 1"	7' 11"	7' 9"	7' 8"	7' 6"	7' 4"	7' 3"	7' 1"	7' 0"	6' 11"	6' 9"		
5										8' 0"	7' 10"	7' 8"	7' 7"	7' 5"	7' 4"	7' 2"	7' 1"	7' 0"	6' 10"	6' 9"	6' 8"		
5½											7' 7"	7' 6"	7' 4"	7' 3"	7' 2"	7' 0"	6' 11"	6' 10"	6' 9"	6' 7"	6' 6"		
6												7' 3"	7' 2"	7' 1"	7' 0"	6' 10"	6' 9"	6' 8"	6' 7"	6' 6"	6' 5"		

Double Box Beam

Cant. (ft)	Deck Span (ft) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	31' 7"	25' 0"	21' 10"	19' 10"	18' 5"	17' 4"	16' 6"	15' 9"	15' 2"	14' 7"	14' 2"	13' 9"	13' 5"	13' 1"	12' 9"	12' 6"	12' 3"	12' 0"	11' 10"	11' 7"	11' 5"		
½	24' 1"	21' 7"	19' 9"	18' 4"	17' 3"	16' 5"	15' 9"	15' 1"	14' 7"	14' 2"	13' 9"	13' 5"	13' 1"	12' 9"	12' 6"	12' 3"	12' 0"	11' 9"	11' 7"	11' 5"	11' 3"		
1		19' 1"	18' 0"	17' 1"	16' 4"	15' 8"	15' 1"	14' 7"	14' 1"	13' 9"	13' 4"	13' 0"	12' 9"	12' 6"	12' 3"	12' 0"	11' 9"	11' 7"	11' 5"	11' 3"	11' 1"		
1½			16' 8"	16' 1"	15' 6"	14' 11"	14' 6"	14' 0"	13' 8"	13' 4"	13' 0"	12' 9"	12' 5"	12' 2"	12' 0"	11' 9"	11' 7"	11' 5"	11' 3"	11' 1"	10' 10"		
2				15' 2"	14' 9"	14' 4"	13' 11"	13' 7"	13' 3"	12' 11"	12' 8"	12' 5"	12' 2"	11' 11"	11' 9"	11' 7"	11' 4"	11' 2"	11' 0"	10' 10"	10' 7"		
2½					14' 1"	13' 9"	13' 5"	13' 2"	12' 10"	12' 7"	12' 4"	12' 1"	11' 11"	11' 8"	11' 6"	11' 4"	11' 2"	11' 0"	10' 10"	10' 7"	10' 5"		
3						13' 3"	13' 0"	12' 9"	12' 6"	12' 3"	12' 1"	11' 10"	11' 8"	11' 6"	11' 4"	11' 2"	11' 0"	10' 9"	10' 7"	10' 4"	10' 2"		
3½							12' 7"	12' 4"	12' 2"	12' 0"	11' 9"	11' 7"	11' 5"	11' 3"	11' 1"	10' 11"	10' 9"	10' 6"	10' 4"	10' 2"	10' 0"		
4								12' 0"	11' 10"	11' 8"	11' 6"	11' 4"	11' 2"	11' 0"	10' 10"	10' 8"	10' 6"	10' 3"	10' 1"	9' 11"	9' 9"		
4½									11' 7"	11' 5"	11' 3"	11' 1"	11' 0"	10' 9"	10' 7"	10' 5"	10' 3"	10' 1"	9' 11"	9' 9"	9' 7"		
5										11' 2"	11' 0"	10' 10"	10' 8"	10' 6"	10' 4"	10' 2"	10' 0"	9' 10"	9' 8"	9' 6"	9' 5"		
5½											10' 9"	10' 7"	10' 5"	10' 3"	10' 1"	9' 11"	9' 9"	9' 8"	9' 6"	9' 4"	9' 3"		
6												10' 3"	10' 1"	10' 0"	9' 10"	9' 8"	9' 7"	9' 5"	9' 4"	9' 2"	9' 1"		

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=50 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

Table 9. Maximum Allowable Spans for Single and Double Box Beam – 125 psf TL[1,2,3,4,5]

Single Box Beam

Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	23' 3"	18' 5"	16' 1"	14' 7"	13' 7"	12' 9"	12' 1"	11' 5"	10' 10"	10' 3"	9' 9"	9' 4"	9' 0"	8' 8"	8' 4"	8' 1"	7' 10"	7' 8"	7' 5"	7' 3"			
1/2	17' 9"	15' 11"	14' 6"	13' 6"	12' 9"	12' 1"	11' 5"	10' 9"	10' 3"	9' 9"	9' 4"	9' 0"	8' 8"	8' 4"	8' 1"	7' 10"	7' 8"	7' 5"	7' 3"	7' 1"			
1		14' 1"	13' 3"	12' 7"	12' 0"	11' 4"	10' 9"	10' 2"	9' 9"	9' 4"	8' 11"	8' 8"	8' 4"	8' 1"	7' 10"	7' 7"	7' 5"	7' 3"	7' 1"	6' 11"			
1 1/2			12' 3"	11' 9"	11' 2"	10' 7"	10' 1"	9' 8"	9' 3"	8' 11"	8' 7"	8' 4"	8' 1"	7' 10"	7' 7"	7' 5"	7' 3"	7' 1"	6' 11"	6' 9"			
2				10' 10"	10' 4"	9' 11"	9' 6"	9' 2"	8' 10"	8' 6"	8' 3"	8' 0"	7' 9"	7' 7"	7' 5"	7' 2"	7' 0"	6' 10"	6' 9"	6' 7"			
2 1/2					9' 8"	9' 4"	9' 0"	8' 9"	8' 5"	8' 2"	8' 0"	7' 9"	7' 6"	7' 4"	7' 2"	7' 0"	6' 10"	6' 8"	6' 7"	6' 5"			
3						8' 10"	8' 7"	8' 4"	8' 1"	7' 11"	7' 8"	7' 6"	7' 4"	7' 2"	7' 0"	6' 10"	6' 8"	6' 7"	6' 5"	6' 4"			
3 1/2							8' 2"	8' 0"	7' 9"	7' 7"	7' 5"	7' 3"	7' 1"	6' 11"	6' 9"	6' 8"	6' 6"	6' 5"	6' 3"	6' 2"			
4								7' 8"	7' 6"	7' 4"	7' 2"	7' 0"	6' 10"	6' 9"	6' 7"	6' 6"	6' 4"	6' 3"	6' 2"	6' 0"			
4 1/2									7' 2"	7' 1"	6' 11"	6' 10"	6' 8"	6' 7"	6' 5"	6' 4"	6' 3"	6' 1"	6' 0"	5' 11"			
5										6' 10"	6' 9"	6' 7"	6' 6"	6' 5"	6' 3"	6' 2"	6' 1"	6' 0"	5' 11"	5' 10"			
5 1/2											6' 6"	6' 5"	6' 4"	6' 3"	6' 1"	6' 0"	5' 11"	5' 10"	5' 9"	5' 8"			
6												6' 3"	6' 2"	6' 1"	6' 0"	5' 11"	5' 10"	5' 9"	5' 8"	5' 7"			

Double Box Beam

Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	29' 3"	23' 3"	20' 3"	18' 5"	17' 1"	16' 1"	15' 3"	14' 7"	14' 1"	13' 7"	13' 2"	12' 9"	12' 5"	12' 1"	11' 10"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"			
1/2	22' 4"	20' 0"	18' 4"	17' 0"	16' 1"	15' 3"	14' 7"	14' 0"	13' 7"	13' 2"	12' 9"	12' 5"	12' 1"	11' 10"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"	10' 0"			
1		17' 9"	16' 9"	15' 11"	15' 2"	14' 6"	14' 0"	13' 6"	13' 1"	12' 9"	12' 5"	12' 1"	11' 9"	11' 5"	11' 1"	10' 9"	10' 6"	10' 3"	10' 0"	9' 9"			
1 1/2			15' 6"	14' 11"	14' 4"	13' 10"	13' 5"	13' 0"	12' 8"	12' 4"	12' 1"	11' 9"	11' 4"	11' 1"	10' 9"	10' 6"	10' 2"	10' 0"	9' 9"	9' 6"			
2				14' 1"	13' 8"	13' 3"	12' 11"	12' 7"	12' 3"	12' 0"	11' 8"	11' 4"	11' 0"	10' 8"	10' 5"	10' 2"	9' 11"	9' 9"	9' 6"	9' 4"			
2 1/2					13' 1"	12' 9"	12' 6"	12' 2"	11' 11"	11' 7"	11' 3"	10' 11"	10' 8"	10' 5"	10' 2"	9' 11"	9' 8"	9' 6"	9' 3"	9' 1"			
3						12' 3"	12' 1"	11' 9"	11' 5"	11' 2"	10' 10"	10' 7"	10' 4"	10' 1"	9' 10"	9' 8"	9' 5"	9' 3"	9' 1"	8' 11"			
3 1/2							11' 6"	11' 3"	11' 0"	10' 9"	10' 6"	10' 3"	10' 0"	9' 9"	9' 7"	9' 5"	9' 3"	9' 0"	8' 10"	8' 9"			
4								10' 9"	10' 7"	10' 4"	10' 1"	9' 11"	9' 9"	9' 6"	9' 4"	9' 2"	9' 0"	8' 10"	8' 8"	8' 6"			
4 1/2									10' 2"	10' 0"	9' 10"	9' 7"	9' 5"	9' 3"	9' 1"	8' 11"	8' 9"	8' 8"	8' 6"	8' 4"			
5										9' 8"	9' 6"	9' 4"	9' 2"	9' 0"	8' 10"	8' 9"	8' 7"	8' 5"	8' 4"	8' 2"			
5 1/2											9' 2"	9' 1"	8' 11"	8' 9"	8' 8"	8' 6"	8' 5"	8' 3"	8' 2"	8' 0"			
6												8' 10"	8' 8"	8' 7"	8' 5"	8' 4"	8' 3"	8' 1"	8' 0"	7' 11"			

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=75 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

Table 10. Maximum Allowable Spans for Single and Double Box Beam – 150 psf TL[1,2,3,4,5]

Single Box Beam

Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	21' 10"	17' 4"	15' 2"	13' 9"	12' 9"	11' 9"	10' 11"	10' 2"	9' 7"	9' 1"	8' 8"	8' 4"	8' 0"	7' 8"	7' 5"	7' 2"	7' 0"	6' 10"	6' 7"				
1/2	16' 8"	14' 11"	13' 8"	12' 9"	11' 8"	10' 10"	10' 2"	9' 7"	9' 1"	8' 8"	8' 4"	8' 0"	7' 8"	7' 5"	7' 2"	7' 0"	6' 10"	6' 7"	6' 5"				
1		13' 3"	12' 6"	11' 6"	10' 9"	10' 1"	9' 6"	9' 1"	8' 8"	8' 3"	8' 0"	7' 8"	7' 5"	7' 2"	7' 0"	6' 9"	6' 7"	6' 5"	6' 3"				
1 1/2			11' 1"	10' 6"	9' 11"	9' 5"	9' 0"	8' 7"	8' 3"	7' 11"	7' 8"	7' 5"	7' 2"	7' 0"	6' 9"	6' 7"	6' 5"	6' 3"	6' 2"				
2				9' 7"	9' 3"	8' 10"	8' 6"	8' 2"	7' 10"	7' 7"	7' 4"	7' 2"	6' 11"	6' 9"	6' 7"	6' 5"	6' 3"	6' 1"	6' 0"				
2 1/2					8' 7"	8' 4"	8' 0"	7' 9"	7' 6"	7' 4"	7' 1"	6' 11"	6' 8"	6' 6"	6' 5"	6' 3"	6' 1"	6' 0"	5' 10"				
3						7' 10"	7' 8"	7' 5"	7' 2"	7' 0"	6' 10"	6' 8"	6' 6"	6' 4"	6' 2"	6' 1"	5' 11"	5' 10"	5' 8"				
3 1/2							7' 3"	7' 1"	6' 11"	6' 9"	6' 7"	6' 5"	6' 4"	6' 2"	6' 0"	5' 11"	5' 10"	5' 8"	5' 7"				
4								6' 10"	6' 8"	6' 6"	6' 4"	6' 3"	6' 1"	6' 0"	5' 10"	5' 9"	5' 8"	5' 7"	5' 6"				
4 1/2									6' 5"	6' 3"	6' 2"	6' 1"	5' 11"	5' 10"	5' 9"	5' 7"	5' 6"	5' 5"	5' 4"				
5										6' 1"	6' 0"	5' 10"	5' 9"	5' 8"	5' 7"	5' 6"	5' 5"	5' 4"	5' 3"				
5 1/2											5' 9"	5' 8"	5' 7"	5' 6"	5' 5"	5' 4"	5' 3"	5' 2"	5' 1"				
6												5' 7"	5' 6"	5' 5"	5' 4"	5' 3"	5' 2"	5' 1"	5' 0"				

Double Box Beam

Cant. (ft)	Deck Span (ft)																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	27' 7"	21' 10"	19' 1"	17' 4"	16' 1"	15' 2"	14' 5"	13' 9"	13' 3"	12' 9"	12' 3"	11' 9"	11' 3"	10' 11"	10' 6"	10' 2"	9' 11"	9' 7"	9' 4"				
1/2	21' 0"	18' 10"	17' 3"	16' 0"	15' 1"	14' 4"	13' 9"	13' 2"	12' 9"	12' 3"	11' 9"	11' 3"	10' 10"	10' 6"	10' 2"	9' 10"	9' 7"	9' 4"	9' 1"				
1		16' 8"	15' 9"	14' 11"	14' 3"	13' 8"	13' 2"	12' 9"	12' 2"	11' 8"	11' 3"	10' 10"	10' 6"	10' 2"	9' 10"	9' 7"	9' 4"	9' 1"	8' 11"				
1 1/2			14' 7"	14' 0"	13' 6"	13' 1"	12' 8"	12' 1"	11' 7"	11' 2"	10' 10"	10' 5"	10' 2"	9' 10"	9' 7"	9' 4"	9' 1"	8' 10"	8' 8"				
2				13' 3"	12' 10"	12' 5"	11' 11"	11' 6"	11' 1"	10' 9"	10' 5"	10' 1"	9' 9"	9' 6"	9' 3"	9' 1"	8' 10"	8' 8"	8' 6"				
2 1/2					12' 1"	11' 9"	11' 4"	11' 0"	10' 7"	10' 4"	10' 0"	9' 9"	9' 6"	9' 3"	9' 0"	8' 10"	8' 7"	8' 5"	8' 3"				
3						11' 1"	10' 9"	10' 6"	10' 2"	9' 11"	9' 8"	9' 5"	9' 2"	9' 0"	8' 9"	8' 7"	8' 5"	8' 3"	8' 1"				
3 1/2							10' 3"	10' 0"	9' 9"	9' 7"	9' 4"	9' 1"	8' 11"	8' 9"	8' 6"	8' 4"	8' 2"	8' 1"	7' 11"				
4								9' 7"	9' 5"	9' 2"	9' 0"	8' 10"	8' 8"	8' 6"	8' 4"	8' 2"	8' 0"	7' 10"	7' 9"				
4 1/2									9' 1"	8' 11"	8' 9"	8' 7"	8' 5"	8' 3"	8' 1"	7' 11"	7' 10"	7' 8"	7' 7"				
5									"	8' 7"	8' 5"	8' 4"	8' 2"	8' 0"	7' 11"	7' 9"	7' 8"	7' 6"	7' 5"				
5 1/2											8' 2"	8' 1"	7' 11"	7' 10"	7' 8"	7' 7"	7' 6"	7' 4"	7' 3"				
6												7' 10"	7' 9"	7' 7"	7' 6"	7' 5"	7' 4"	7' 2"	7' 1"				

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=100 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

Table 11. Maximum Allowable Spans for Single and Double Box Beam – 200 psf TL[1,2,3,4,5]

Single Box Beam																							
Cant. (ft)	**Deck Span (ft)**																						
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
0	19' 10"	15' 9"	13' 9"	12' 1"	10' 10"	9' 11"	9' 2"	8' 7"	8' 1"	7' 8"	7' 4"	7' 0"	6' 9"	6' 6"	6' 3"	6' 1"	5' 10"						
1/2	15' 2"	13' 7"	12' 0"	10' 9"	9' 10"	9' 2"	8' 7"	8' 1"	7' 8"	7' 4"	7' 0"	6' 9"	6' 6"	6' 3"	6' 1"	5' 10"	5' 8"						
1		11' 5"	10' 6"	9' 8"	9' 0"	8' 6"	8' 0"	7' 7"	7' 3"	7' 0"	6' 8"	6' 5"	6' 3"	6' 0"	5' 10"	5' 8"	5' 7"						
1 1/2			9' 4"	8' 10"	8' 4"	7' 11"	7' 6"	7' 3"	6' 11"	6' 8"	6' 5"	6' 3"	6' 0"	5' 10"	5' 8"	5' 6"	5' 5"						
2				8' 1"	7' 9"	7' 5"	7' 1"	6' 10"	6' 7"	6' 5"	6' 2"	6' 0"	5' 10"	5' 8"	5' 6"	5' 5"	5' 3"						
2 1/2					7' 3"	7' 0"	6' 9"	6' 6"	6' 4"	6' 2"	5' 11"	5' 9"	5' 8"	5' 6"	5' 4"	5' 3"	5' 1"						
3						6' 7"	6' 5"	6' 3"	6' 1"	5' 11"	5' 9"	5' 7"	5' 5"	5' 4"	5' 2"	5' 1"	5' 0"						
3 1/2							6' 1"	5' 11"	5' 10"	5' 8"	5' 6"	5' 5"	5' 3"	5' 2"	5' 1"	5' 0"	4' 10"						
4								5' 8"	5' 7"	5' 6"	5' 4"	5' 3"	5' 2"	5' 0"	4' 11"	4' 10"	4' 9"						
4 1/2									5' 5"	5' 3"	5' 2"	5' 1"	5' 0"	4' 11"	4' 10"	4' 9"	4' 8"						
5										5' 1"	5' 0"	4' 11"	4' 10"	4' 9"	4' 8"	4' 7"	4' 6"						
5 1/2																							
6																							

Double Box Beam																							
Cant. (ft)	**Deck Span (ft)**																						
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
0	25' 0"	19' 10"	17' 4"	15' 9"	14' 7"	13' 9"	12' 11"	12' 1"	11' 5"	10' 10"	10' 4"	9' 11"	9' 6"	9' 2"	8' 10"	8' 7"	8' 4"						
1/2	19' 1"	17' 1"	15' 8"	14' 7"	13' 9"	12' 10"	12' 1"	11' 5"	10' 10"	10' 4"	9' 10"	9' 6"	9' 2"	8' 10"	8' 7"	8' 4"	8' 1"						
1		15' 2"	14' 4"	13' 7"	12' 9"	11' 11"	11' 4"	10' 9"	10' 3"	9' 10"	9' 6"	9' 1"	8' 10"	8' 6"	8' 3"	8' 1"	7' 10"						
1 1/2			13' 2"	12' 5"	11' 9"	11' 2"	10' 8"	10' 2"	9' 9"	9' 5"	9' 1"	8' 9"	8' 6"	8' 3"	8' 0"	7' 10"	7' 8"						
2				11' 5"	10' 11"	10' 6"	10' 1"	9' 8"	9' 4"	9' 0"	8' 9"	8' 6"	8' 3"	8' 0"	7' 10"	7' 7"	7' 5"						
2 1/2					10' 2"	9' 10"	9' 6"	9' 3"	8' 11"	8' 8"	8' 5"	8' 2"	8' 0"	7' 9"	7' 7"	7' 5"	7' 3"						
3						9' 4"	9' 1"	8' 10"	8' 7"	8' 4"	8' 1"	7' 11"	7' 9"	7' 6"	7' 4"	7' 3"	7' 1"						
3 1/2							8' 8"	8' 5"	8' 3"	8' 0"	7' 10"	7' 8"	7' 6"	7' 4"	7' 2"	7' 0"	6' 11"						
4								8' 1"	7' 11"	7' 9"	7' 7"	7' 5"	7' 3"	7' 1"	7' 0"	6' 10"	6' 9"						
4 1/2									7' 7"	7' 6"	7' 4"	7' 2"	7' 1"	6' 11"	6' 10"	6' 8"	6' 7"						
5										7' 3"	7' 1"	7' 0"	6' 10"	6' 9"	6' 8"	6' 6"	6' 5"						
5 1/2																							
6																							

SI 1 psf = 0.0479 kPa, 1 ft = 0.305 m, 1 in = 25.4 mm

1. Loads used to produce the tables above are as follows: DL=10 psf, LL=40 psf, SL=150 psf. Live load deflection is limited to L/360, total deflection is limited to L/240, where L is the span length.
2. Factored load combinations were determined as follows:
   When LL < SL, the factored total load is 1.2DL + 1.6SL + 0.5 LL
   When LL > SL, the factored total load is 1.2DL + 1.6LL + 0.5 SL
3. Grey areas in tables indicate instances where the joists backspan is less than twice the cantilever distance or where the maximum joist span is exceeded.
4. If a box beam is supported by more than two posts, then its span selected above should be multiplied by 0.85 for a single box beam and 0.90 for a double box beam.
5. If a box beam is provided as an intermediate joist support, then its span selected above or modified by Note 4 should be multiplied by 0.60 for a "dropped" box beam and 0.70 for a "flush" box beam.

6.3 *Ledger Connection*

6.3.1 The Track component of the New Castle Steel Deck Framing System may be used as the deck ledger to the band joist of a building in accordance with IBC Section 1604.8.3 and when designed as specified in IRC Section R507.1 and IRC Section R301.1.3.

6.3.1.1 **Table 12** and **Table 13** provide the spacing required to provide performance at least equivalent to the lag screws found in IRC Table R507.9.1.3(1) in accordance with IBC Section 104.11, IBC Section 1604.8.3, IRC Section R104.11, and IRC Section R507.1, and in accordance with generally accepted engineering practice.

Table 12. Fastener Spacings (in.) for Ledger Connection – 2-Screw Attachment

Fastener	Unfactored Total Loads (psf)	Ledger [7]	Band Joist Material[3,8]	Maximum Deck Joist Spans[1,2,4,5,6]								
				Up to 6'	Up to 8'	Up to 10'	Up to 12'	Up to 14'	Up to 16'	Up to 18'	Up to 20'	Up to 22'
Simpson Strong Tie SDS25200	50	NCS Track, 1 1/4" x 8"	Sawn Lumber (SG = 0.55)	24	24	22	18	16	14	12	11	10
	75			24	18	14	12	10	9	8	7	6
	100			18	14	11	9	8	7	6	5	5
	125			14	11	8	7	6	5	4	4	4
	150			12	9	7	6	5	4	4	3	3
	200			9	7	5	4	4	3	3	2	2

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Based on load duration, C_D, of 1.15 for snow load conditions. Wet service factor, C_M, of 0.7 has been applied as well. Spacing may be adjusted by the applicable load duration for other conditions as specified in the NDS.
2. Fasteners are required to have full thread penetration into the main member. Minimum fastener length to be used is 2".
3. Solid sawn band joists shall be SP (Specific gravity of 0.55).
4. Fastener spacing is based on published design values from approved agencies.
5. Fasteners shall installed as detailed in **Section 9**.
6. A maximum 1/2" structural sheathing may be installed between the ledger and the band joist.
7. See **Table 1** for specifications.
8. Solid sawn band joist shall be of sufficient depth to accommodate the fastener spacing detailed in **Section 9**.

Table 13. Fastener Spacings (in.) for Ledger Connection – 3-Screw Attachment

Fastener	Unfactored Total Loads (psf)	Ledger [7]	Band Joist Material[3,8]	Maximum Deck Joist Spans[1,2,4,5,6]								
				Up to 6'	Up to 8'	Up to 10'	Up to 12'	Up to 14'	Up to 16'	Up to 18'	Up to 20'	Up to 22'
Simpson Strong Tie SDS25200	50	NCS Track, $1^1/_4$" x 8"	Sawn Lumber (SG = 0.55)	24	24	24	24	24	21	18	16	15
	75			24	24	22	18	16	14	12	11	10
	100			24	21	16	14	12	10	9	8	7
	125			22	16	13	11	9	8	7	6	6
	150			18	14	11	9	8	7	6	5	5
	200			14	10	8	7	6	5	4	4	3

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

9. Based on load duration, C_D, of 1.15 for snow load conditions. Wet service factor, C_M, of 0.7 has been applied as well. Spacing may be adjusted by the applicable load duration for other conditions as specified in the NDS.
10. Fasteners are required to have full thread penetration into the main member. Minimum fastener length to be used is 2".
11. Solid sawn band joists shall be SP (Specific gravity of 0.55).
12. Fastener spacing is based on published design values from approved agencies.
13. Fasteners shall installed as detailed in **Section 9**.
14. A maximum $^1/_2$" structural sheathing may be installed between the ledger and the band joist.
15. See **Table 1** for specifications.
16. Solid sawn band joist shall be of sufficient depth to accommodate the fastener spacing detailed in **Section 9**.

6.4 *New Castle Steel Post (NCS Post)*

6.4.1 New Castle Steel Posts were evaluated under compressive loads in accordance with AISI S100 Section E2.

6.4.1.1 Allowable compressive loads at various heights are provided in **Table 14**.

Table 14. Allowable Compressive Loads (lb) for NCS Posts

Component	NCS Post Height (ft)							
	8	9	10	11	12	13	14	15
NCS Post	76,500	75,500	74,000	72,500	71,000	69,000	67,500	65,500

SI 1 ft = 0.305 m, 1 lb = 4.448 N

6.4.2 New Castle Steel Posts were evaluated under compressive loads in accordance with AISI S100 Section F3.2.

6.4.2.1 Allowable lateral loads at various heights are provided in **Table 15**.

Table 15. Allowable Lateral Loads (lb) for NCS Posts

Component	NCS Post Height (ft)							
	8	9	10	11	12	13	14	15
NCS Post	1,505	1,340	1,205	1,095	1,005	925	860	805
SI 1 ft = 0.305 m, 1 lb = 4.448 N								

6.5 *NCS Deck Framing System - Lateral Performance*

6.5.1 New Castle Steel Deck Framing System has sufficient lateral strength to resist wind events and dynamic lateral live loads from occupants over the range of deck dimensions in the span tables shown in **Section 6.2**.

6.5.2 Lateral pushover response of New Castle Steel Deck Framing System with gravity loads present on deck was analyzed with accepted engineering principles with the fundamental performance properties calculated in accordance with AISI S100.

6.5.2.1 Analysis considered a two post deck with, the maximum joist span and maximum joist cantilever, maximum beam span with no cantilever, and both single and double box beam. See **Table 16** for deck dimensions.

Table 16. NCS Deck Dimensions used in Lateral Performance Analysis

Deck Load (psf)	Single Box Beam Deck Dimensions			Double Box Beam Deck Dimensions		
	Deck Width (ft)	Deck Length (ft)	Joist Cantilever (ft)	Deck Width (ft)	Deck Length (ft)	Joist Cantilever (ft)
50	10.17	22	6	13.33	22	6
75	9.42	22	6	12.42	22	6
100	8.58	21	6	11.25	22	6
125	7.75	19	6	10.92	19	6
150	7.08	18	6	10.00	18	6
200	6.33	16	6	8.92	16	5
SI 1 ft = 0.305 m, 1 psf = 0.0479 kPa						

6.5.2.2 See **Table 17** and **Table 18** for the maximum lateral load applied to the above New Castle Steel Deck Framing System.

Table 17. Single Box Beam NCS Deck System Lateral Performance[1]

Deck Height	Total Load (Gravity) on NCS Deck (psf)											
	50		75		100		125		150		200	
	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)
6	658	0.31	498	0.23	502	0.22	629	0.26	717	0.29	766	0.29
8	544	0.56	442	0.45	454	0.45	542	0.52	571	0.53	602	0.54
10	463	0.89	392	0.75	404	0.77	470	0.87	471	0.85	489	0.85
12	402	1.32	349	1.16	358	1.19	403	1.30	397	1.27	407	1.27

SI: 1 in = 25.4 mm, 1 ft = 0.305 m, 1 psf = 0.0479 kPa, 1 lb = 4.448 N

1. Values in table based on nominal strengths to approximate the failure lateral load.

Table 18. Double Box Beam NCS Deck System Lateral Performance[1]

Deck Height	Total Load (Gravity) on NCS Deck (psf)											
	50		75		100		125		150		200	
	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)	Max Load per Post (lb)	Deck Defl. (in)
6	858	0.30	755	0.26	788	0.27	907	0.30	1003	0.32	1138	0.36
8	700	0.56	642	0.52	670	0.53	748	0.58	815	0.63	903	0.68
10	590	0.93	553	0.88	573	0.90	630	0.98	676	1.04	738	1.12
12	506	1.38	477	1.32	492	1.38	534	1.49	568	1.58	613	1.68

SI: 1 in = 25.4 mm, 1 ft = 0.305 m, 1 psf = 0.0479 kPa, 1 lb = 4.448 N

1. Values in table based on nominal strengths to approximate the failure lateral load.

6.5.3 Lateral force generated by occupants varies depending on the natural frequency of the deck and the swaying frequency of the occupants.

6.5.3.1 Occupant frequency (i.e. from dancing at parties) ranges from 1 to 3 Hz.[21]

6.5.3.2 If occupant-induced frequency is close to the structure's natural frequency, lateral forces generated may be in the range of 3% to 7% of the occupant weight.[22]

6.5.3.3 Approximated natural frequency NCS Deck System and maximum dynamic lateral live load is provided in **Table 19**.

Table 19. Single Box Beam NCS Deck System Dynamic Lateral Performance[1]

Deck Height	Total Load (Gravity) on NCS Deck (psf)											
	50		75		100		125		150		200	
	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)	Nat. Freq., ω_n (Hz)	Max. Lateral Force (lb)
6	2.3	67	2.0	258	1.8	183	1.8	187	1.8	187	1.8	207
8	1.5	48	1.3	49	1.2	53	1.2	55	1.2	57	1.2	59
10	1.1	30	1.0	37	0.9	41	0.9	43	0.9	45	0.9	46
12	0.9	25	0.7	33	0.7	37	0.7	39	0.6	41	0.6	42

SI: 1 in = 25.4 mm, 1 ft = 0.305 m, 1 psf = 0.0479 kPa, 1 lb = 4.448 N

1. Values in table based on nominal strengths to approximate the failure lateral load.

6.6 Rail post connection using NCS Railing Post Base plate installed onto structural plastic blocking is capable of resisting a 500 lb force applied to the top of the rail post.

6.6.1 Rail post height shall be 36″ in height maximum.

6.6.2 For use in accordance with IBC, maximum post spacing shall be limited to 6′ o.c.

6.6.2.1 Exception: in Group 1-3, F, H, and S occupancies, for areas that are not accessible to the general public and that have an occupant load less than 50, maximum post spacing shall be limited to 8′ o.c.

6.6.3 For use in IRC (one- and two-family dwellings), maximum post spacing shall be limited to 8′ o.c.

6.7 NCS Stringers (and NCS Stair Straps) are sufficient to carry 40 psf live load per stair run at 12″ o.c. spacing.

6.8 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science and fire science.

7 Certified Performance[23]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[24]

7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.[25]

8 Regulatory Evaluation and Accepted Engineering Practice

8.1 New Castle Steel Deck Framing System complies with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Design capacities for the New Castle Steel Deck Framing System, joist and box beams, were determined in accordance with AISI S100 as specified in IBC Section 2210.1.

8.1.2 Maximum spans were calculated in accordance with accepted engineering practices.

8.2 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP/approved sources. DrJ is qualified[26] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.

8.3 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which are also its areas of professional engineering competence.

8.4 Any regulation specific issues not addressed in this section are outside the scope of this report.

9 Installation

9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report and the applicable building code.

9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.

9.3 *Installation Procedure*

9.3.1 Approved New Castle Steel Deck Framing System fasteners:

9.3.1.1 **Note**: any fasteners with performance equivalent (or better) to the fasteners specified herein may be permitted.

9.3.1.2 Decking to metal fasteners shall be evaluated for wind uplift capacity.

9.3.1.2.1 Contact fastener manufacturer for more information.

9.3.1.3 *Metal-to-Metal Attachment*:

9.3.1.3.1 Simspon Strong-Tie XEQ34B1016

9.3.1.3.2 ITW Buildex Teks Select™ P/N 1076000 (#10-#16 x 3/4″ HWH Teks 3)

9.3.1.4 *Decking-to-Metal Attachment*:

9.3.1.4.1 *Face Attachment*:

9.3.1.4.1.1 FastenMaster® Cortex Driller™

9.3.1.4.1.2 DeckFast® Metal 410 SS with Epoxy Coating

9.3.1.4.1.3 Simpson Strong-Tie Quik Drive DCSD238 (xxxx)

9.3.1.4.1.3.1 (xxxx) denotes color of product

9.3.1.4.2 *Hidden Fasteners*:

9.3.1.4.2.1 Trex Elevations® Universal Hidden Fasteners

9.3.1.4.2.2 CAMO Wedge Metal

9.3.2 *New Castle Steel Post to Foundation*

9.3.2.1 New Castle Steel's proprietary post base plate shall be installed onto the foundation using four $^1/_2$″ x 6″ concrete anchors.

9.3.2.2 NCS Post shall be cut to the required length prior to installation onto the post base.

9.3.2.3 Pre-drill two $^{3}/_{16}$″ holes through the NCS Post and post base on each side.

9.3.2.3.1 Holes shall be along the centerline of post.

9.3.2.3.1.1 First hole shall be $1^{1}/_{2}$″ from the base, and the second hole shall be 5″ from the base.

9.3.2.3.1.2 Fasten the NCS Post to the post base with the provided $^{1}/_{4}$″ x $1^{1}/_{8}$″ screws.

9.3.2.3.1.2.1 Screws shall not be over-fastened.

9.3.2.4 Secure post cap to the top of the NCS Post with exterior grade sealant.

9.3.2.5 See **Figure 10** for details.

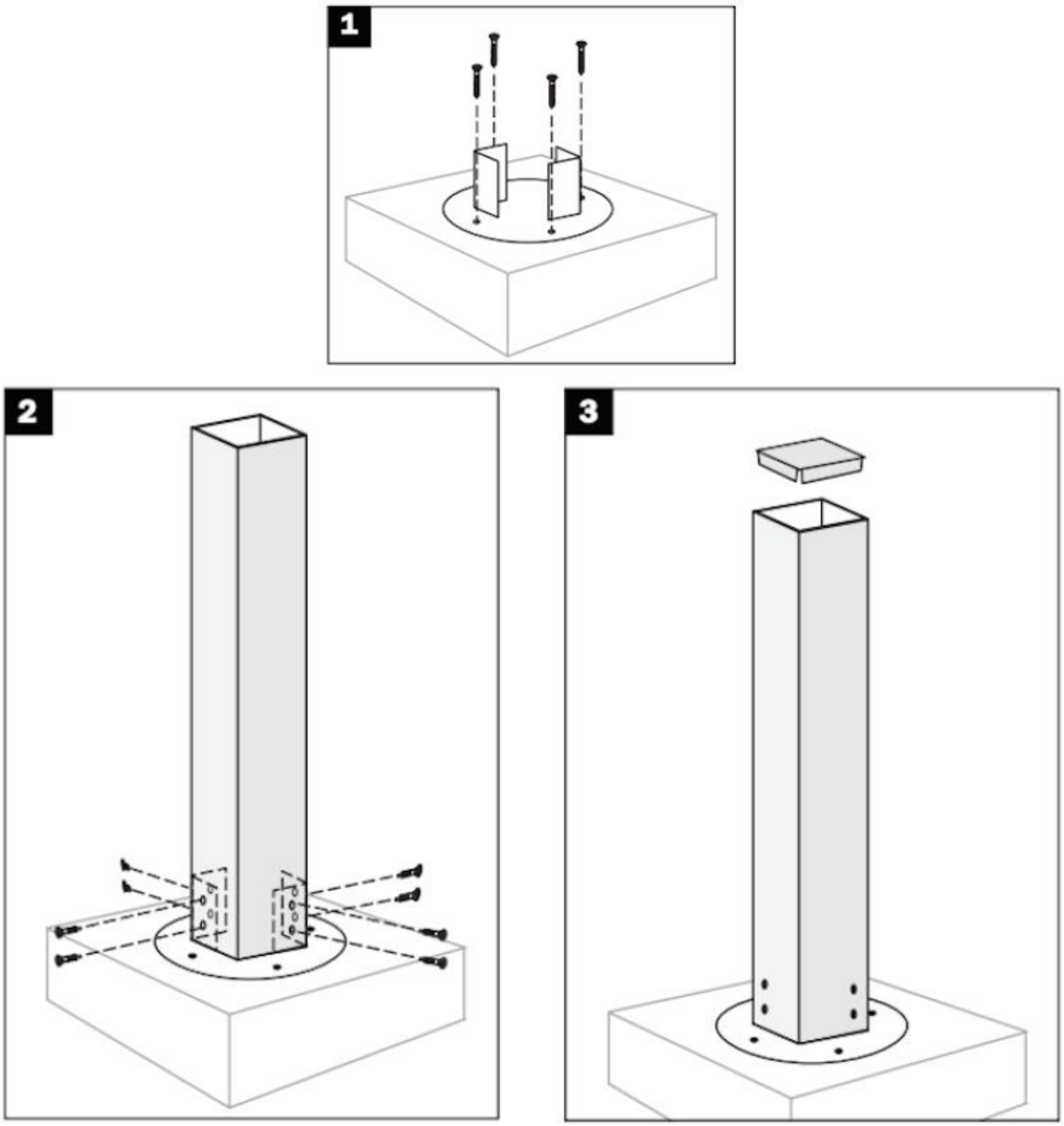

Figure 10. NCS Post Base Installation

9.3.3 Joists may bear on the top flange of the box beam (dropped beam construction) or joists may be fastened to the face of the box beam (flush beam construction).

9.3.3.1 See **Table 20** for installation details.

9.3.3.2 Details for “flush beam construction” are shown in **Figure 11** and **Figure 12**.

9.3.3.3 Details for “dropped beam construction” are shown **Figure 13** and **Figure 16**.

Table 20. Component Fastening Schedule Metal-to-Metal[1,2,3]

Connection	Fasteners
1⁵/₈" joist to dropped box beam	(1) #10 screw from joist bottom flange to dropped beam top flange
1⁵/₈" joist to flush box beam	Simpson 16-gauge L70 angle bracket with (8) #10 screws
1⁵/₈" joist to continuous track/ledger	(1) #10 screw into top and bottom flange of 1⁵/₈" joist + Simpson 16-gauge L70 angle bracket with (8) #10 screws
1⁵/₈" joist to continuous track (front plate)	(1) #10 screw into top and bottom flange of 1⁵/₈" joist
Joist blocking to dropped box beam	Non-Hurricane Zone: (1) #10 screw from blocking bottom flange to dropped beam top flange
	Hurricane Zone: (4) #10 screws from blocking bottom flange to dropped beam top flange
Joist blocking to 1⁵/₈" joist	Simpson 16-gauge L70 angle bracket with (8) #10 screws
1⁵/₈" joist to continuous track (outer rim)	#10 screw from joist bottom flange to dropped beam top flange

SI: 1 in = 25.4 mm

1. Fasteners shall be #10 x ¾”, 16 threads per inch, #2 drill point, corrosion-resistant, self-drilling, self-tapping hex head screws.
2. Quantity of fasteners indicated for Non-Hurricane Zone is based on the following parameters: K_z = 0.90, K_{zt} = 1.0, K_d = 0.85, V = 90 mph, I = 1.00
3. Quantity of fasteners indicated for Hurricane Zone is based on the following parameters: K_z = 0.90, K_{zt} = 1.0, K_d = 0.85, V = 90 mph, I = 1.00

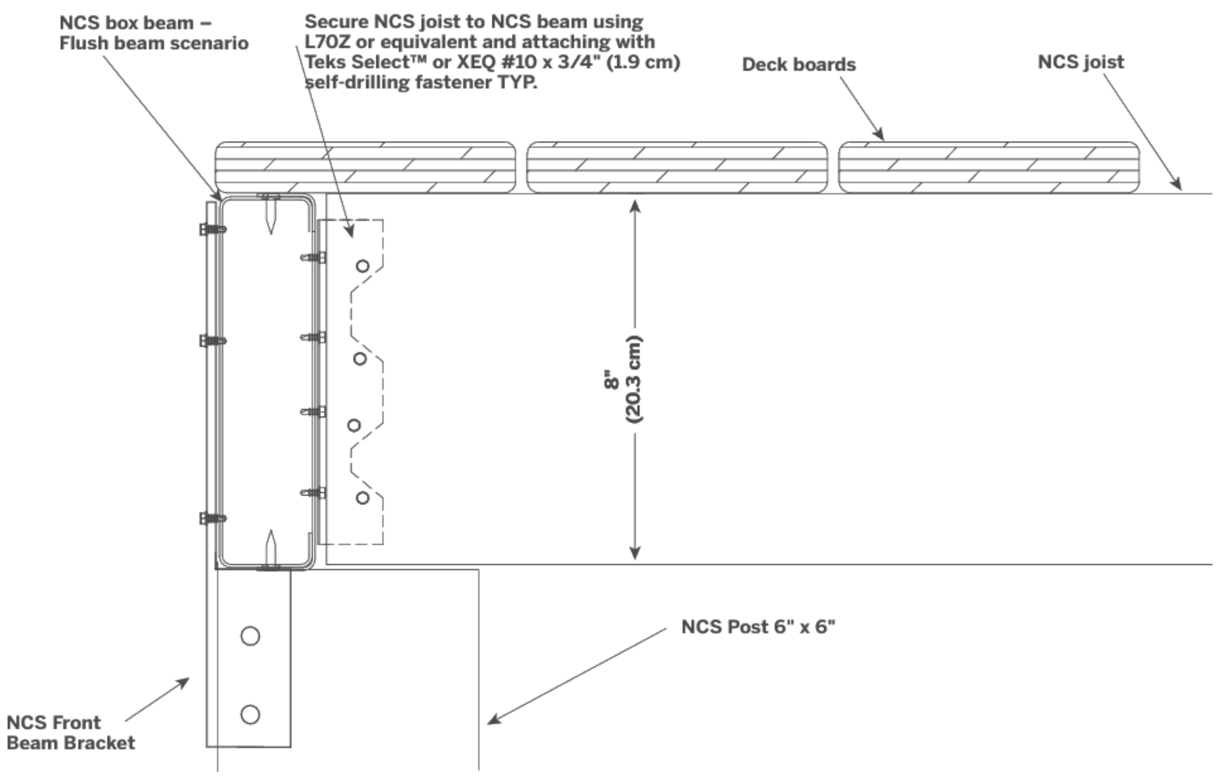

Figure 11. Joist to Box Beam Construction Detail – Flush Beam Scenario

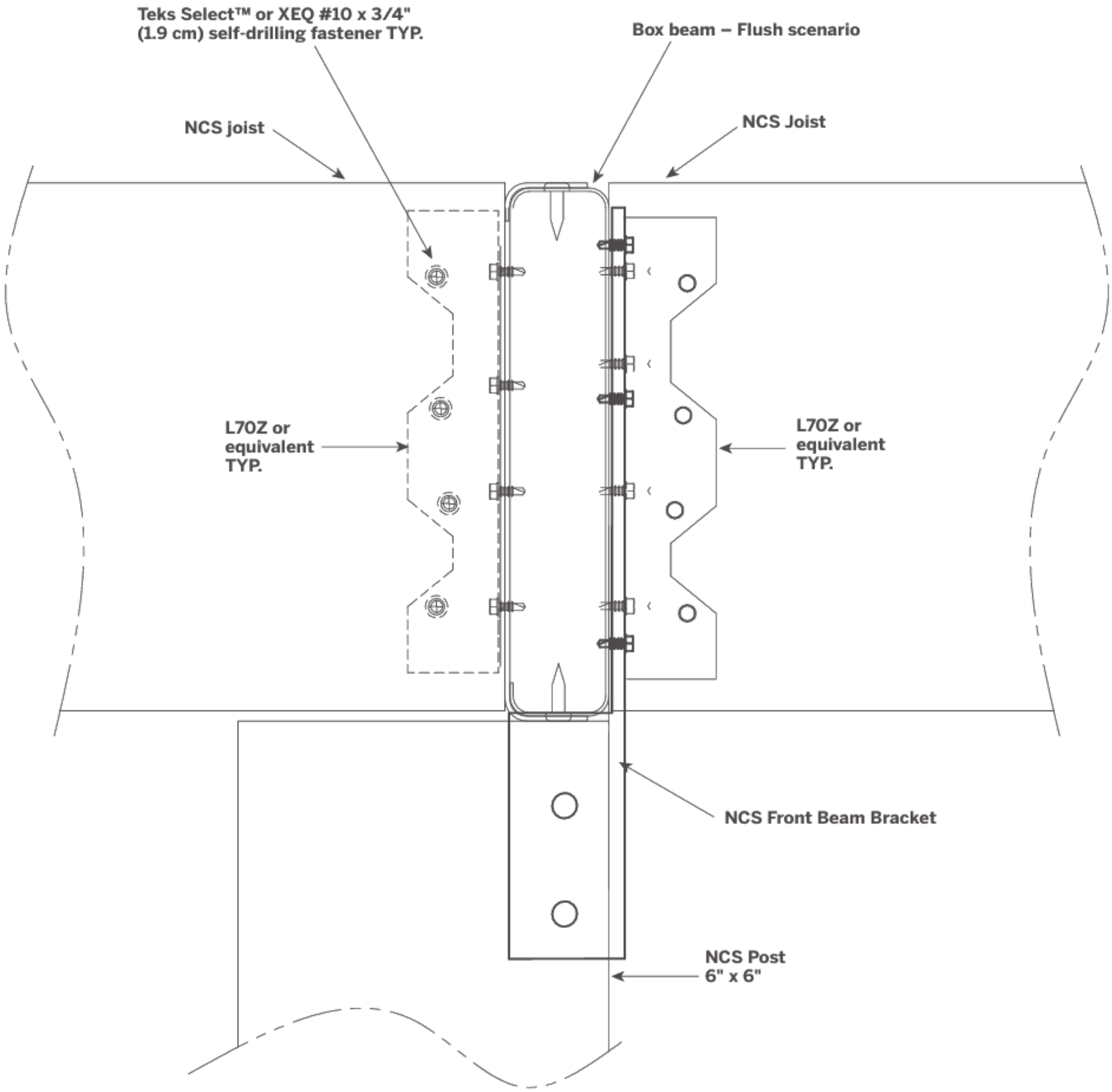

Figure 12. Joist to Box Beam Construction Detail – Sharing Flush Beam Scenario

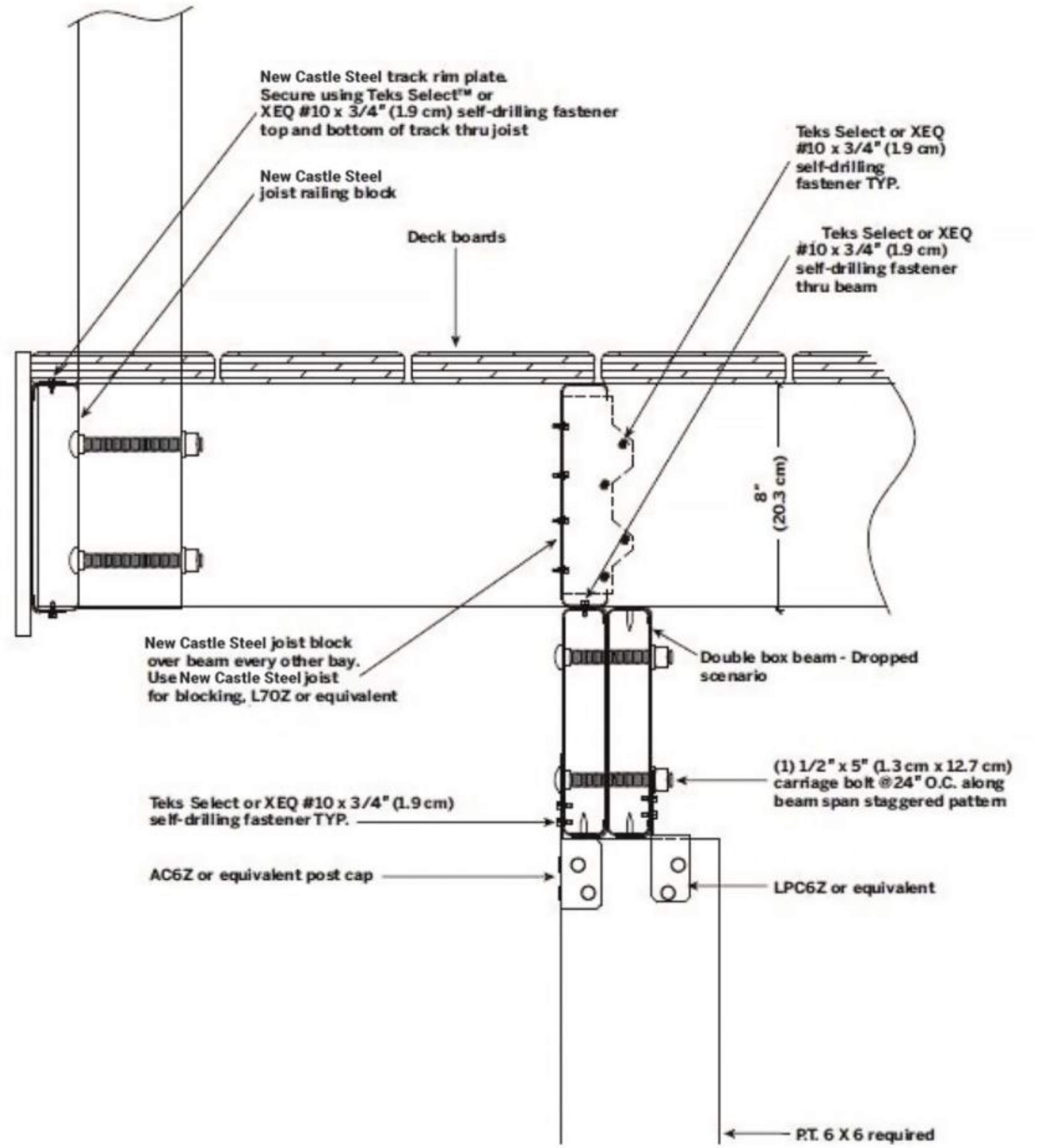

Figure 13. Double Box Beam to Un-notched Wood Post Detail – Dropped Beam Construction

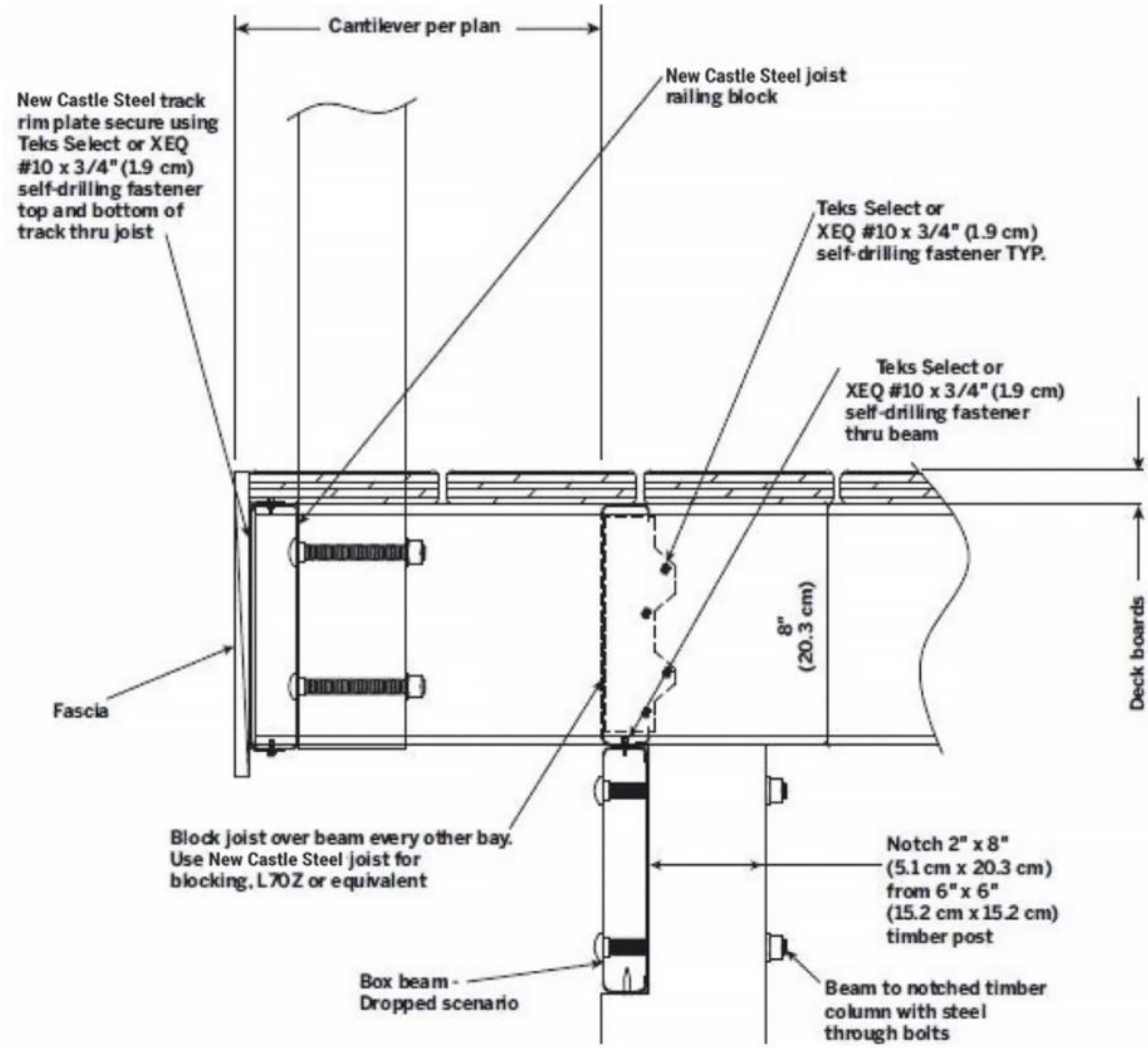

Figure 14. Box Beam to Notched Wood Post Detail – Dropped Beam Construction

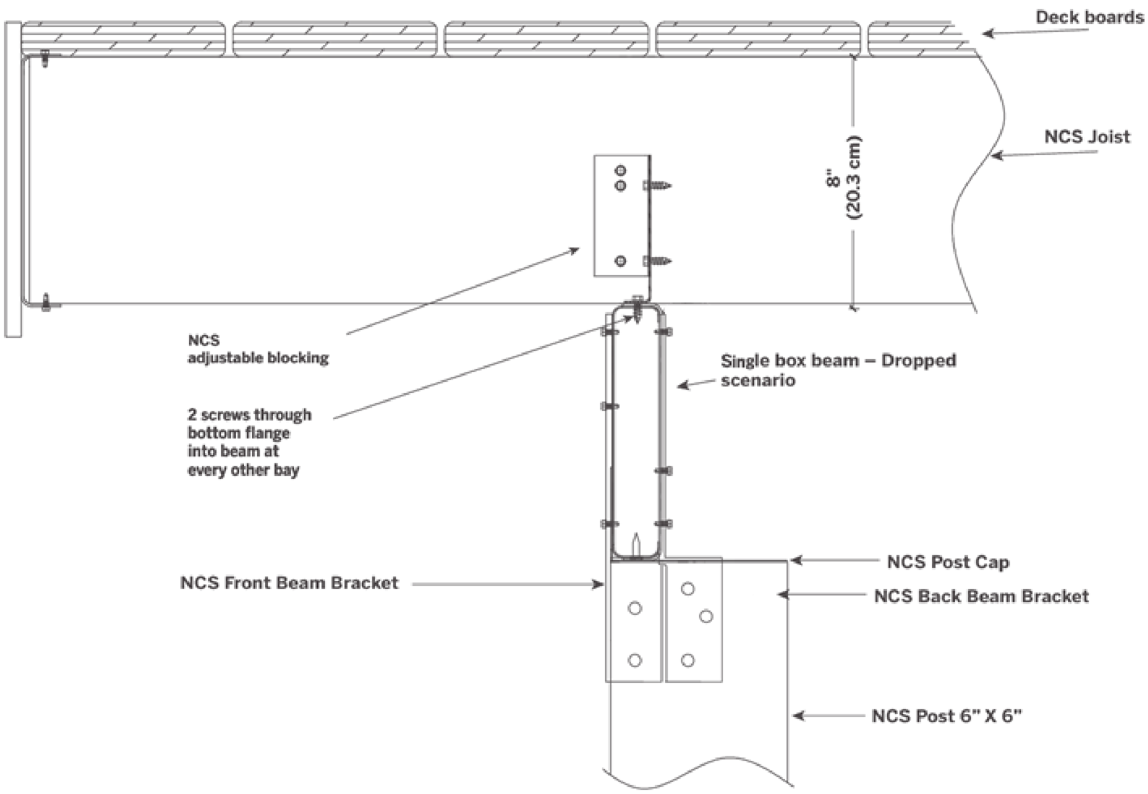

Figure 15. Single Box Beam to New Castle Steel Post Detail – Dropped Beam Construction

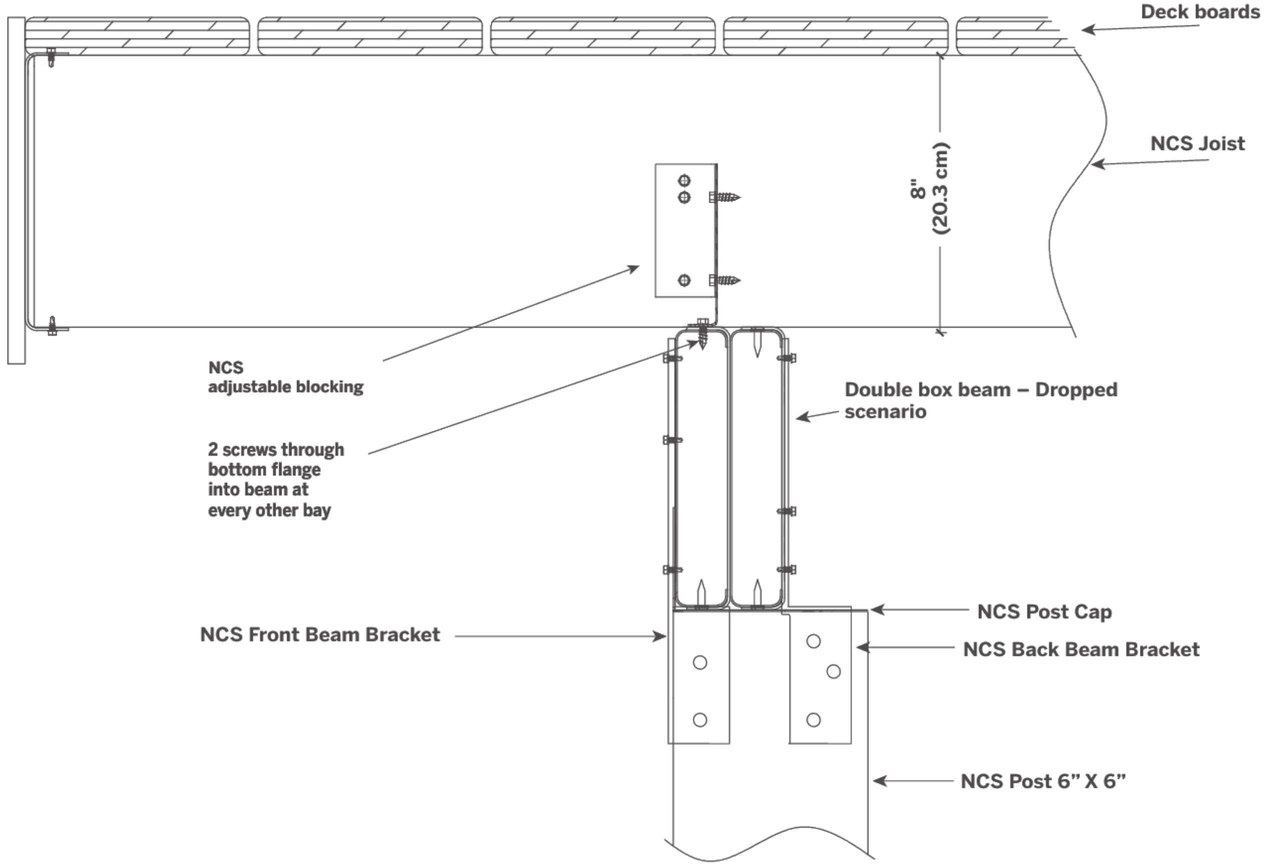

Figure 16. Double Box Beam to New Castle Steel Post Detail – Dropped Beam Construction

9.3.4 Box beams may be attached to un-notched wood support posts as detailed in **Figure 13** using Simpson Strong-Tie AC4, AC6, LPC4, or LPC6 post brackets.

9.3.4.1 Wood support posts are outside the scope of this report.

9.3.4.2 Single box beams may be attached to notched wood as shown in **Figure 14**. The wood support posts shall have a published specific gravity of 0.50 or greater. Wood support posts performance are outside the scope of this report. See **Table 21** for installation details.

Table 21. Single Box Beam to Notched Wood Support Post Fastening Schedule[1,2]

Location	Fastener
Non-Hurricane Zone	(2) 1/2" diameter, 8" long A307 carriage bolts
Hurricane Zone	(4) 1/2" diameter, 8" long A307 carriage bolts and (2) Simpson MSTA18 post to beam connectors. Each Simpson MSTA18 connector shall be fastened to box beam with (5) #10 screws and fastened to wood support post with (20) 10d nails.

SI: 1 in = 25.4 mm
1. Wood support post shall have a published specific gravity of 0.50 or greater.
2. Unless noted otherwise, fasteners shall be self-drilling, self-tapping hex head screws.

9.3.5 Joist splice over dropped beam details are shown in **Figure 17**.

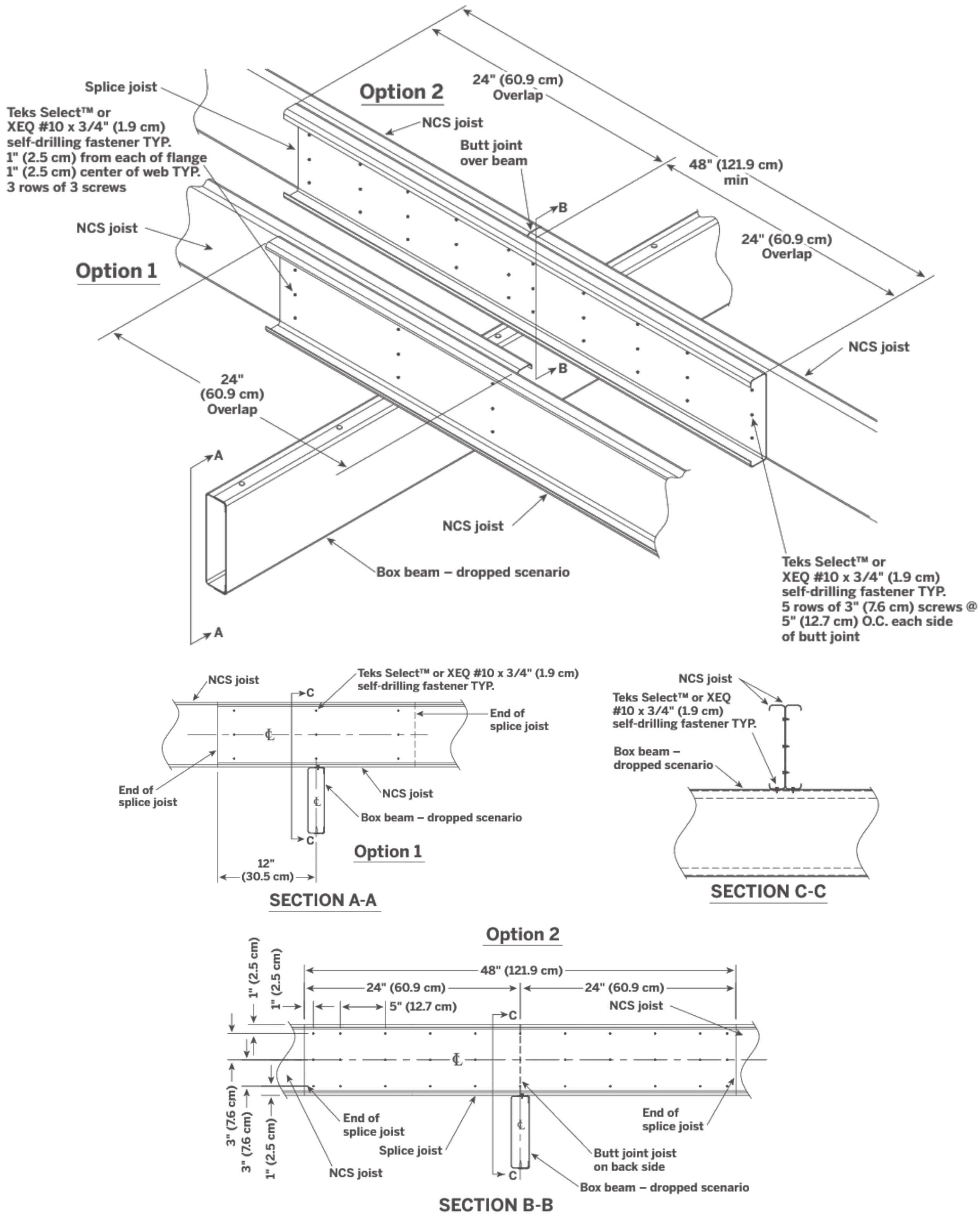

Figure 17. Joist Splice Over Dropped Beam Details

9.3.6 Joist blocking is required every other bay above dropped beams for all joist spans and every bay at joist mid-span for joist spans greater than 8′.

9.3.6.1 Joist blocking members are fabricated from $1^{5}/_{8}$″ joists.

9.3.6.2 All joist blocking shall be installed with angle brackets. See **Figure 18** for joist blocking details.

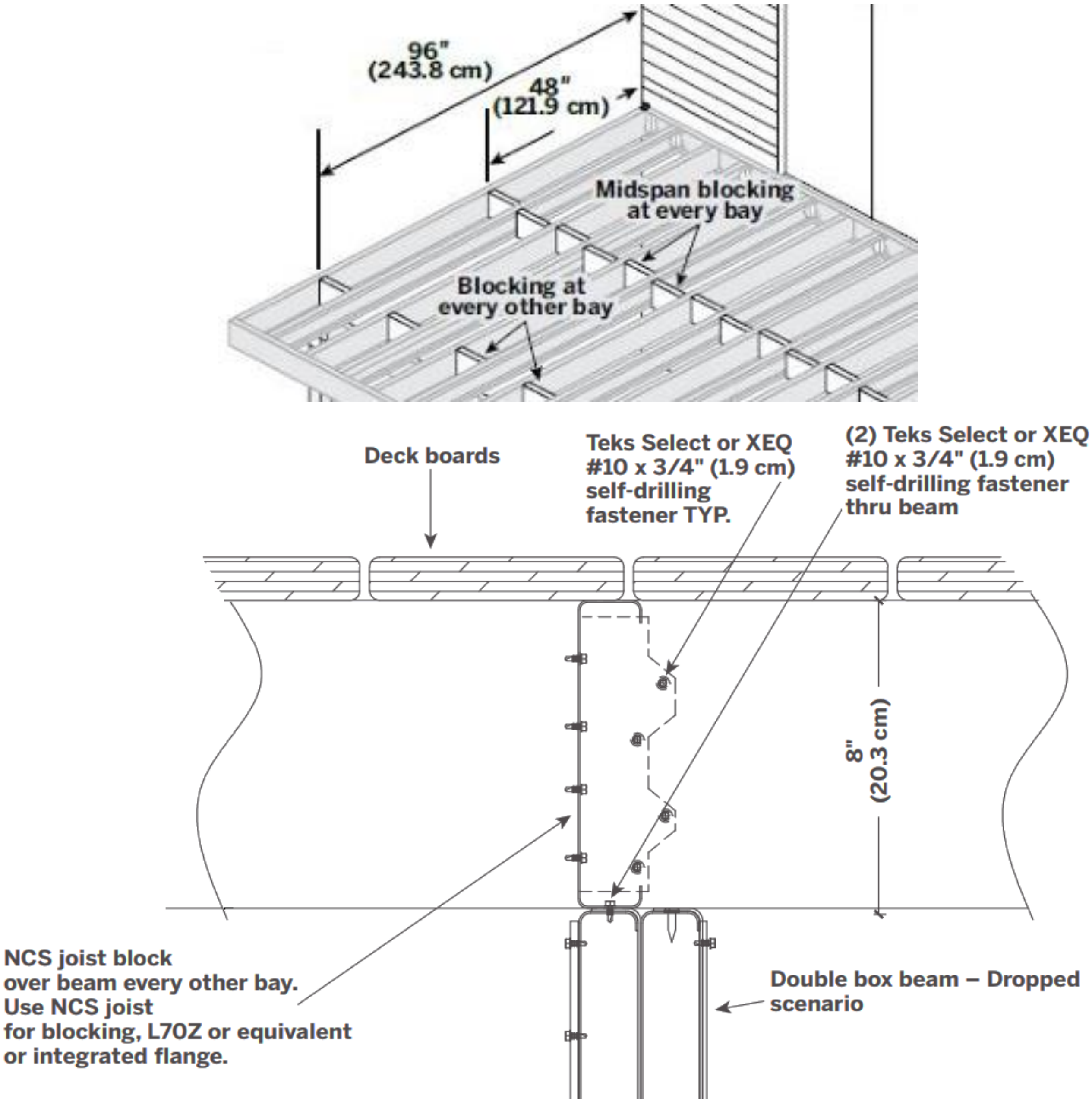

Figure 18. $1^{5}/_{8}$″ Joist Blocking Details

9.3.6.3 New Castle Steel Adjustable Blocking may be used alternative to the 1$^5/_8$″ joist blocking.

9.3.6.3.1 Installation shall be as shown in **Figure 19**.

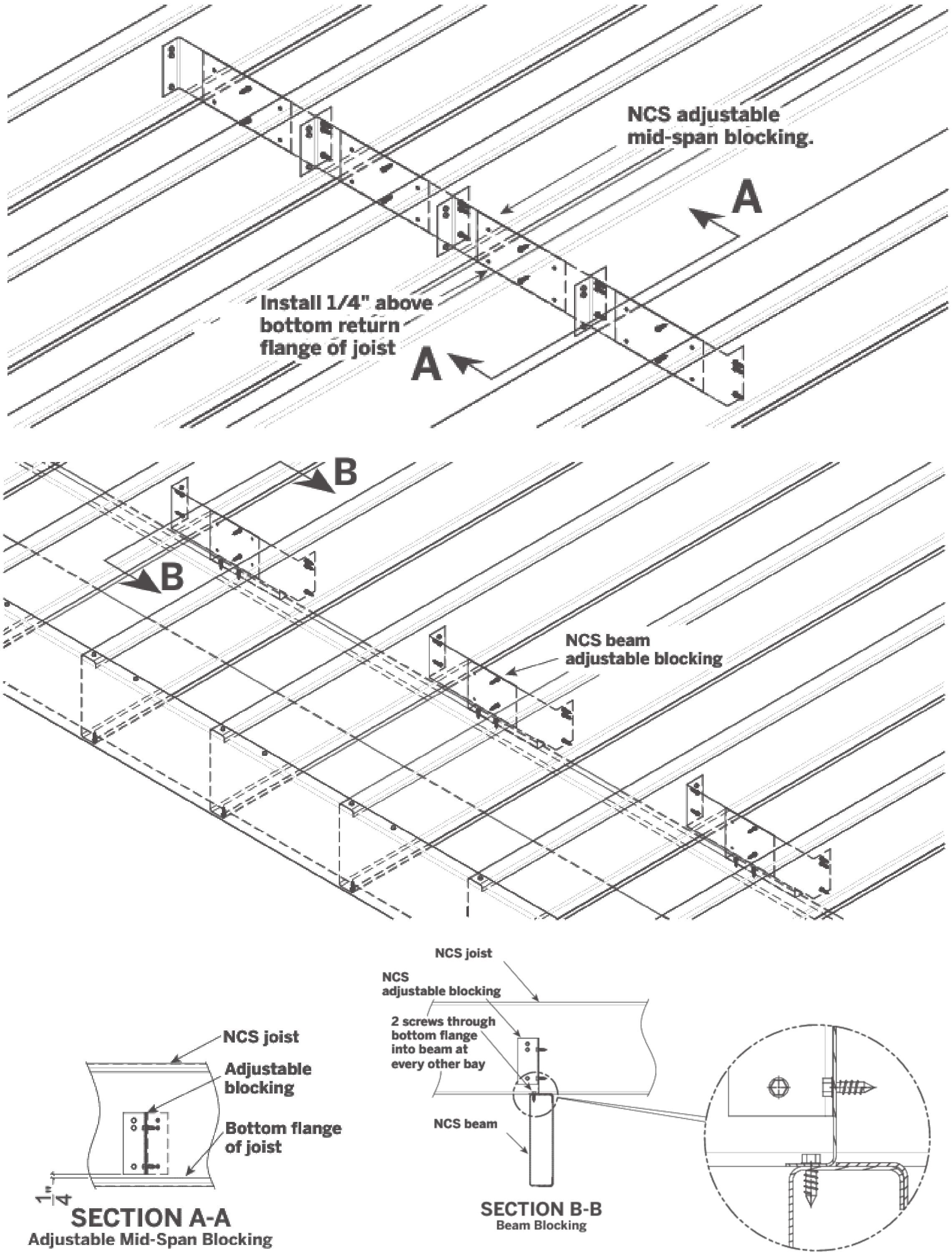

Figure 19. Adjustable Blocking Details

9.3.6.4 Trex Rain Escapes® may be used with New Castle Steel Adjustable Blocking, with an alternative installation detail.

9.3.6.4.1 Installation shall be as shown in **Figure 20**.

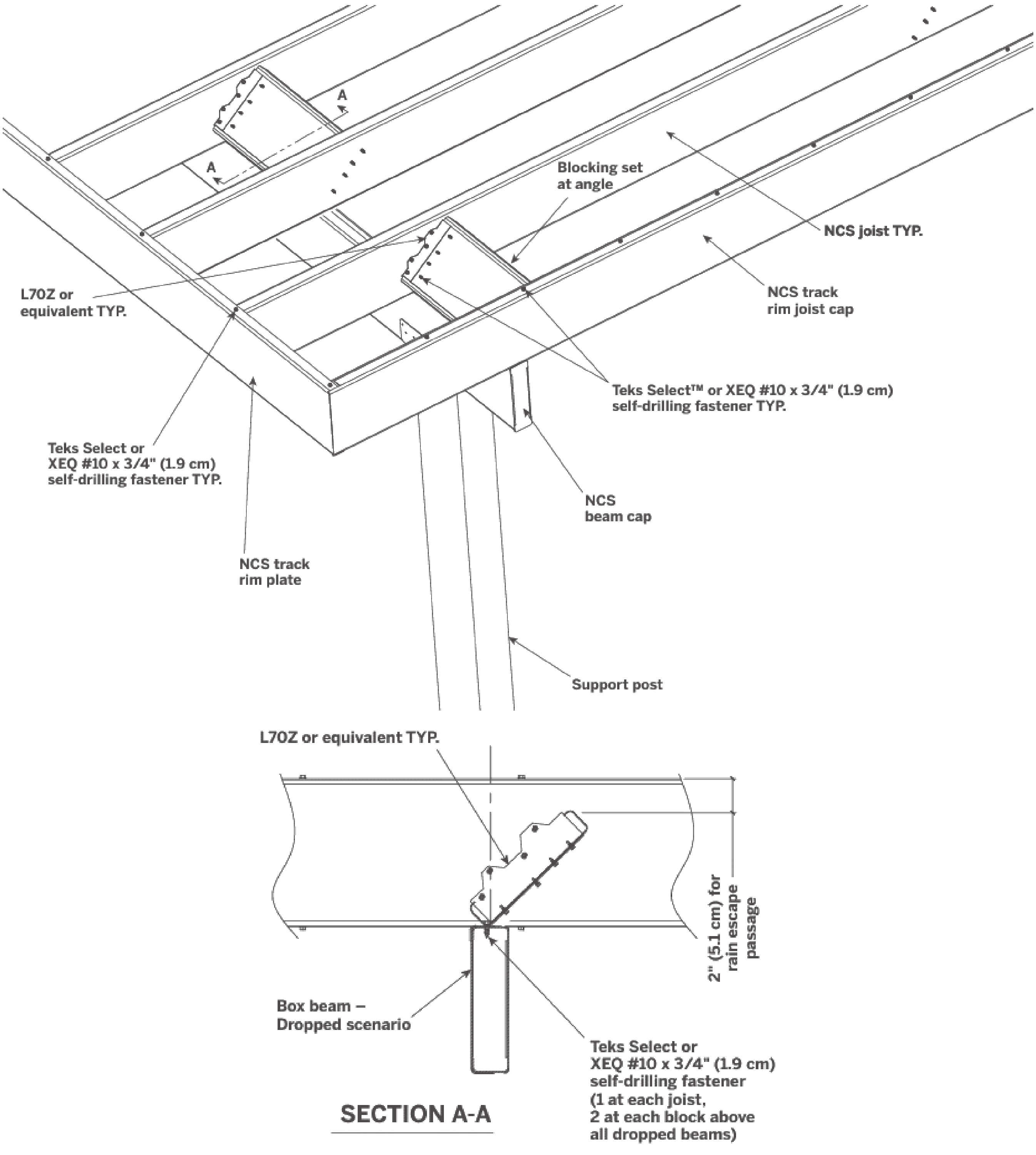

Figure 20. Trex Rain Escapes Blocking Details

9.3.7 Joist Perforations

9.3.7.1 In accordance with IRC Section R505.2.6, perforations in the web of joist members shall comply with the conditions as prescribed in Section A4.5 of AISI S230.

9.3.7.2 Perforations not in compliance with the conditions as prescribed in Section A4.5 of AISI S230 shall be:

9.3.7.2.1 Reinforced in accordance with the provisions of Section A4.6 of AISI S230, or

9.3.7.2.2 Patched in accordance with the provisions of Section A4.7 of AISI S230.

9.3.7.3 See **Figure 21** for details.

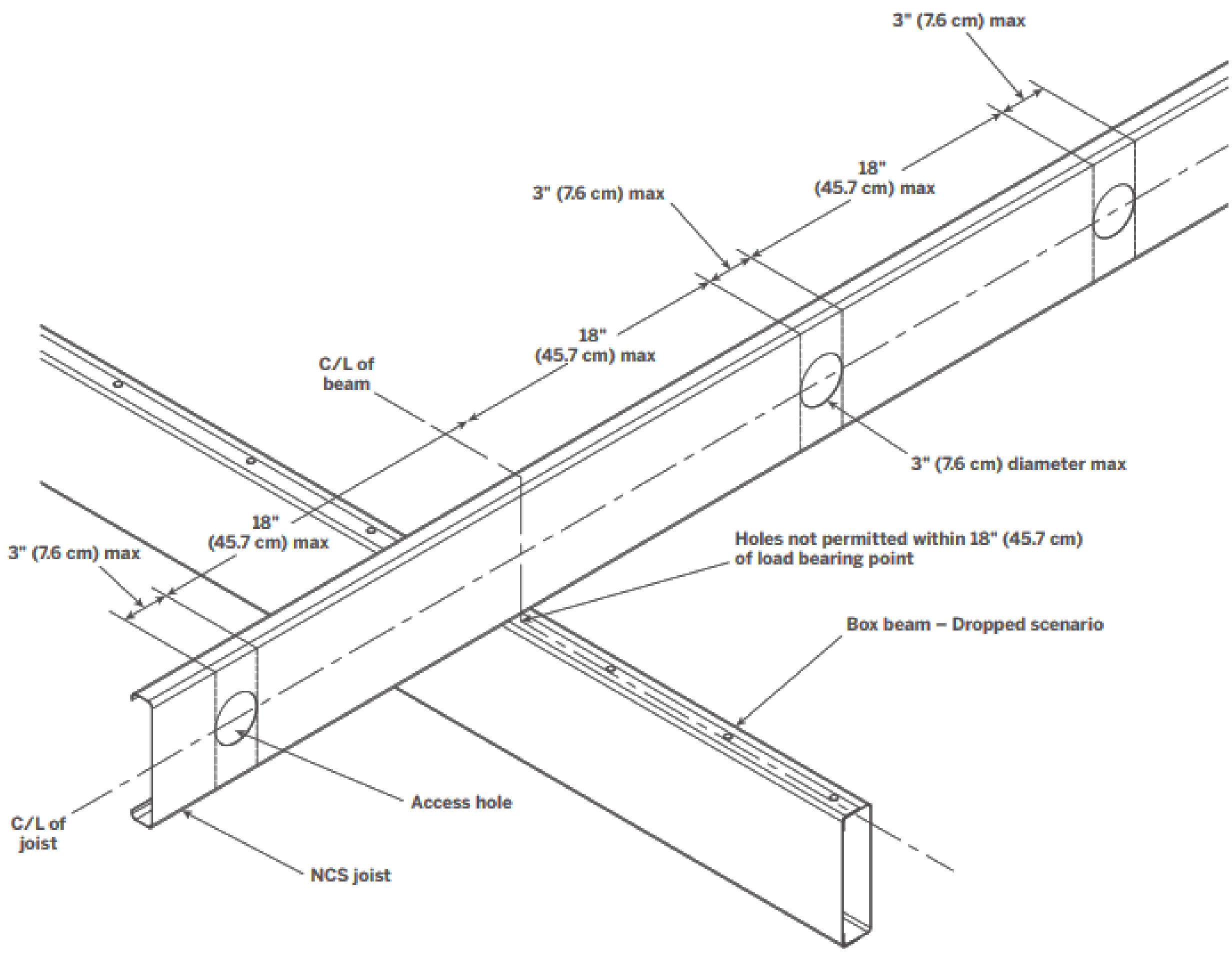

Figure 21. Joist Perforation Details

9.3.8 Rail Post Attachment

9.3.8.1 Rail posts are attached to steel deck framing system as detailed in **Figure 22** through **Figure 24**.

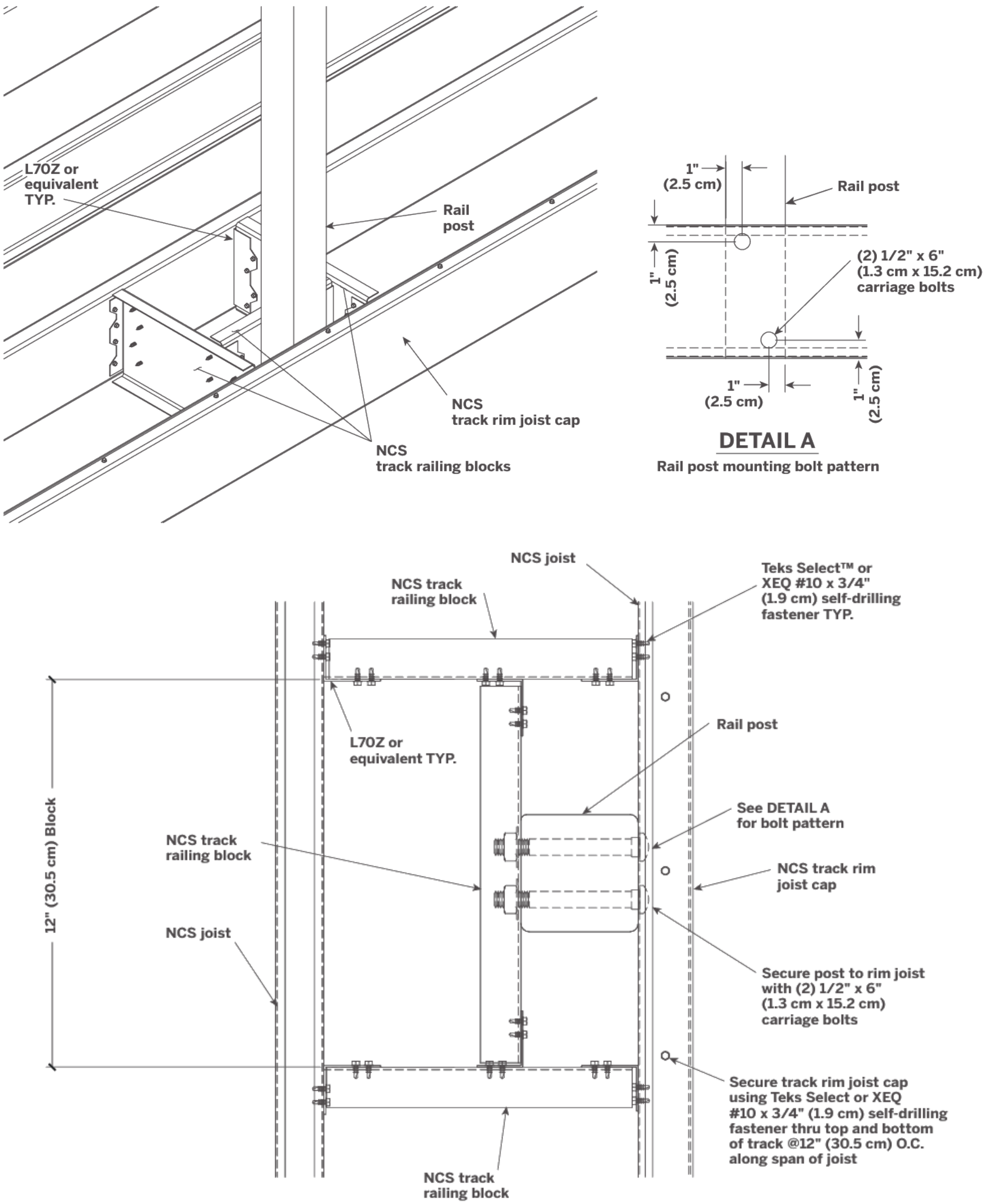

Figure 22. Rail to Post Installation Details – Inside Rail Post Attachment at Rim Plate

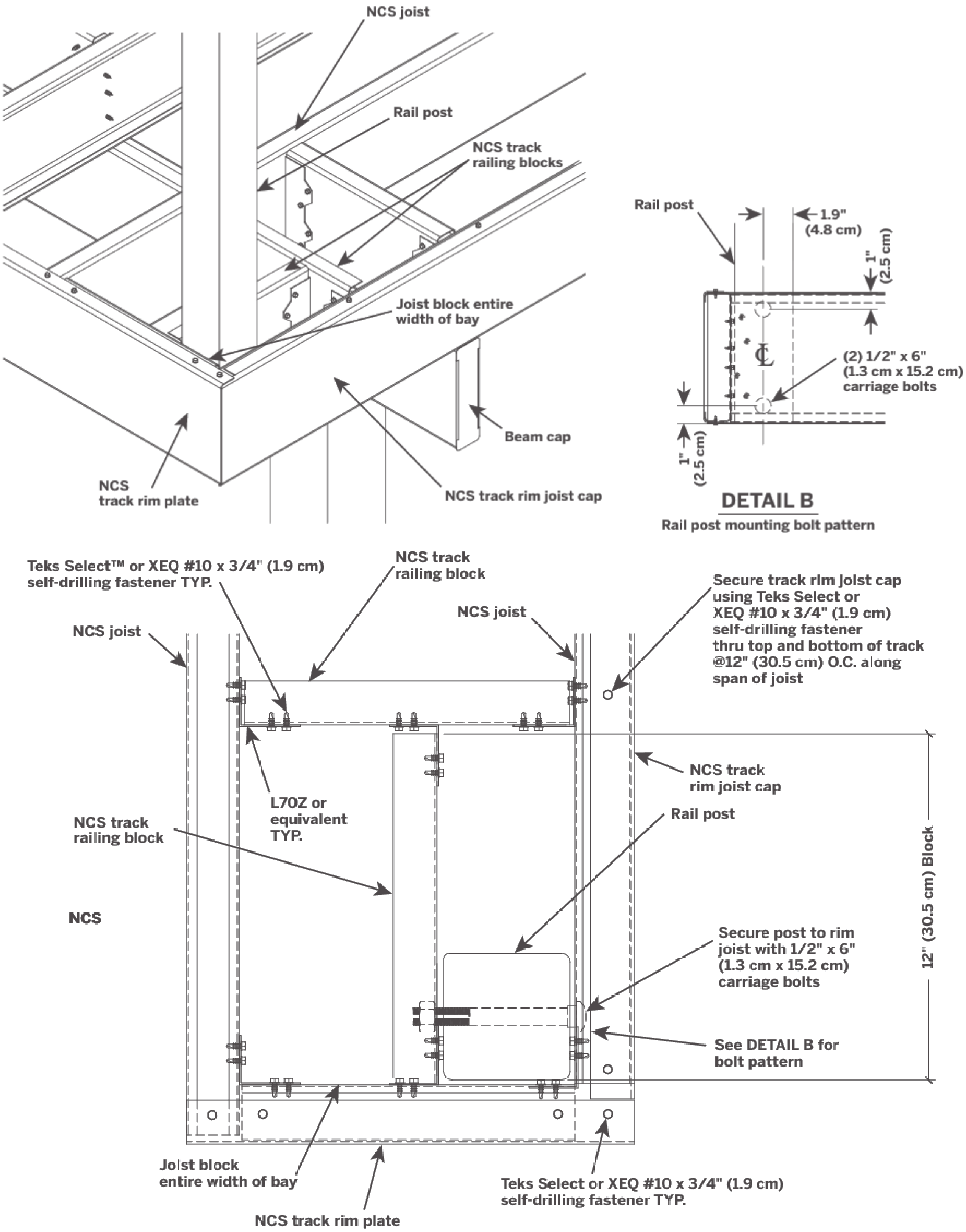

Figure 23. Rail to Post Installation Details – Inside Rail Post Attachment at Corner

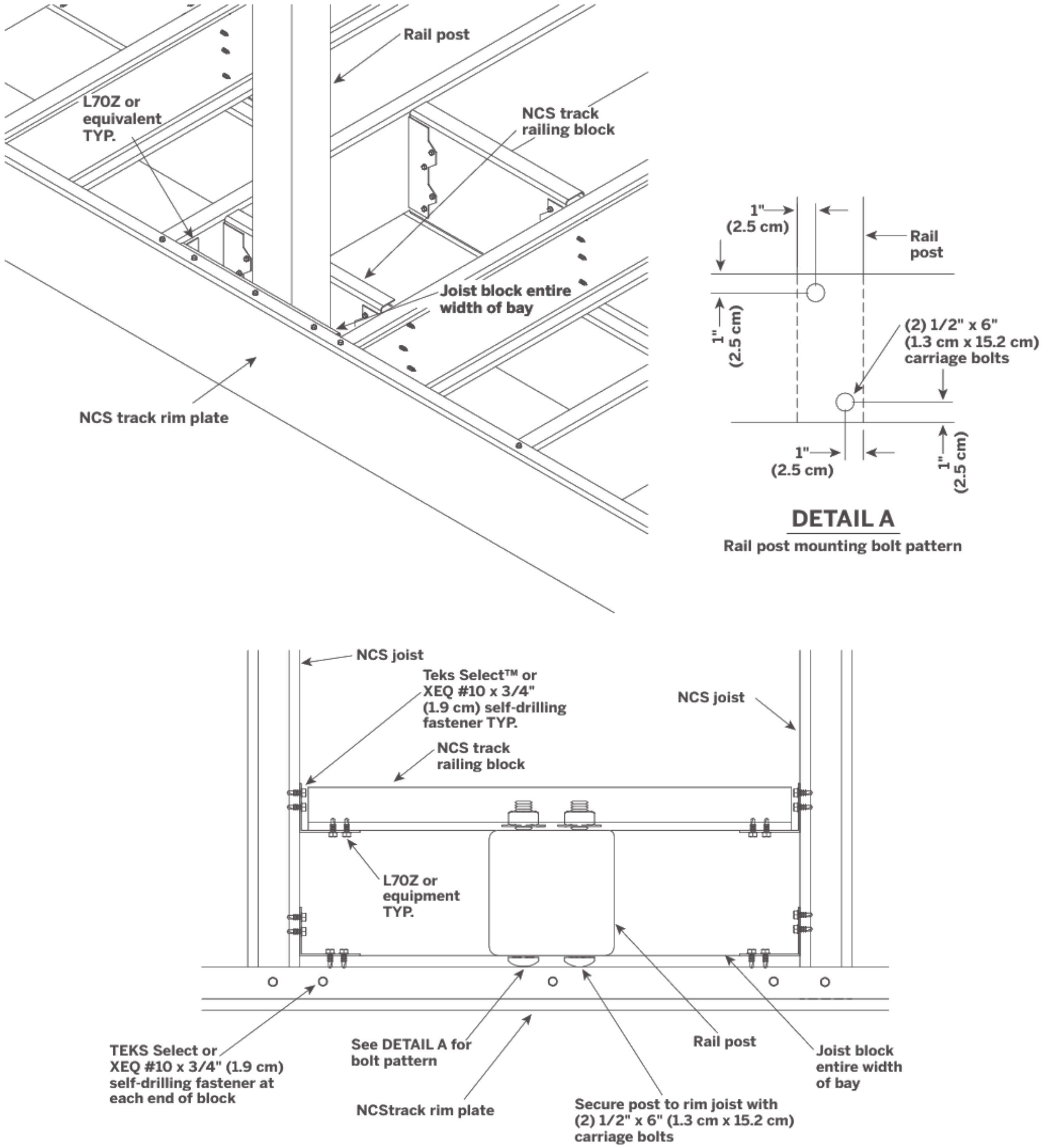

Figure 24. Rail to Post Installation Details – Inside Rail Post Attachment at Rim (Front) Plate

9.3.8.2 Alternatively, railing posts may be installed in accordance with the following.

9.3.8.2.1 A $4^1/_2$″ by $4^1/_2$″ by $^1/_4$″ thick aluminum post base plate shall be anchored to structural plastic blocking with four (4) 6″ long Simpson StrongTie SDWS Timber Screws.

9.3.8.2.1.1 Plastic blocking shall meet the minimum properties as described in **Table 20**.

9.3.8.2.1.1.1 Equivalent or higher performing structural plastic products may be permitted.

9.3.8.2.1.1.2 See **Table 20** for the required minimum properties of the structural plastic material.

Table 22. Component Fastening Schedule Metal-to-Metal

Property		Value/Units
Density (Specific Gravity)		54 pcf (0.86)
Flexural Strength		1,355 psi
Flexural Modulus (Secant, at 1% strain)		96,000 psi
Compressive Strength	(parallel to grain)	1420 psi
	(perpendicular to grain)	650 psi
Compressive Modulus (parallel to grain)		51000 psi
Coefficient of Thermal Expansion		5.5 x 10^{-5} in./in./ °F
Screw Withdrawal		646 lb
Brittleness		No break at -40°F
Hardness-Shore D		80
SI: 1 pcf = 16.02 kg/m^3, 1 psi = 0.0069 MPa, 1 in./in./ °F = 1.8 mm/mm/ °C, 1 lb = 4.45 N		

9.3.8.2.1.2 Dimensions of the plastic blocking shall be $1^7/_8$″ thick, 8″ deep, and shall be of sufficient length to span across to the next joist.

9.3.8.2.1.2.1 Plastic blocking shall be framed into adjacent joist webs with Simpson StrongTie L70 angles (both faces, both sides) with eight (8) #10 x $1^1/_2$″ Simpson StrongTie SD connector screws.

9.3.8.2.1.2.2 Details of the connection are shown in **Figure 25** through **Figure 27**.

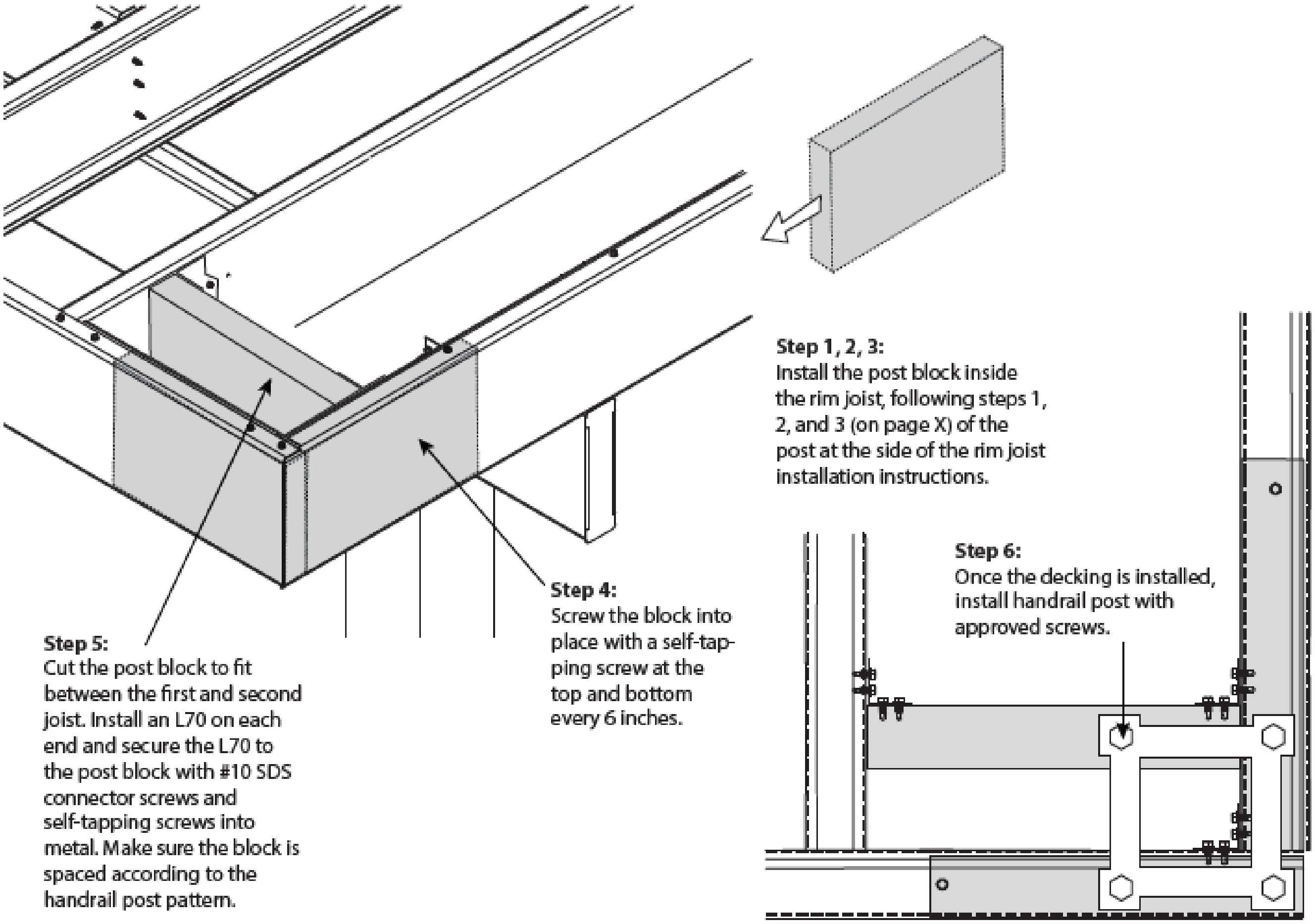

Figure 25. Rail to Post Installation Details – Surface Mount Post at Corner with Drop Beam

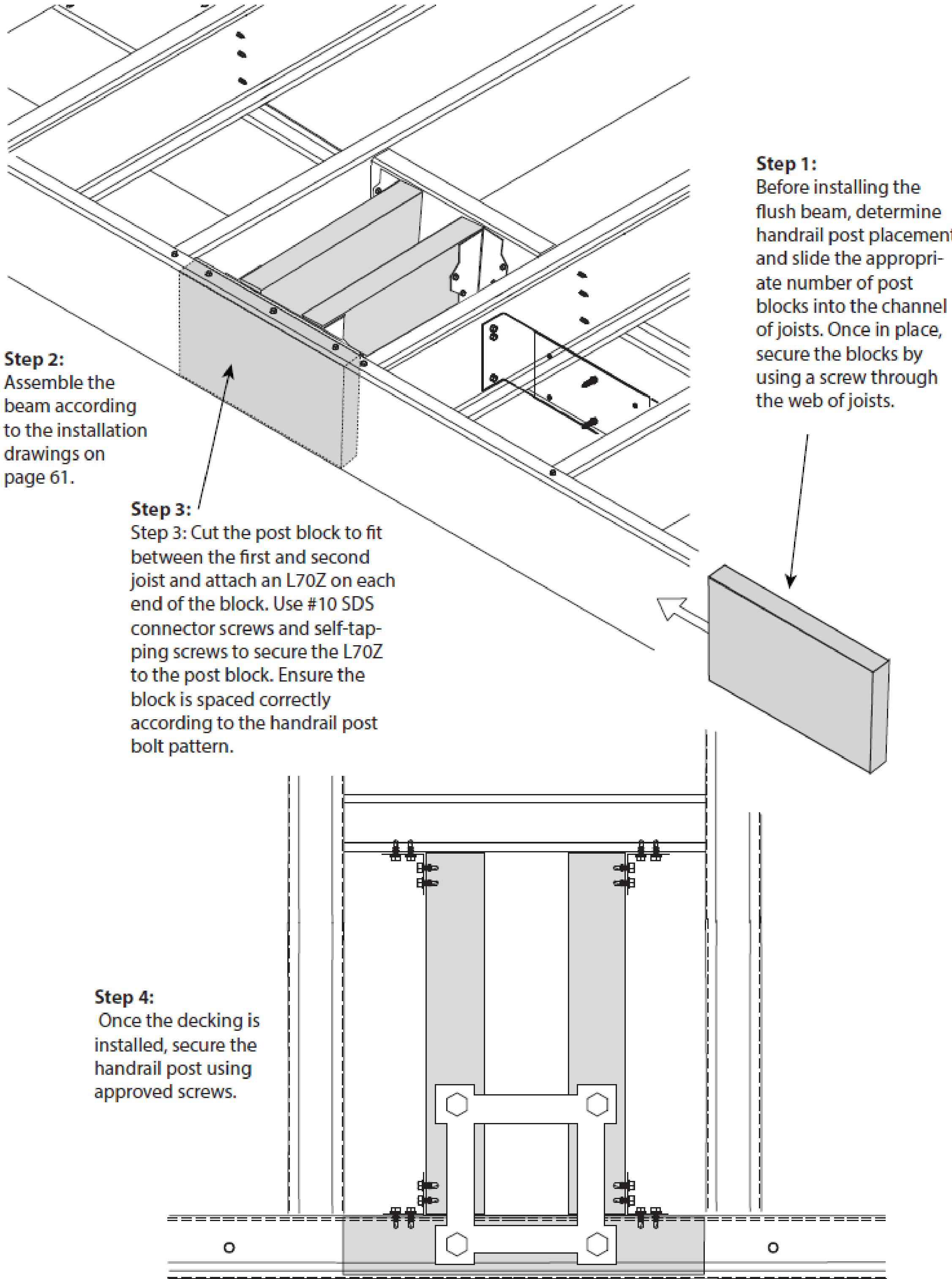

Figure 26. Rail to Post Installation Details – Surface Mount Post at Side with Flush Beam

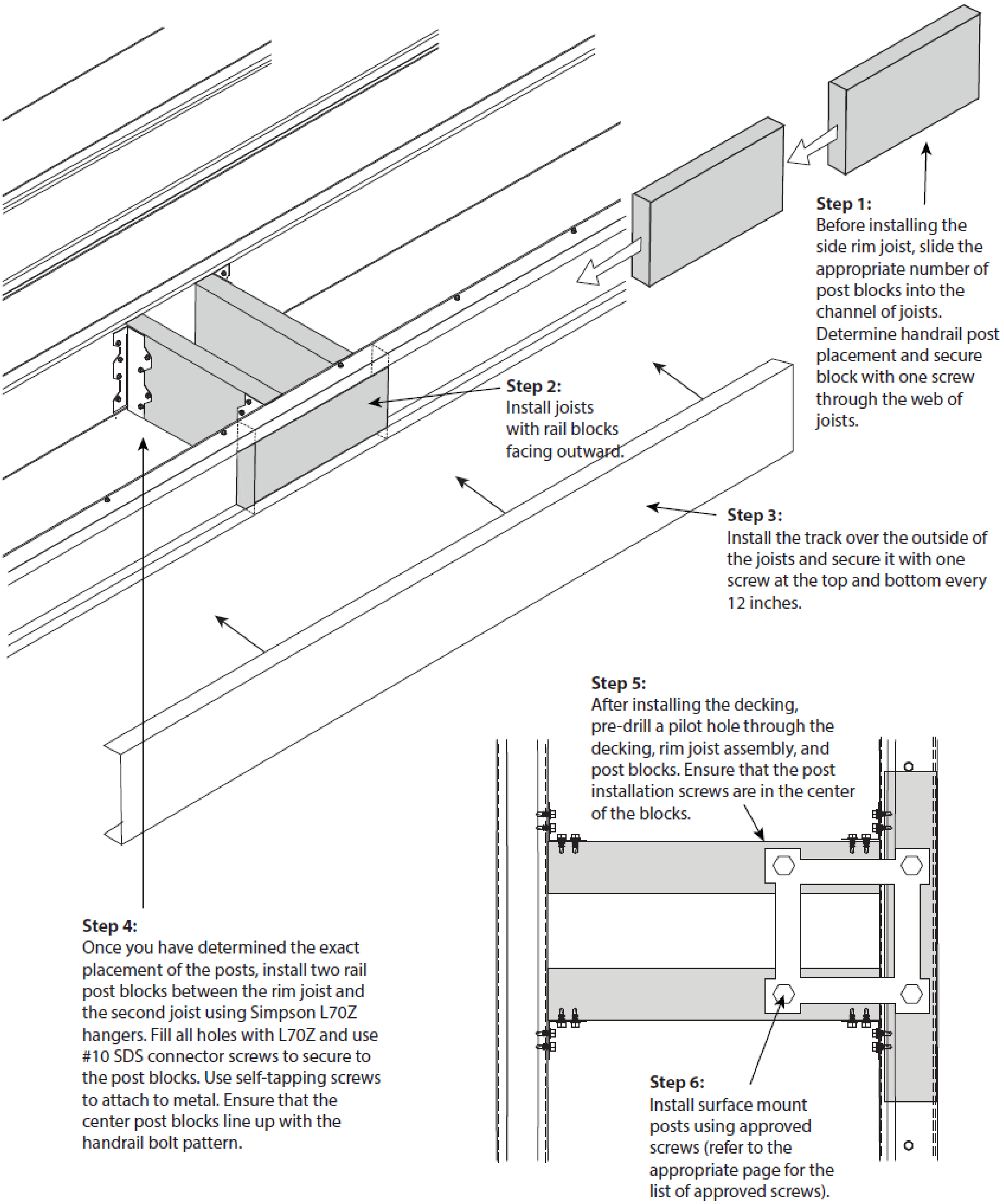

Figure 27. Rail to Post Installation Details – Post Blocks at Side Rim Joists

9.3.9 New Castle Steel Joists are attached to continuous track/ledger, and/or continuous track (front plate).

9.3.9.1 The connections shall be as shown in **Figure 28**.

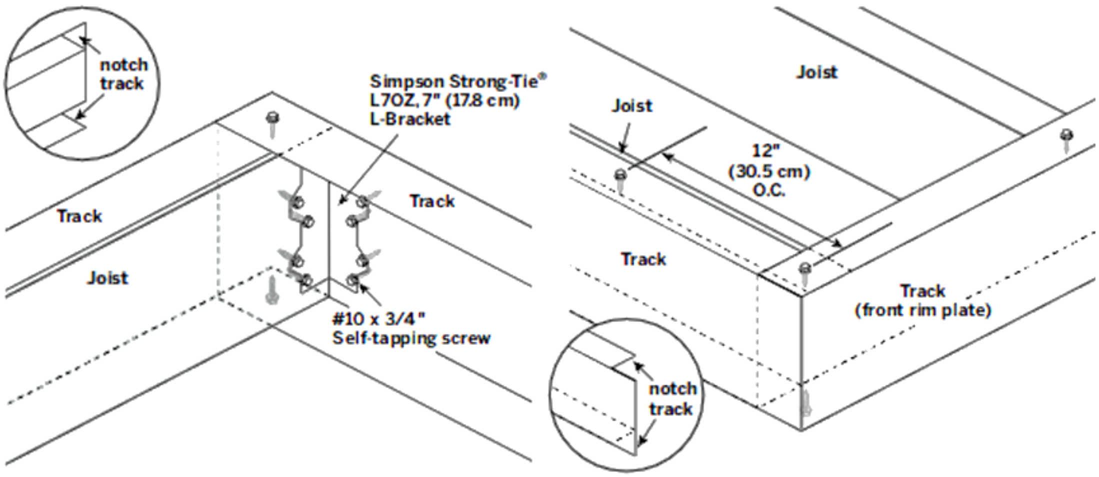

Figure 28. Joist to Track/Ledger and Joist to Track (Front Plate) Connection Details

9.3.9.2 Joist connection to a curved front track rim plate shall be as shown in **Figure 29**.

9.3.9.2.1 Relief cut shall be as indicated in **Table 23**.

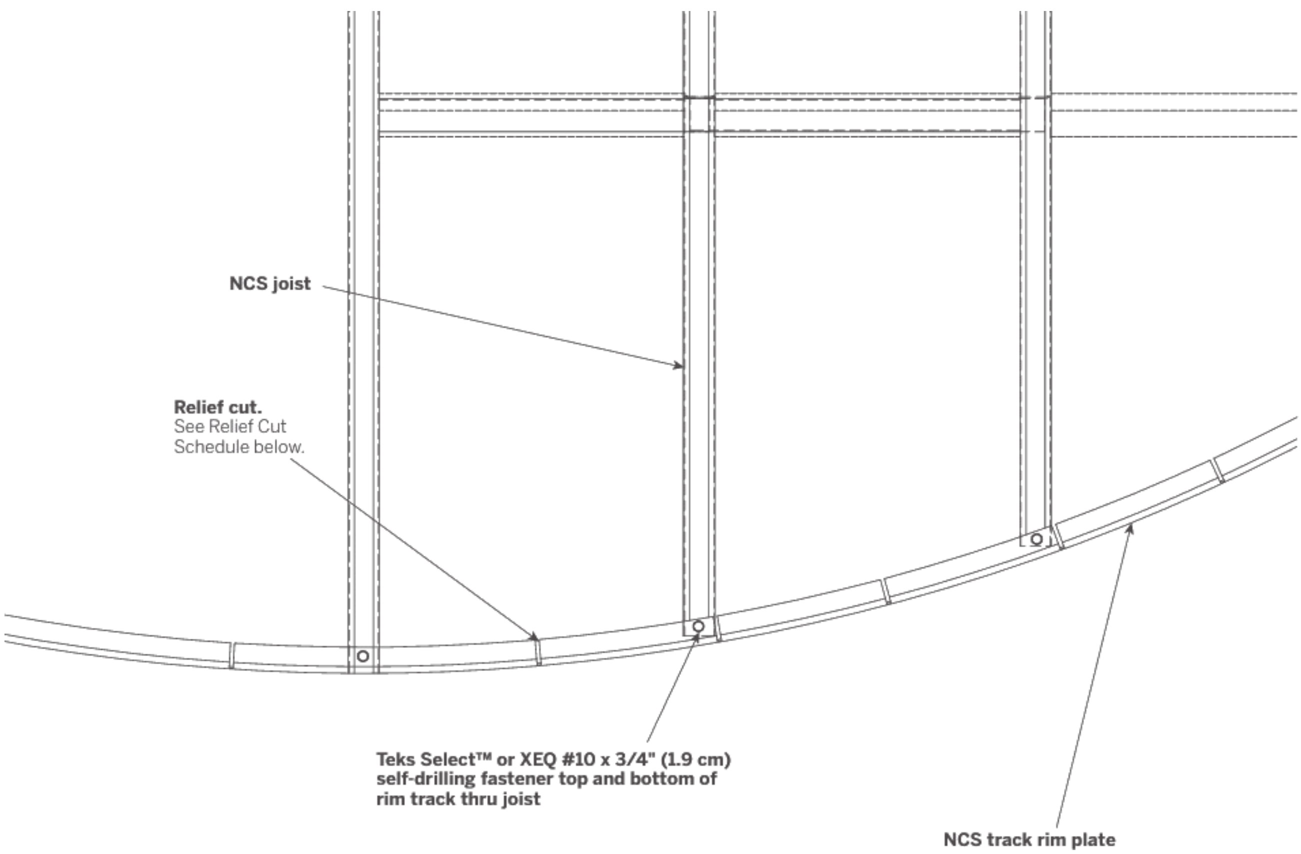

Figure 29. Joist to Curved Track/Rim (Front) Plate Connection Details

Table 23. Relief Cut Schedule[1]

Radius of Curved New Castle Steel Track Rim Plate	Relief Cut
3'-0" to 5'-11" (91.4 cm to 180.3 cm)	2" (5.1 cm)
5'-11" to 8'-11" (180.3 cm to 271.8 cm)	4" (10.2 cm)
8'-11" to 11'-11" (271.8 cm to 363.2 cm)	6" (15.2 cm)
11'-11" to 14'-11" (363.2 cm to 454.0 cm)	8" (20.3 cm)
14'-11" and above (454.0 cm)	10" (25.4 cm)

SI: 1 in = 25.4 mm
1. Decking to metal fasteners shall be evaluated for wind uplift capacity.

9.3.10 Continuous track/ledger may be attached to existing 2″ nominal lumber band joist with Simpson Strong Tie, SDS Heavy-Duty Connector Screw, SDS25200.

9.3.10.1 The existing band joist shall have a published specific gravity of 0.55 or greater.

9.3.10.2 See **Table 12** and **Table 13** in **Section 6** for continuous track/ledger fastening schedule.

9.3.10.3 See **Figure 30** and **Figure 31** for installation details.

9.3.10.3.1 Exterior wall sheathing shall be a maximum of $^1/_2$″ plywood or oriented strand board (OSB).

9.3.10.3.1.1 Sheathing shall be independently fastened to rim plate.

9.3.10.3.2 Minimum edge distance from the top and bottom fasteners to the edge of the wood rim plate shall be $1^1/_2$″.

9.3.10.3.3 When two rows of SDS2500 screws are used, minimum vertical distance between the rows of the fasteners shall be 4″.

9.3.10.3.4 When three rows of SDS2500 screws are used, minimum vertical distance between the rows of the fasteners shall be 2″.

9.3.10.3.5 Middle row of screws shall be offset horizontally from the top and bottom rows of screws by $1^1/_2$″.

9.3.10.3.6 There shall be no air gap between steel track ledger and wood sheathing or rim plate.

Figure 30. 2-screw (left) and 3-screw (right) Ledger Connection

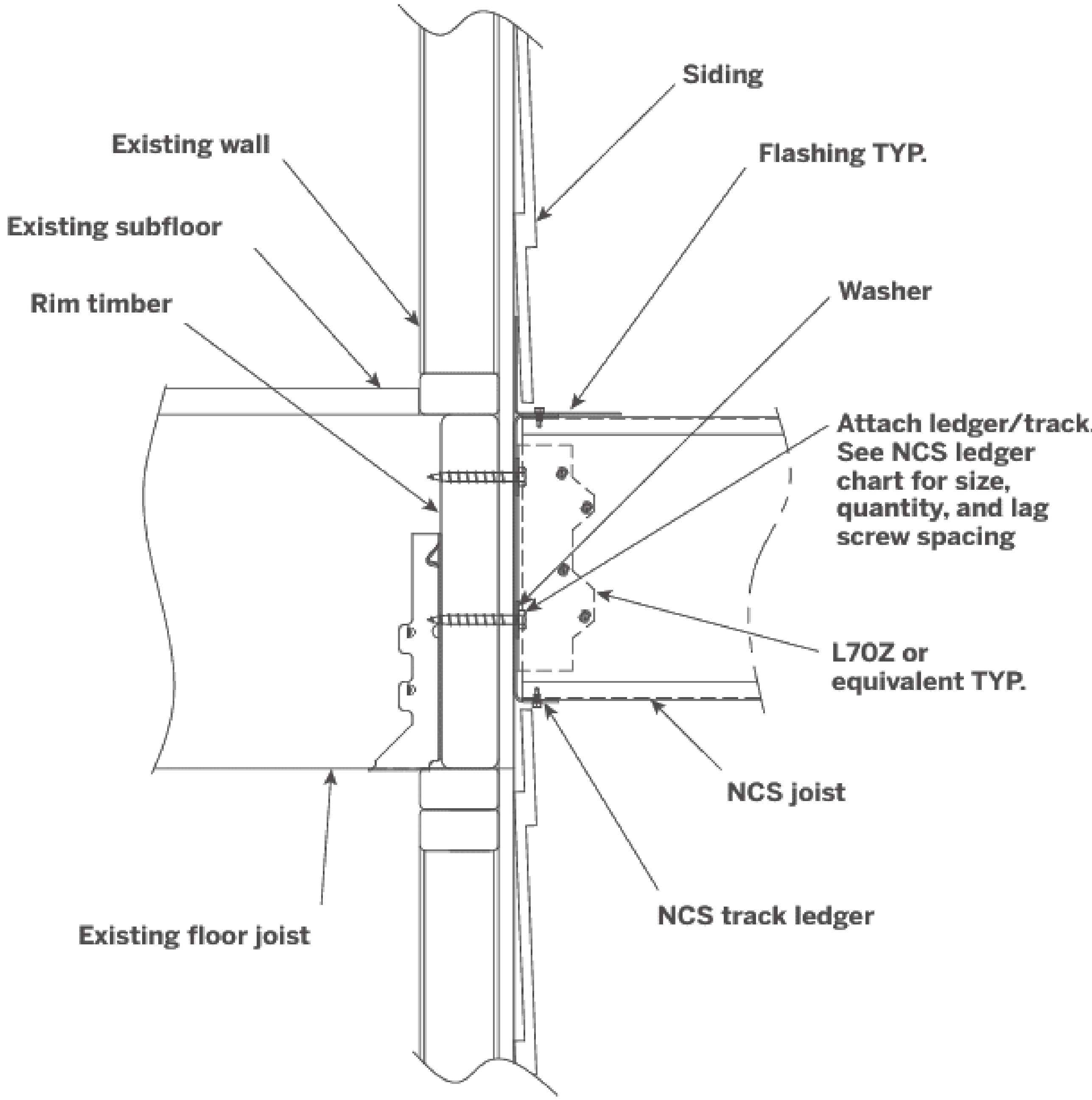

Figure 31. Ledger Connection Details

9.3.11 Deck framing anchorage for lateral load shall comply with IBC Section 1604.8.3, IRC Section R301, and IRC Section R507.9.1.3.

9.3.12 Deck boards shall be positively fastened to each joist using the appropriate fasteners specified in **Section 9.3.1**.

9.3.13 Border plank framing details are shown in **Figure 32**.

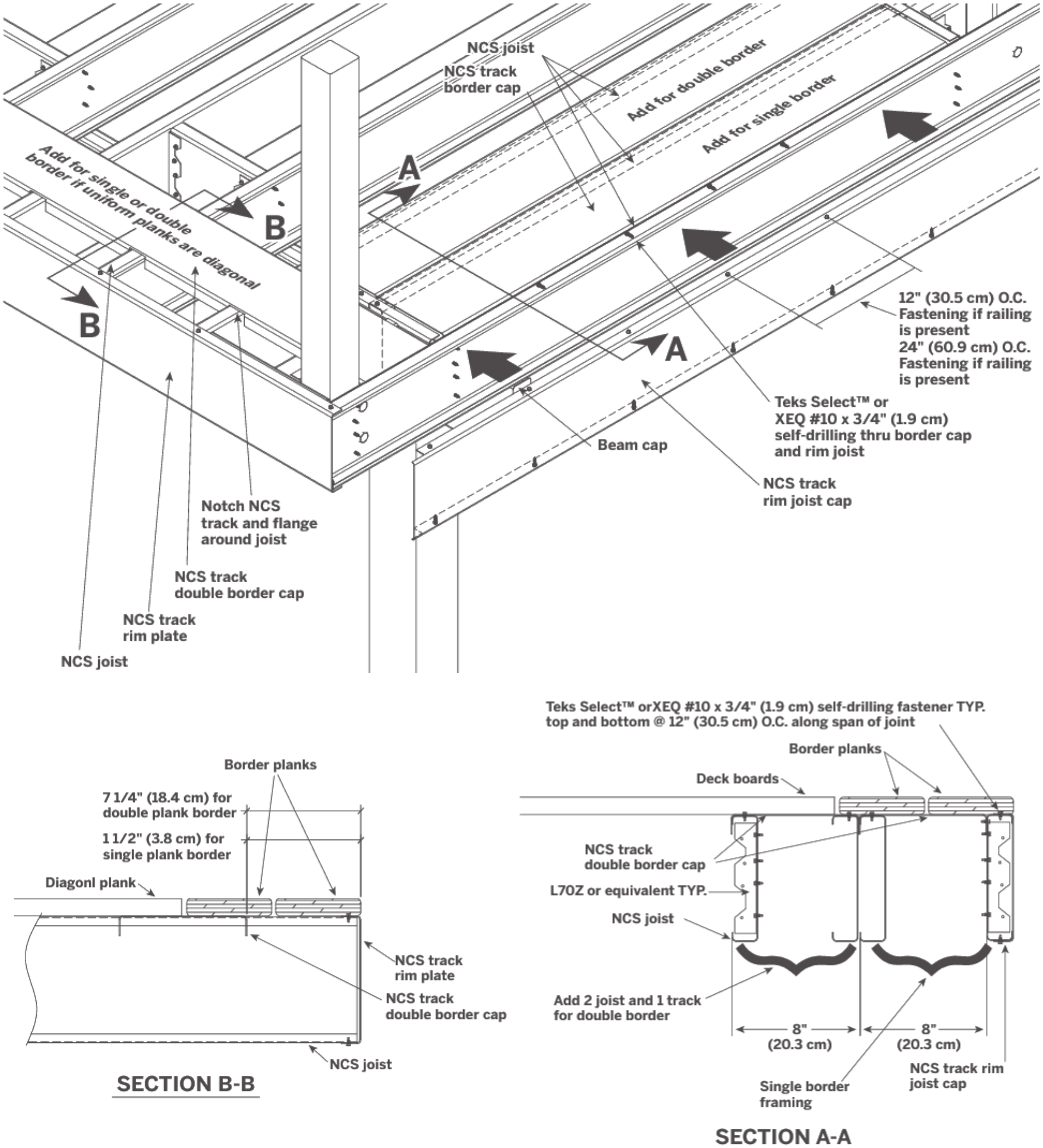

Figure 32. Border Plank Framing Connection Details

9.3.13.1 Breaker board framing details are shown in **Figure 33** and **Figure 34**.

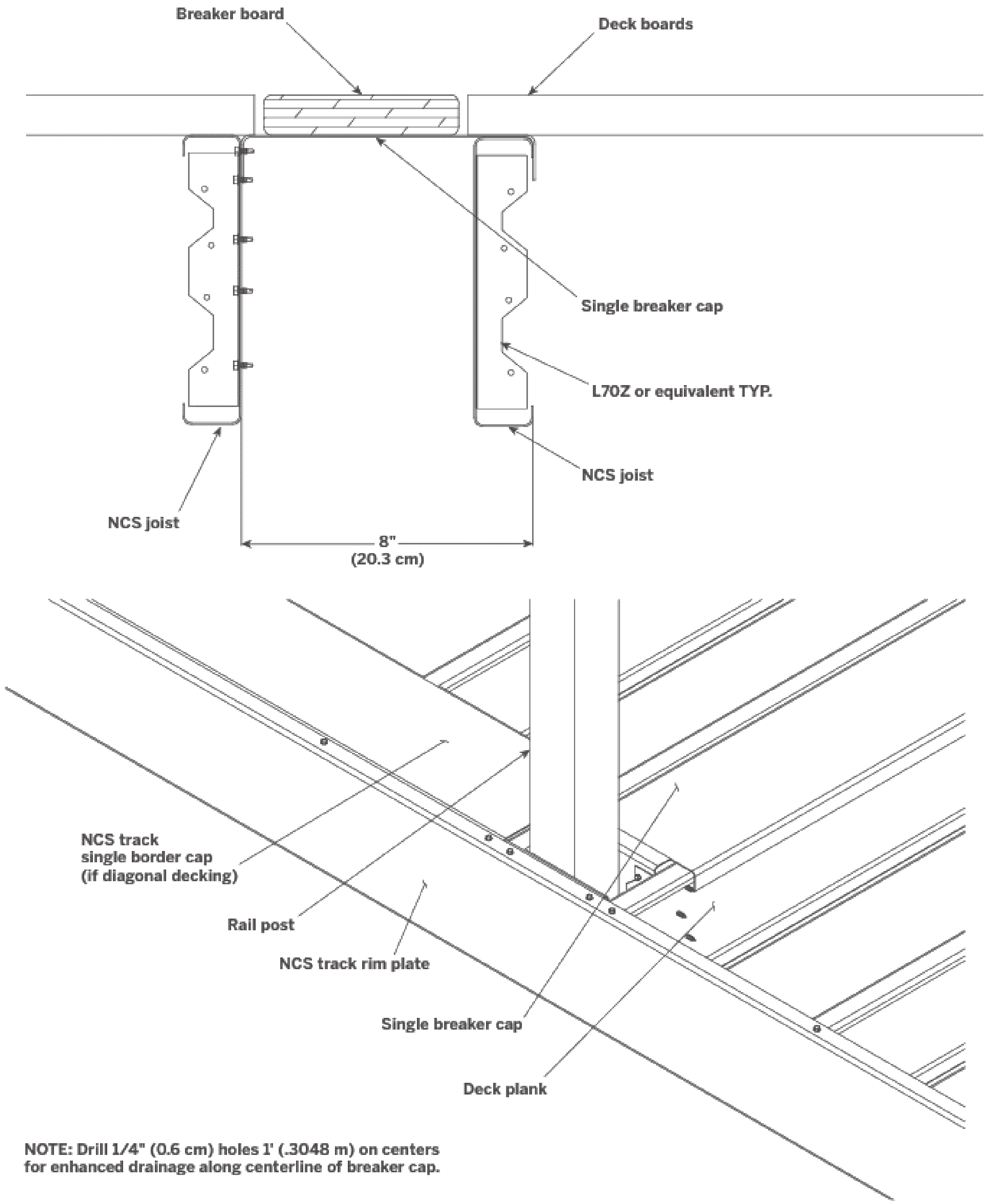

Figure 33. Breaker Board Framing (Typical) Single Break

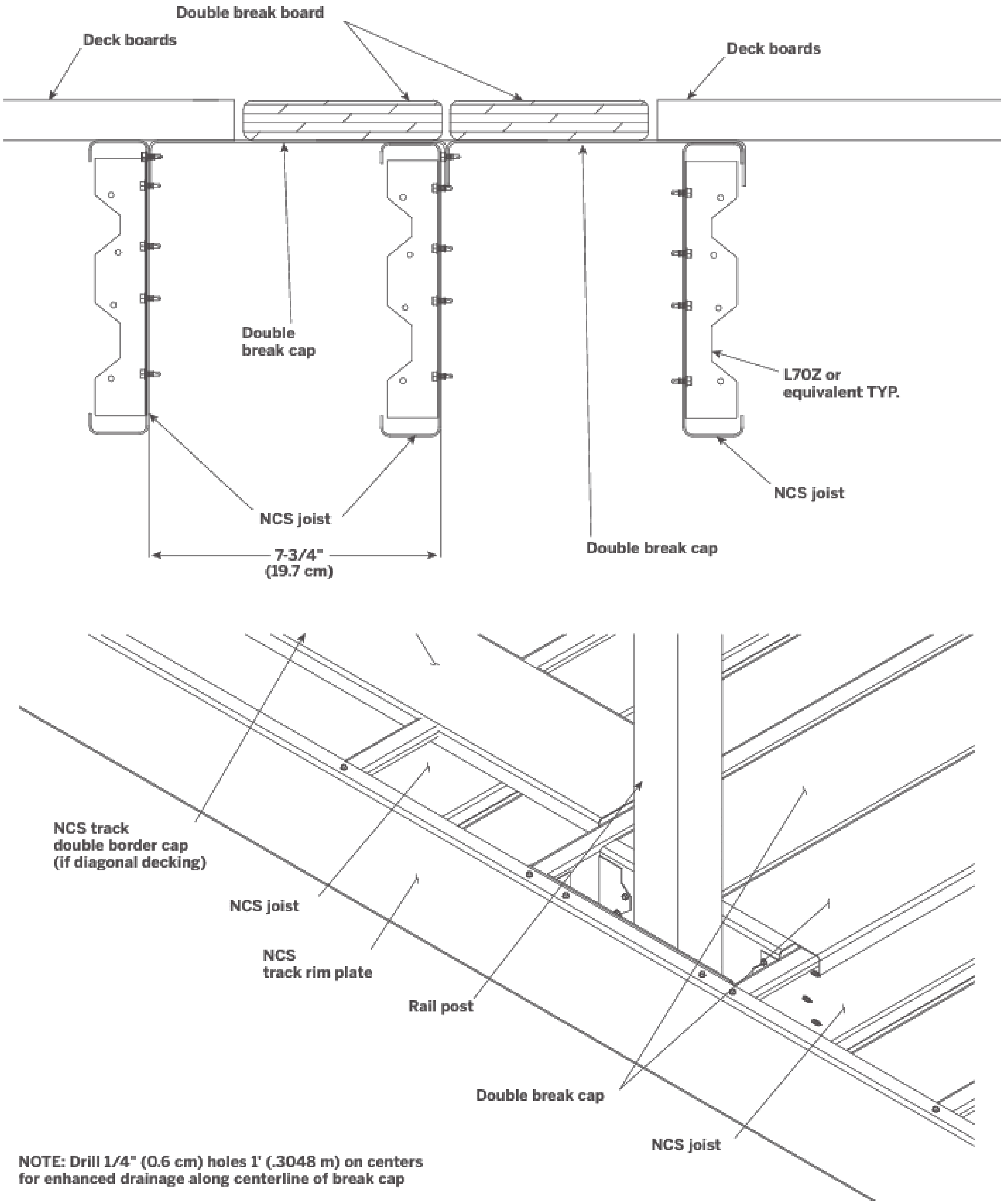

Figure 34. Breaker Board Framing (Typical) Double Break

9.3.14 NCS Stairs – Ladder Box

9.3.14.1 An overview of stair assembly is shown in **Figure 35**.

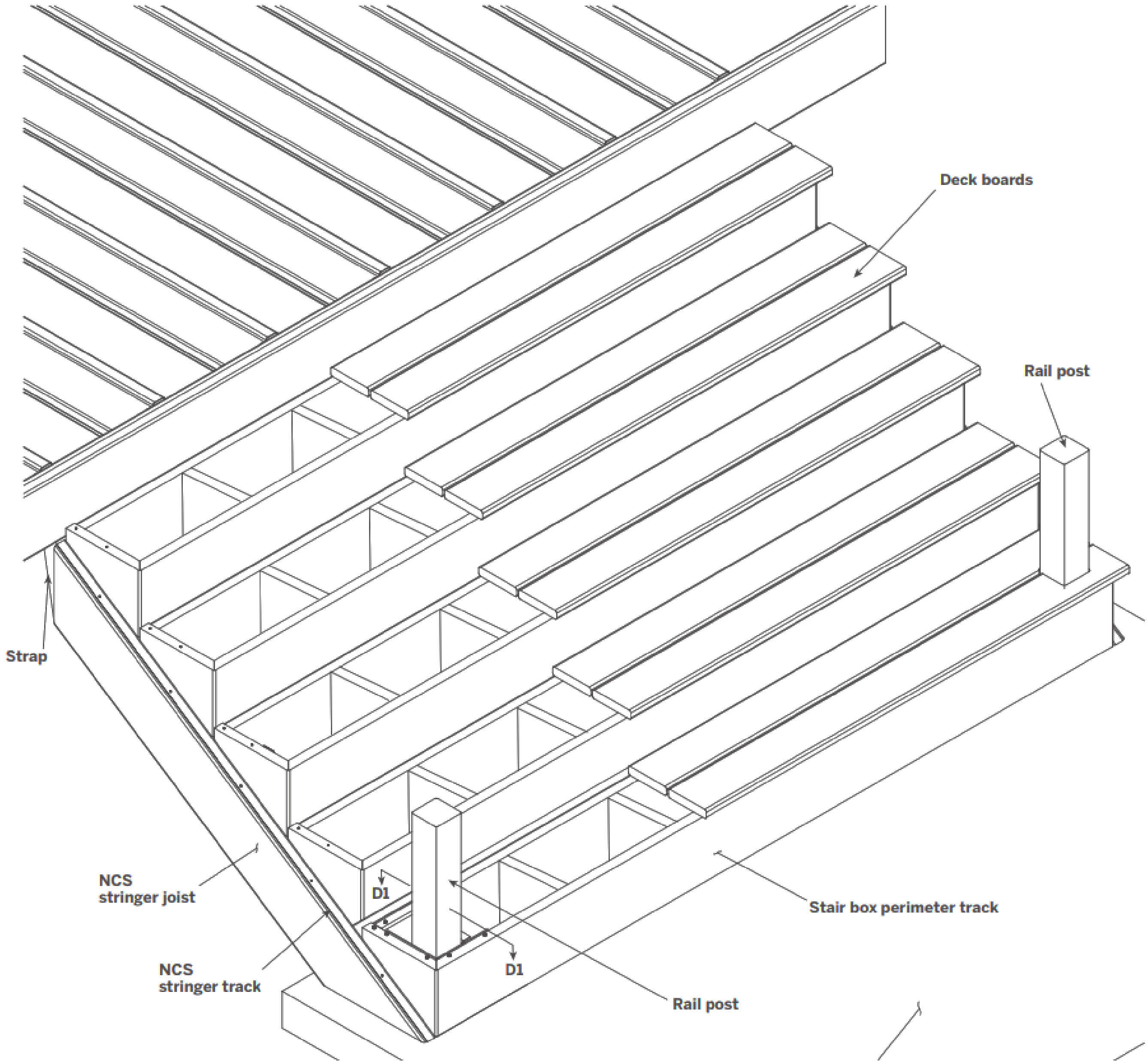

Figure 35. NCS Stair Overview

9.3.14.2 Each stair tread substructure is comprised of NCS Joists sandwiched in between two NCS Tracks.

9.3.14.2.1 NCS Joists are spaced maximum of 12″ o.c and are attached to the tracks with #10 x $^3/_4$″ self-drilling screws (one at the top flange and one at the bottom flange). See **Figure 36**.

9.3.14.2.1.1 Joists shall be long enough to comply with the applicable building code for width of stair treads.

9.3.14.2.2 Assemble enough to create a slope that complies with the applicable building code for stair rise.

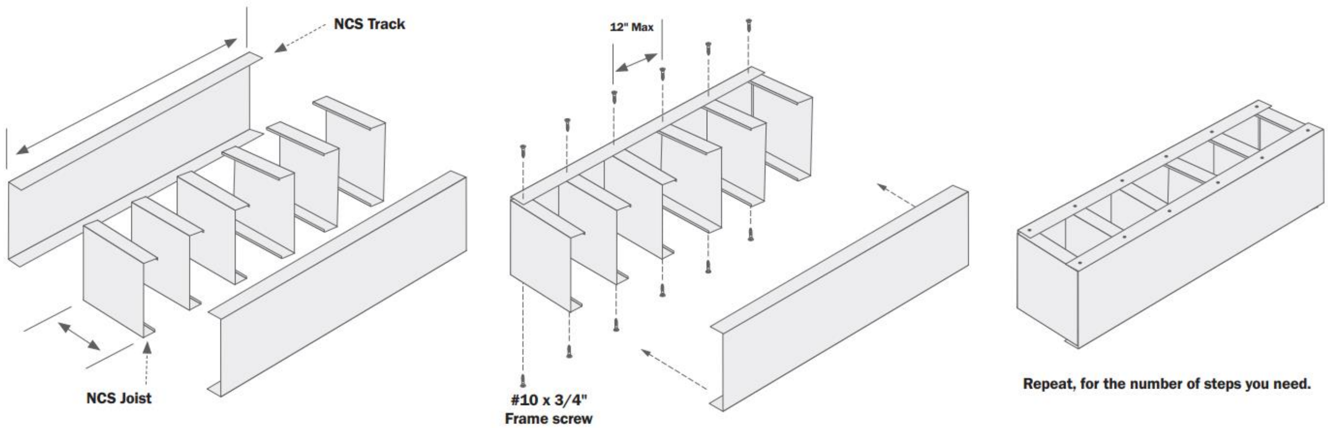

Figure 36. NCS Stair – “Stair Box Step”

9.3.14.2.3 Cut NCS Tracks into stringers that match the slope of the stairs.

9.3.14.2.3.1 Secure the top step to the outer rim joist or outer beam with two #10 x $^3/_4$″ self-drilling screws in each cavity.

9.3.14.2.3.2 Attach the stringer to the ends with six #10 x $^3/_4$″ self-drilling screws.

9.3.14.2.3.3 Repeat for the subsequent steps.

9.3.14.2.3.4 See **Figure 37**.

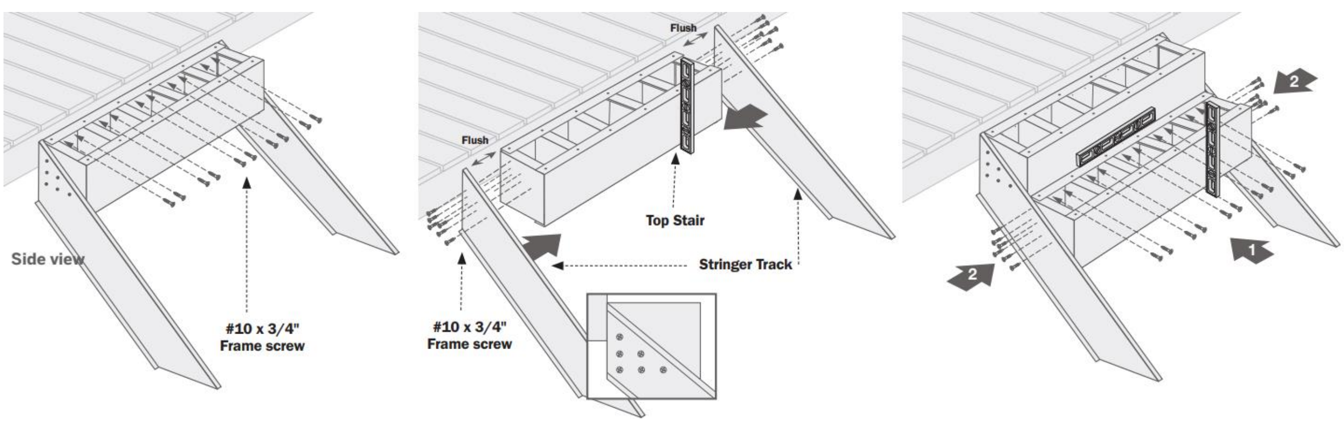

Figure 37. NCS Stair – “Ladder Box Step”

9.3.14.2.3.5 For the bottom step, rip cut the "stair box steps" and secure the pieces to the desired height of the bottom step.

9.3.14.2.3.5.1 See **Figure 38**.

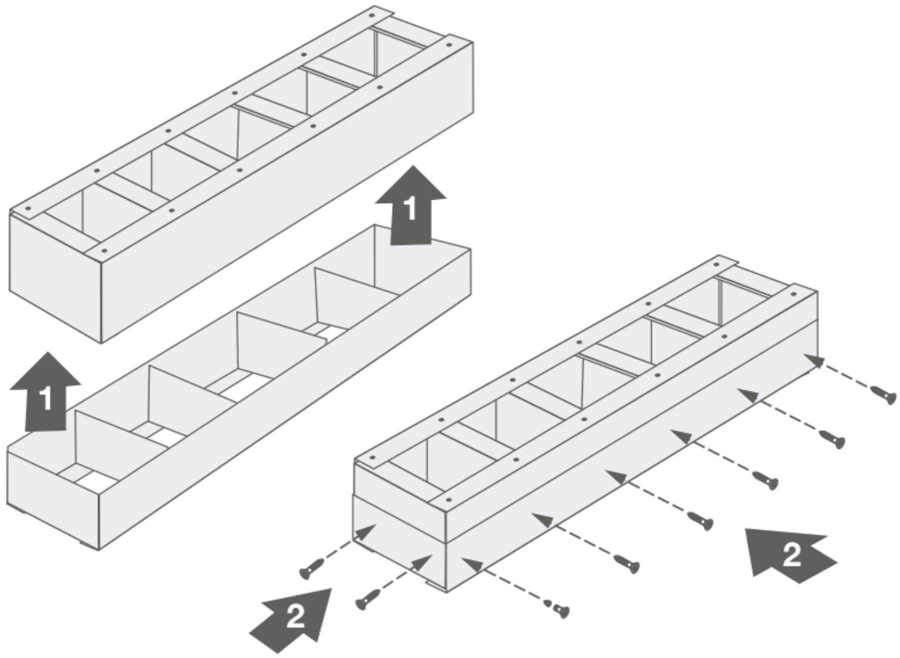

Figure 38. NCS Stair – Bottom Step Assembly

9.3.14.2.3.6 Rip NCS Joists to the same profile as the stringer and secure the Stringer Joists to the Stringer Tracks with #10 x $^{3}/_{4}''$ self-drilling screws (one at the top flange and one at the bottom flange).

9.3.14.2.3.7 Reinforce the connection of the stair to the outer rim joist or outer beam with a Simpson Strong-Tie, ST22 strap tie on each side of the stair.

9.3.14.2.3.7.1 The ST22 strap ties shall be attached to the stair stringer. See **Figure 39** and **Figure 40**.

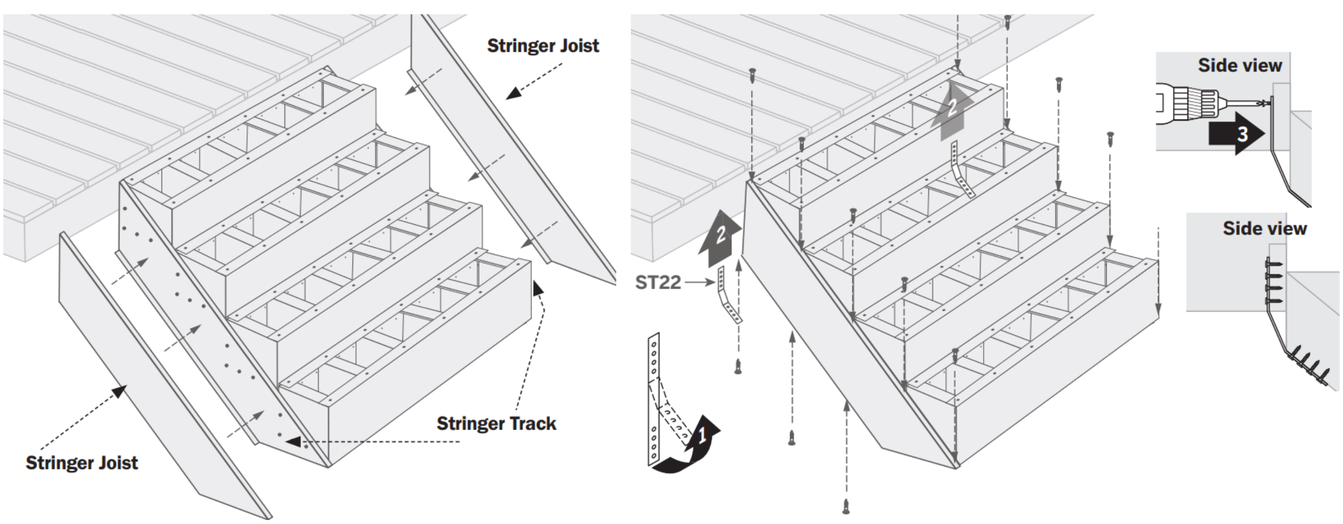

Figure 39. NCS Stair – Stringer Connection Details

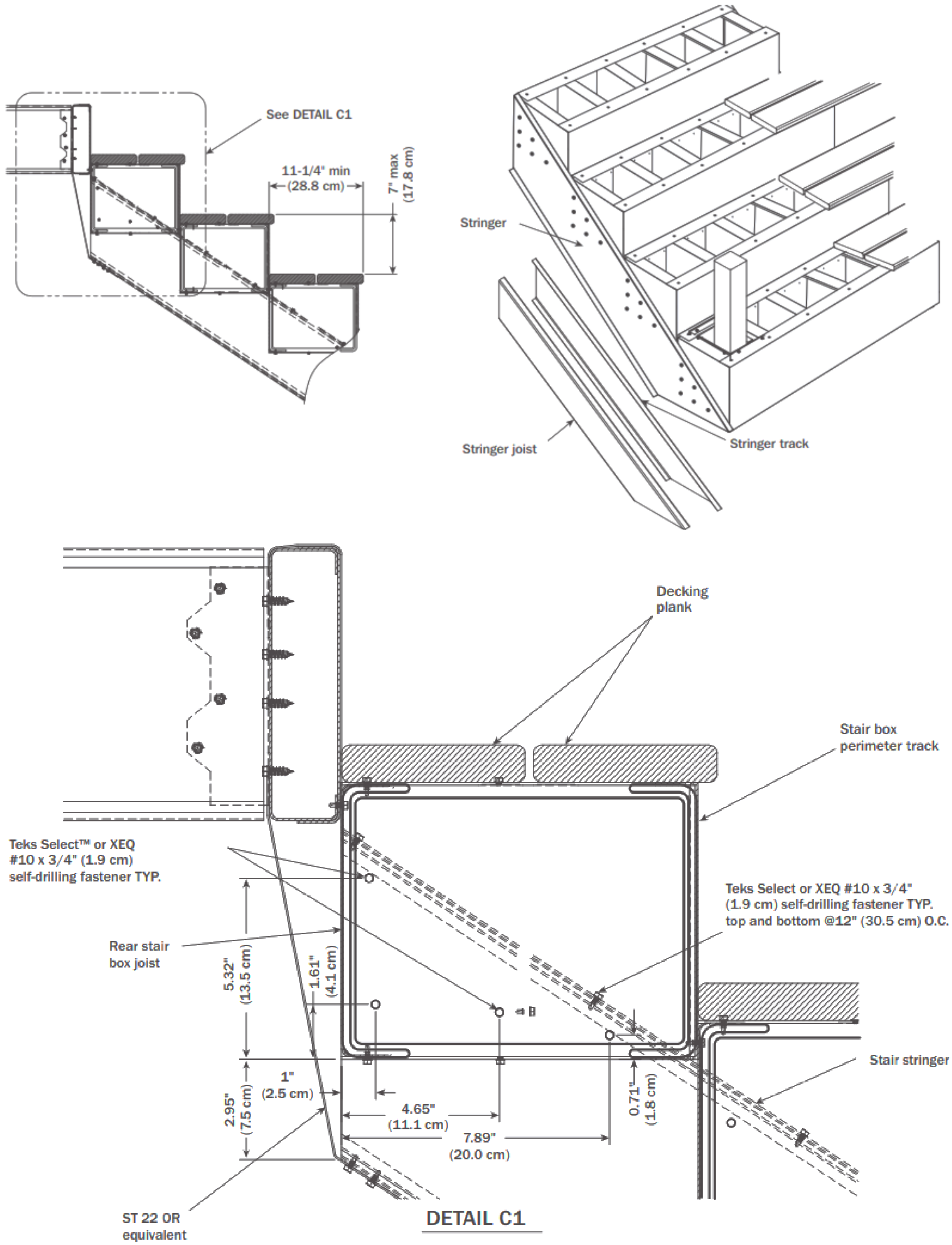

Figure 40. NCS Stair – Additional Stair Stringer Details

9.3.14.2.3.8 Details for a "center stringer," where needed, are shown in **Figure 41**.

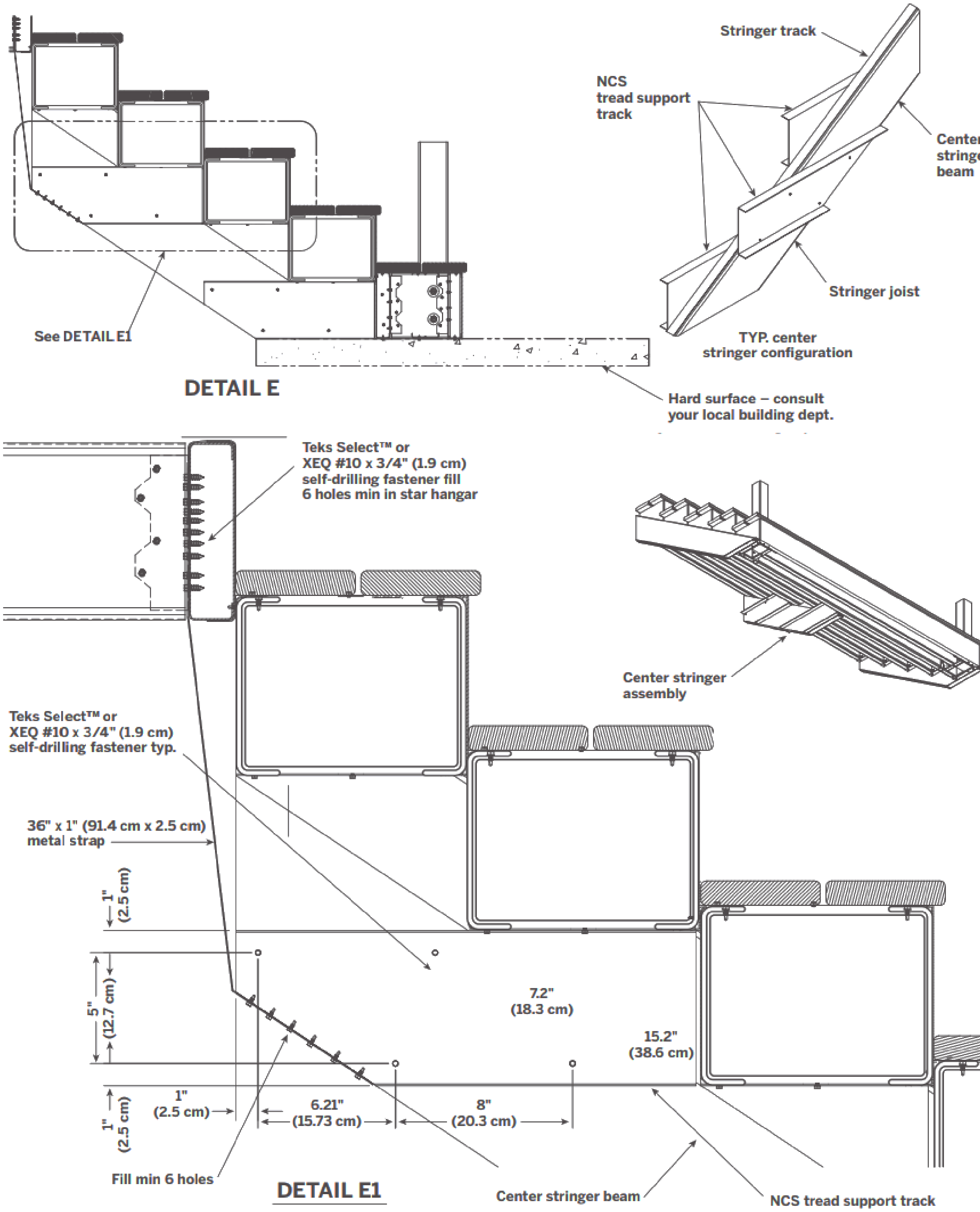

Figure 41. NCS Stair – Stair Center Stringer Details

9.3.14.3 Railing post attachment is detailed in **Figure 42**.

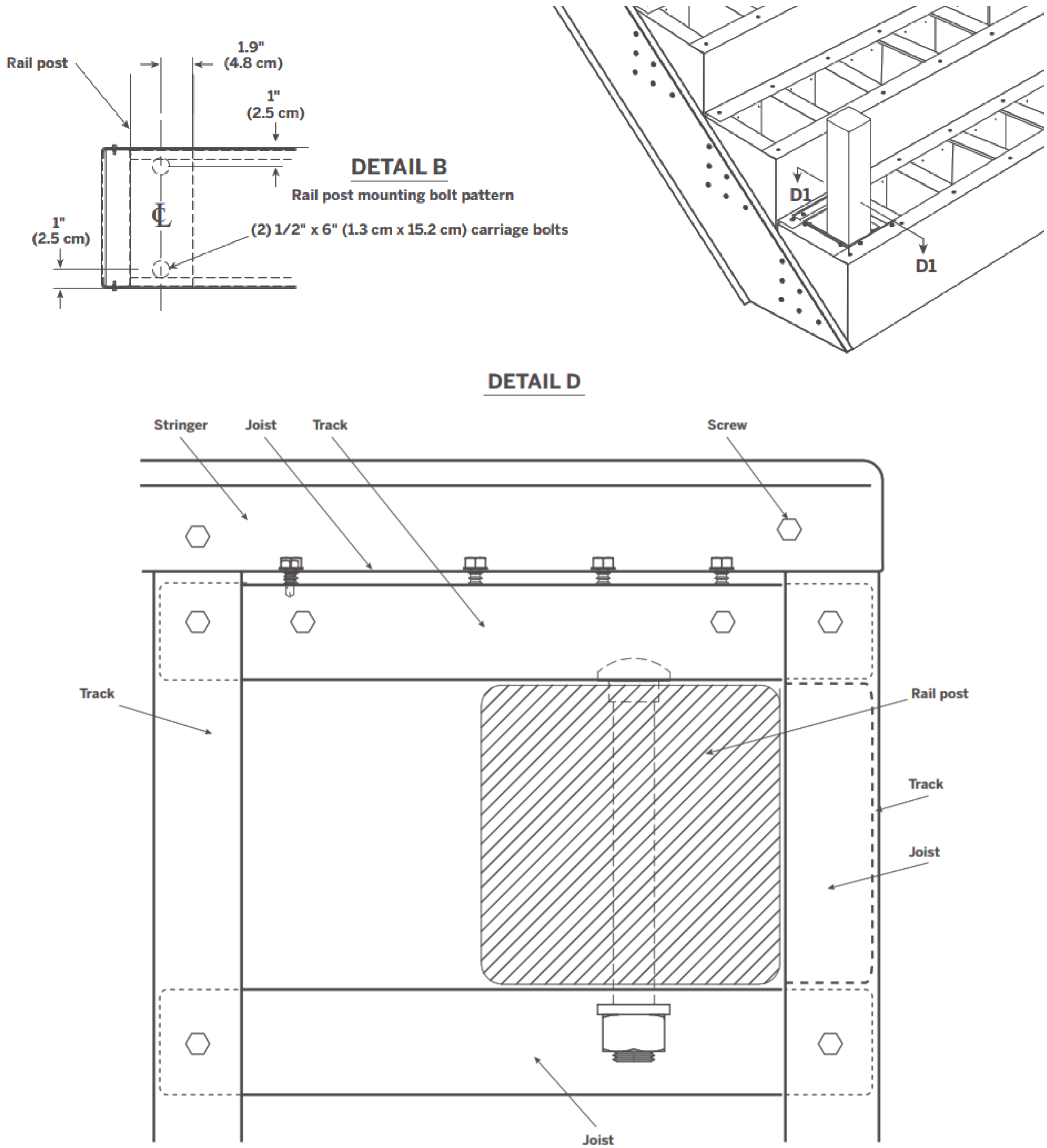

Figure 42. NCS Stair – Stair Railing Post Details

9.3.15 NCS Stairs – NCS Stringer

9.3.15.1 NCS Stairs using NCS Stringers are laid out as follows.

9.3.15.1.1 Exterior stringer pairs spaced 10″ o.c.

9.3.15.1.2 Intermediate stringer pairs spaced 12″ o.c.

9.3.15.1.3 A model of a NCS Stringer is shown in **Figure 43**.

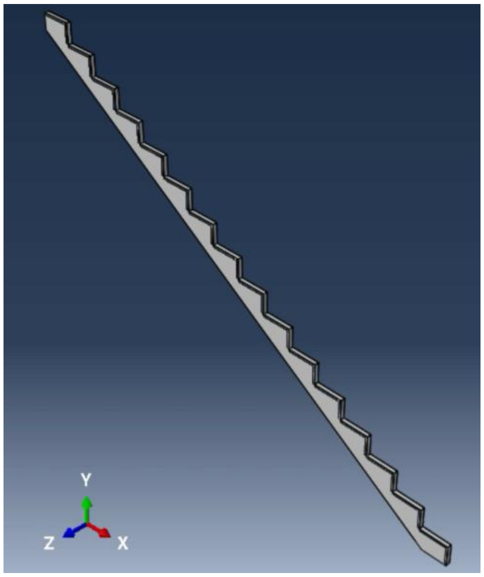

Figure 43. NCS Stringer (Model)

9.3.15.1.4 NCS Stringers are built-up thin-walled steel member (ASTM A653, SS50 with a base metal thickness of 0.060″) comprising of two components: a U-shaped stepped and folded, and a center stepped and folded piece with bent tabs that fit inside the U-shaped piece.

9.3.15.1.4.1 These two pieces are welded together at the horizontal and vertical seams (three $1^{1}/_{2}$″ long welds on the horizontal and two $1^{1}/_{2}$″ long welds on the vertical).

9.3.15.1.4.2 NCS Stringers have 16 steps.

9.3.15.1.4.2.1 Each step has a rise of $6^{3}/_{4}$″ to $7^{1}/_{4}$″ (in 1/8″ increments), and a run of $10^{1}/_{2}$″.

9.3.15.1.4.2.2 Stringers may be cut down to the appropriate length.

9.3.15.2 NCS Stringers are attached to the deck frame via NCS Stair Straps.

9.3.15.2.1 Details of the NCS Stair Straps are shown in **Figure 44**.

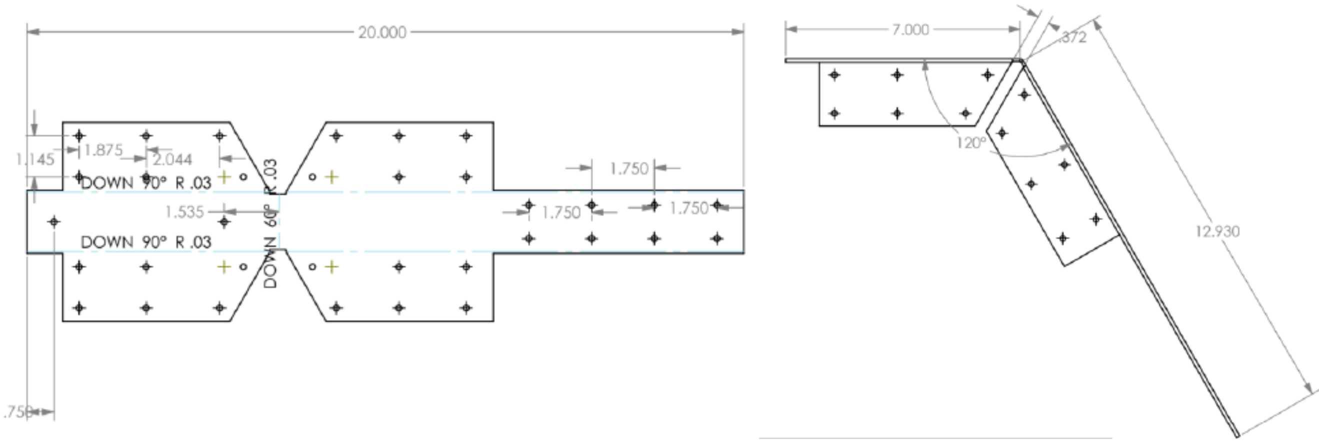

Figure 44. NCS Stair Strap (Diagram)

9.3.15.2.2 NCS Stair Straps are fabricated from ASTM A653 SS50 grade steel with a base metal thickness of 0.078″.

9.3.15.2.3 The straps are fastened to the deck frame and stringer using Simpson StrongTie self-tapping fasteners.

9.3.15.2.3.1 Eight (8) fasteners connect the strap to the deck.

9.3.15.2.3.2 Six (6) fasteners connect the strap to each side of the stringer.

9.3.15.2.3.3 Two (2) fasteners connect the strap to the bottom of the NCS Stringer.

9.3.15.2.4 NCS Stringers are anchored to the ground via NCS Railing Post Brackets.

9.3.15.2.4.1 NCS Railing Post Brackets are fabricated with ASTM A653 SS50 grade steel with a base metal thickness of 0.25″.

9.3.15.2.4.2 There are two brackets installed between each of the exterior stringer pairs, and fastened with four #10 self-tapping screws per face (and per bracket).

9.3.15.2.4.3 The outermost bracket is bolted to a concrete pad with two $^{1}/_{2}$″ diameter anchor bolts.

9.3.15.2.4.4 Details are shown in **Figure 45**.

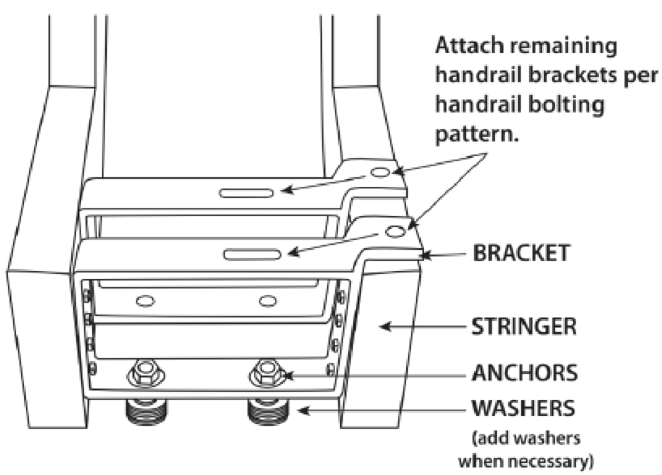

Figure 45. NCS Railing Post Bracket Installation with Ground-Level Anchorage

9.3.15.2.4.5 Stair tread material shall be notched around the raised tabs of the NCS Railing Post Bracket as shown in **Figure 46**.

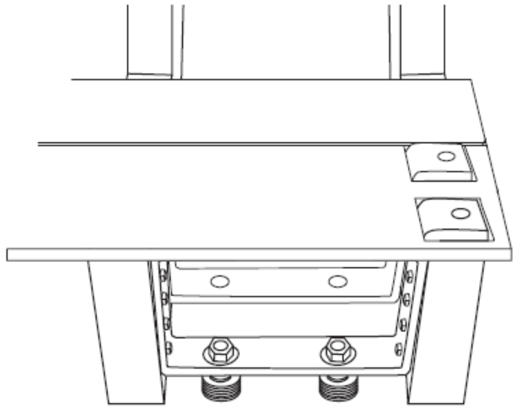

Figure 46. Notched Stair Tread

9.3.15.2.4.6 Handrail post shall be installed using galvanized or stainless steel bolts, $^{3}/_{8}$″ x 1$^{1}/_{4}$″ (max), threaded into the raised tabs over stringer.

9.3.15.2.4.6.1 Threadlock or lock washers shall be applied to ensure bolt remains in place.

9.3.15.2.4.6.2 Holes may be drilled into stair tread material where required for the remaining fastener slots on the handrail post base and fastened with $^{3}/_{8}$″ x 2″ (min) galvanized or stainless steel bolts as shown in **Figure 47**.

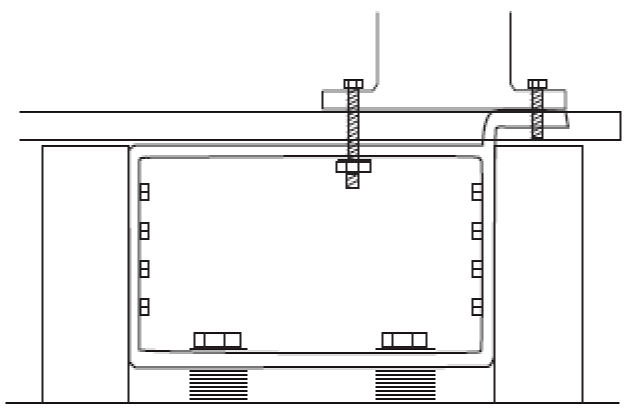

Figure 47. Handrail Installation onto NCS Railing Post Bracket

9.3.16 New Castle Steel Decks may be grounded as shown in **Figure 48**.

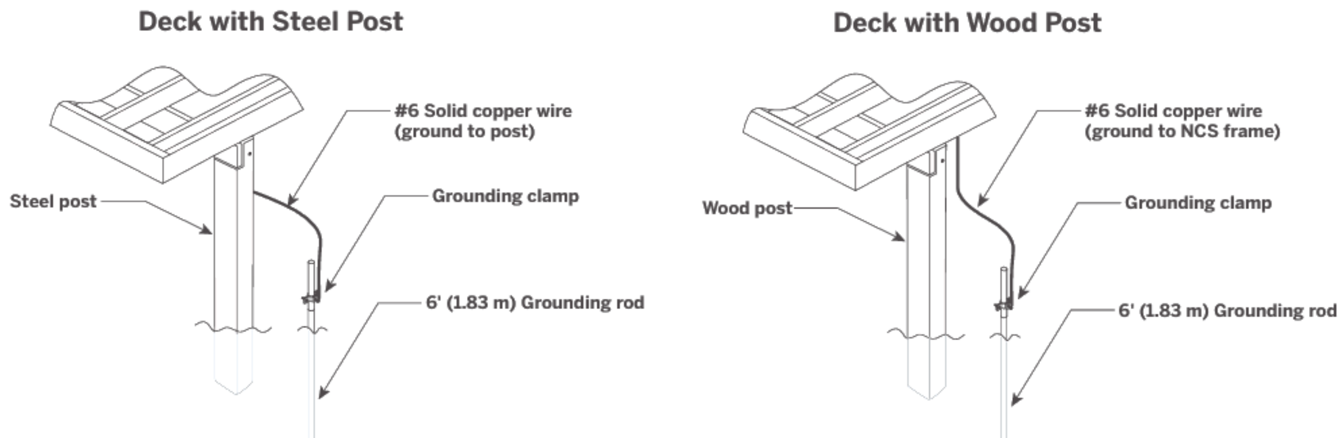

Figure 48. Deck Framing Detail – Grounding (Optional)

10 Substantiating Data

10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

10.1.1 Reports of engineering analysis in accordance with AISI S100 from approved source.

10.1.2 Lateral strength structural analysis report of NCS deck system from approved source.

10.1.3 Structural analysis report of rail post connection to structural plastic blocking from approved source.

10.1.4 Structural analysis report of NCS Stair Stringer from approved source.

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability and safety.

10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.

10.5 Testing and engineering analysis: The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.[27]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for New Castle Steel Deck Framing System on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, New Castle Steel Deck Framing System has performance characteristics that were tested and/or meet applicable regulations and is suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, New Castle Steel Deck Framing System shall be approved for the following applications:

11.2.1 Use as the substructure of an exterior deck.

11.3 Unless exempt by state statute, when New Castle Steel Deck Framing System is to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.

11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from New Castle Steel®, Inc..

11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[28] are similar) in pertinent part states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

11.6 **Approved**:[29] Building regulations require that the building official shall accept duly authenticated reports.[30]

11.6.1 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited.

11.6.2 An approved source is *"approved"* when an RDP is properly licensed to transact engineering commerce.

11.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB-Accredited Product Certification Body – Accreditation #1131.

11.8 Through the IAF Multilateral Agreements (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.[31]

12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

12.2 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.

12.3 Framing members and their connections shall be designed and installed in accordance with IBC Section 2210 and IRC Section R301.1.3.

12.4 Fasteners shall used in New Castle Steel Deck System steel framing system shall be corrosion resistant, self-drilling/tapping screws conforming to ASTM C1513, and installed with an edge distance no less than 1/2″.and center-to-center spacing spacing denoted in **Section 9**.

12.4.1 Screws shall extend through the steel a minimum of three exposed threads

12.5 Adequate joist top flange bracing to preclude lateral torsional buckling.

12.6 Additional design and construction are required for anchorage of lateral loads to the primary framing in accordance with IBC Section 1604.8.3, IRC Section R301, and IRC Section R507.9.1.3.

12.7 New Castle Steel Deck System steel framing system shall be limited to sites subjected to a maximum design wind speed of 150 mph, Exposure C, and a maximum design snow load of 150 psf.

12.8 Steel $1^1/_4''$ flange tracks have not been evaluated for use as individual joists.

12.9 Conventional wood supports for guards and substructure steel framing system are not within the scope of this report and are subject to evaluation and approval by the building official.

12.10 Supports shall satisfy the design load requirements specified in and IBC Chapter 16 and shall provide suitable material for anchorage. Where required by the building official, engineering calculations and details shall be provided.

12.11 Compatibility of fasteners and other metallic components with wood supports for guards and substructure steel framing system, including chemically treated wood, is not within the scope of this report.

12.12 Connections and conditions outside of this report shall be verified by an RDP.

12.13 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

12.13.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

12.13.2 This report and the installation instructions shall be submitted at the time of permit application.

12.13.3 This innovative product has an internal quality control program and a third-party quality assurance program.

12.13.4 At a minimum, this innovative product shall be installed per **Section 9** of this report.

12.13.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.

12.13.6 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4 and IRC Section R109.2.

12.13.7 The application of this innovative product in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2 and any other regulatory requirements that may apply.

12.14 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, "*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11*," all of IBC Section 104, and IBC Section 105.4.

12.15 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

12.16 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

13.1 The innovative product listed in **Section 1.1** is identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number and other information to confirm code compliance.

13.2 Additional technical information can be found at www.ncsteel.com .

14 Review Schedule

14.1 This report is subject to periodic review and revision. For the latest version, visit drjcertification.org.

14.2 For information on the status of this report, please contact DrJ Certification.

15 Approved for Use Pursuant to U.S. and International Legislation Defined in Appendix A

15.1 New Castle Steel Deck Framing System is included in this report published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services. This report states either that the material, product or service meets recognized standards or has been tested and found suitable for a specified purpose. This report meets the legislative intent and definition of being acceptable to the AHJ.

Appendix A

1 Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:

1.1.1 Advance innovation

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints

1.1.3 Benefit consumers through lower prices, better quality, and greater choice

1.2 **Adopted Legislation**: The following local, state and federal regulations affirmatively authorize this innovative product to be approved by AHJs, delegates of building departments and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies, and/or methods of construction. The goal is to "*protect economic freedom and opportunity by promoting free and fair competition in the marketplace*."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),[32] where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years[33] and/or a $5,000,000 fine or 3 times the value of[34] the Intellectual Property (IP) and Trade Secrets (TS).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of Listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[35] that are not specifically provided for in any regulation, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[36]

1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence provided in writing, that specific legislation have been violated by an individual registered PE.

1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.[37]

1.3 **Approved[38] by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards that apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[39] The Superintendent of Building Approved Testing Agency Roster is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a DrJ Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.[40]

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed[41] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[42] (i.e., ANAB, International Accreditation Forum also known as IAF, etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods or systems of construction shall be approved, without further evaluation by:

1.6.1 A certification mark or listing of an approved certification agency,

1.6.2 A test report from an approved testing laboratory,

1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity, or

1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed and sealed by a professional engineer or architect, licensed in Florida.

1.6.5 For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods:

1.6.5.1 A certification mark, listing or label from a commission-approved certification agency indicating that the product complies with the code,

1.6.5.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code,

1.6.5.3 A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code, 1.6.5.4 A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code, or

1.6.5.5 A statewide product approval issued by the Florida Building Commission.

1.6.6 The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).

1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

1.8 **Approved by New Jersey**: Pursuant to the 2018 Building Code of New Jersey in IBC Section 1707.1 General,[43] it states: "*In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)*".[44] Furthermore N.J.A.C 5:23-3.7 states: "*Municipal approvals of alternative materials, equipment, or methods of construction*."

1.8.1 **Approvals**: Alternative materials, equipment or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations.

1.8.1.1 A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.8.1.2 Reports of engineering findings issued by nationally recognized evaluation service programs such as but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.8.2 The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item the previous paragraph, given that the listed entities are no longer in existence and/or do not provide "*reports of engineering findings*."

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[45] and Part 3280,[46] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:

1.9.1 "*All construction methods shall be in conformance with accepted engineering practices*."

1.9.2 "*The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur*."

1.9.3 "*The design stresses of all materials shall conform to accepted engineering practice*."

1.10 **Approval by US, Local and State Jurisdictions in General**: In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:

1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[47]

1.10.2 For innovative alternatives and/or methods of construction, the building official shall accept duly authenticated reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.[48]

1.10.2.1 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.

1.10.2.2 An approved source is *"approved"* when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[49]

1.10.3 The design strengths and permissible stresses of any structural material…shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.[50]

1.11 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, designs, services, and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.11.2 **Approved**: The purpose of the MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA and subsequently, acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, designs, services, and/or methods of construction.

1.11.3 ANAB is an IAF-MLA signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.[51]

1.11.4 Therefore, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.[52]

1.12 Approval equity is a fundamental commercial and legal principle.[53]

Notes

1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702

3 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11

4 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as

5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice

6 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies

7 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

8 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency

9 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source

10 https://www.law.cornell.edu/uscode/text/18/1832 (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of $5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

11 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

12 https://www.cbitest.com/accreditation/

13 https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104:~:text=to%20enforce%20the%20provisions%20of%20this%20code

14 https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11:~:text=Where%20the%20alternative%20material%2C%20design%20or%20method%20of%20construction%20is%20not%20approved%2C%20the%20building%20official%20shall%20respond%20in%20writing%2C%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1:~:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%2C%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%2C%20stating%20the%20reasons%20therefore

15 https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11

16 https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

17 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

18 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

19 Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

20 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed AND https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled

21 https://www.istructe.org/journal/volumes/volume-79-(published-in-2001)/issue-6/the-frequency-ranges-of-dance-type-loads/

22 https://www.icevirtuallibrary.com/doi/epdf/10.1680/stbu.2005.158.2.109

23 https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4

24 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

25 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

26 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.

27 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

28 2018 IFC Section 104.9

29 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

30 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

31 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.

32 http://www.drjengineering.org/AppendixC AND https://www.drjcertification.org/cornell-2016-protection-trade-secrets

33 https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years

34 https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided

35 https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

36 IBC 2021, Section 1706.1 Conformance to Standards

37 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

38 See **Section 11** for the distilled building code definition of **Approved**

39 Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

40 https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

41 New York City, The Rules of the City of New York, § 101-07 Approved Agencies

42 New York City, The Rules of the City of New York, § 101-07 Approved Agencies

43 https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

44 https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

45 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

46 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

47 IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

48 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

49 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

50 IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.

51 https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

52 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

53 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission