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DIVISION: 05 – METALS

Section: 05 14 00 – Structural Aluminum

Section: 05 25 00 – Aluminum Joist Framing

REPORT HOLDER:

WINTERGREEN CONSTRUCTION PRODUCTS, LLC

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844-DEXSPAN

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REPORT SUBJECT:

DEXSPAN Aluminum Framing System

1.0 SCOPE OF EVALUATION

1.1. This Research Report addresses compliance with the following Codes:

- 2018, 2015, 2012 *International Building Code*® (IBC)
- 2018, 2015, 2012 *International Residential Code*® (IRC)

Note, this report references the 2018 codes. Section numbers for earlier versions of the codes may differ.

1.2. **DEXSPAN** has been evaluated for the following properties:

- Structural Performance

1.3. **DEXSPAN** is an aluminum framing support system used for the substructure of exterior decks and rooftop deck structures.

2.0 STATEMENT OF COMPLIANCE

DEXSPAN complies with the Codes listed in Section 1.1, for the properties stated in Section 1.2 and uses stated in Section 1.3, when installed as described in this report, including the Conditions of Use stated in Section 6.

3.0 DESCRIPTION

3.1. Materials and Processes – **DEXSPAN** is an assemblage of painted extruded aluminum components, and fastened with metal fasteners

3.1.1. Deck and roof joists are manufactured from 6063-T6 aluminum alloy with nominal wall thickness of 0.125". See Figure 2 for section profiles.

3.1.2. Deck frame members are manufactured from 6063-T6 aluminum alloy with nominal wall thickness of 0.125". See Figure 3 for nominal section profiles.

3.1.3. Corner and intermediate support post brackets are manufactured from 6063-T6 aluminum alloy with thickness of 0.120". See Figure 9 for profiles.

3.1.4. Aluminum beams and support posts are manufactured from 6061-T6 aluminum alloy with a wall thickness of 1/4", in overall dimensions of 4" by 4" and 6" by 6". See Figure 4 for nominal section profiles.

3.1.5. Aluminum Clip Angles are used to connect joists to deck beams and are manufactured from 6063-T6 aluminum alloy with a nominal wall thickness of 1/4". See Figure 12.

3.1.6. Aluminum roof joist "T" and "F" clips are used to connect roof joists to the roof joist ledger and are manufactured from 6063-T6 aluminum alloy with a nominal wall thickness of 0.188 inches. See Figure 7 and Figure 8.

4.0 PERFORMANCE CHARACTERISTICS

4.1. Allowable maximum spans for joists and deck beams are given in Tables 1 through 5.

4.2. Allowable maximum heights for aluminum support posts are given in Table 6.



4.3. *DEXSPAN* aluminum framing system guardrail support attachments (Figure 7) are designed to resist a concentrated load as described in IRC Table R301.5 for up to 42 inch high rail posts for one- and two-family dwellings, and for IBC applications are limited to a maximum span of 4 feet between posts.

4.4. *DEXSPAN* aluminum framing system has not been evaluated for anchorage to primary structure. See Section 6.3.

5.0 INSTALLATION

DEXSPAN aluminum framing system must be installed in accordance with the manufacturer's published installation instructions, the applicable Code and this Research Report. The manufacturer's published installation instructions and this Research Report must be strictly adhered to, and a copy of the instructions must be available on the jobsite during installation.

5.1. See Table 1 for component fastening schedule.

5.2. An aluminum clip angle (Figure 12) is required on both sides of each interior joist at the beam support. One clip angle is required on the interior side of each perimeter joist at the beam support.

5.3. Splicing of joists and deck beam members are outside the scope of this report.

5.4. Deck boards shall be positively fastened to each joist.

5.5. *DEXSPAN* deck support beams are attached to aluminum support posts via Simpson StrongTie brackets as identified in Table 1.

6.0 CONDITION OF USE

The *DEXSPAN* aluminum framing system described in this Research Report complies with, or is a suitable alternative to, what is specified in those Codes listed in Sections 1.0 and 2.0 of this report, subject to the following conditions:

6.1. Installation must comply with this Research Report, the manufacturer's published installation instructions and the applicable Code. In the event of a conflict between the manufacturer's instructions and this report, this report governs.

6.2. Threaded fasteners for aluminum-to-aluminum connections shall be austenitic stainless steel and shall extend through the aluminum a minimum of three exposed threads.

6.3. Additional design and construction are required for anchorage of both vertical and lateral loads to the primary framing in accordance with Section 1604.8.3 of the IBC, and IRC Sections R507.1 and R507.9.2.

6.4. Wind uplift capacity of the deck boards and deck board fasteners shall be demonstrated to the building official's satisfaction.

6.5. Design of anchorage of the support posts shall be by a qualified engineer in accordance with the referenced codes. Where required by the building official, engineering calculations shall verify that the anchorage complies with the building code for the type of framing and condition of the supporting construction.

6.6. The *DEXSPAN* aluminum framing system may be installed on roof tops, provided that the decking used has the same fire classification as the roof covering in accordance with IBC Section 1505.

6.7. *DEXSPAN* aluminum framing system is manufactured under a quality control program with inspections by Intertek.

7.0 SUPPORTING EVIDENCE

7.1. Manufacturer's drawings and installation instructions.

7.2. Reports of testing and engineering analysis demonstrating compliance with ADM1-2010 and ADM1-2015, *Aluminum Design Manual: Part 1 – A Specification for Aluminum Structures*.

7.3. Reports of testing demonstrating compliance with the post-performance requirements of ICC-ES AC273, Acceptance Criteria for Handrails and Guards, approved June 2017.

7.4. Documentation of an Intertek approved quality control system for the manufacturing of products recognized in this report.





8.0 IDENTIFICATION

The *DEXSPAN* aluminum framing system described in this Research Report are identified by a marking bearing the report holder’s name (Wintergreen Construction Products, LLC), the Intertek Mark, and the Code Compliance Research Report number (CCRR-0256).



9.0 OTHER CODES

This section is not applicable.

10.0 CODE COMPLIANCE RESEARCH REPORT USE

10.1. Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

10.2. Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

10.3. Reference to the <https://bpdirectory.intertek.com> is recommended to ascertain the current version and status of this report.

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Table 1 – Component Fastening Schedule

Connections	Fasteners
Joist to Box Perimeter Beams	<p><u>Corner Post Brackets</u> For each corner post bracket flange, three 1/4"-20 Elco Alumi-Flex or AllFlex, Type F, hex-washer head, 302 Stainless Steel screws. Minimum of 3 threads penetrate beyond the connected aluminum material. See Figure 6.</p> <p><u>Intermediate Post Brackets</u> For each intermediate post bracket flange, three 1/4"-20 Elco Alumi-Flex or AllFlex, Type F, hex-washer head, 302 Stainless Steel screws. Minimum of 3 threads penetrate beyond the connected aluminum material. See Figure 6.</p> <p><u>Box Perimeter Beam</u> Three 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws fasten an aluminum plate with flanges to the joist. The assembly the slides onto the box perimeter beam and a 16" long anti-lift clip inserted. See Figure 6.</p>
Roof Joist to Perimeter Roof Joist	<p><u>End "F" Clips</u> For each end "F" clip, three 1/4"-20 Elco Alumi-Flex or AllFlex, Type F, hex-washer head, 302 Stainless Steel screws at the pre-drilled hole locations. Minimum of 3 threads penetrate beyond the connected aluminum material. See Figure 7 and Figure 8.</p> <p><u>Intermediate "T" Clips</u> For each intermediate "T" clip, four 1/4"-20 Elco Alumi-Flex or AllFlex, Type F, hex-washer head, 302 Stainless Steel screws at the pre-drilled hole locations. Minimum of 3 threads penetrate beyond the connected aluminum material. See Figure 7 and Figure 8.</p>
Rail Post to DexSpan Framing	<p>2" square aluminum post is installed over a 13-1/4" long 1-3/4" diameter, 1/4" thick round aluminum tube, where 5-1/4" of the tube is inserted within the post bracket, and the remaining 8" is above the deck. The round aluminum tube is secured to the two-way corner post brackets with two 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws. For intermediate posts, the round aluminum tube is secured to the three-way brackets with three 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws. Screws shall penetrate a minimum of 3 threads beyond the connected aluminum material. See Figure 7.</p> <p>Connection of rails to post are designed and specified by others. The bottom rail attachment to the post must penetrate through the 2" square post and fasten to the inner aluminum tube which is secured in the deck.</p>



Connections	Fasteners		
<p>Joist to Deck Beams</p>	<p>For interior joists, Clip Angles are fastened using one 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screw to the joist. Minimum of 3 threads penetrate beyond the connected aluminum material. Two Clip Angles per interior joist.</p> <p>For perimeter joists, Clip Angles are fastened using one 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screw to the joist. Minimum of 3 threads penetrate beyond the connected aluminum material. One Clip Angle per perimeter joist.</p> <p>Each Clip Angle is fastened to deck beams with two 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws to the box beam. Minimum of 3 threads penetrate beyond the connected aluminum material.</p>		
<p>4x4 Support Post Connections (Figure 10)</p>	<p>Bracket</p>	<p>Bracket to Beam</p>	<p>Post to Bracket</p>
	<p>Simpson StrongTie BC4R, ABW44RZ</p>	<p>Eight 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws</p>	<p>Eight 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws</p>
	<p>Simpson StrongTie ABU44RZ</p>	<p>n/a</p>	<p>Two 1/2" dia, 5.5" long 18-8 stainless steel bolts</p>
<p>6x6 Support Post Connections (Figure 11)</p>	<p>Bracket</p>	<p>Bracket to Beam</p>	<p>Post to Bracket</p>
	<p>Simpson StrongTie BC6R, ABW66RZ</p>	<p>Twelve 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws</p>	<p>Twelve 1/4"-20 Elco Alumi-Flex or AllFlex Type F, hex-washer head, 302 Stainless Steel screws</p>
	<p>Simpson StrongTie ABU66RZ</p>	<p>n/a</p>	<p>Two 1/2" dia, 7.5" long 18-8 stainless steel bolts</p>



Table 2 – Deck Beam Spans (L_B) for Single-Span Joists ^{1, 2, 3, 4, 5, 6, 8, 9, 10, 11}

Beam Type	Live Load (psf)	Dead Load (psf)	Joist Spans ⁷ (L _J) Less Than or Equal to:							
			3'	4'	6'	8'	10'	12'	14'	15'
BP253	40	5	10' - 1"	9' - 2"	8' - 0"	7' - 2"	6' - 5"	5' - 11"	5' - 6"	5' - 4"
		22	9' - 9"	8' - 10"	7' - 6"	6' - 6"	5' - 10"	5' - 4"	5' - 0"	4' - 10"
	100	5	7' - 5"	6' - 9"	5' - 10"	5' - 1"	4' - 7"	4' - 2"	3' - 11"	3' - 9"
		22	7' - 5"	6' - 9"	5' - 7"	4' - 10"	4' - 4"	4' - 0"	3' - 8"	3' - 7"
RT4X8X3/16	40	5	18' - 0"	16' - 4"	14' - 3"	13' - 0"	12' - 0"	11' - 4"	10' - 9"	10' - 6"
		22	17' - 4"	15' - 9"	13' - 10"	12' - 7"	11' - 8"	10' - 10"	10' - 1"	9' - 9"
	100	5	13' - 3"	12' - 0"	10' - 6"	9' - 7"	8' - 10"	8' - 4"	7' - 10"	7' - 7"
		22	13' - 3"	12' - 0"	10' - 6"	9' - 7"	8' - 9"	8' - 0"	7' - 5"	7' - 2"
RT6X6X1/4	40	5	17' - 1"	15' - 6"	13' - 6"	12' - 4"	11' - 4"	10' - 9"	10' - 2"	9' - 11"
		22	16' - 5"	14' - 11"	13' - 1"	11' - 11"	11' - 1"	10' - 3"	9' - 6"	9' - 3"
	100	5	12' - 7"	11' - 4"	9' - 11"	9' - 1"	8' - 4"	7' - 11"	7' - 5"	7' - 2"
		22	12' - 7"	11' - 4"	9' - 11"	9' - 1"	8' - 3"	7' - 7"	7' - 0"	6' - 9"

Notes on next page.





Notes for Table 1:

- ¹ The aluminum grade for the BP253 is 6063-T6, and 6061-T6 for the RT4X8 and RT6X6.
- ² IBC/IRC 2012/2015/2018 loading and deflection criteria used for calculations.
- ³ Single span beam used in serviceability calculations.
- ⁴ Dead load includes self-weight of joist and a 5 psf or 22 psf allowance for decking.
- ⁵ Snow load allowance of 40 psf is considered.
- ⁶ Wind uplift allowance of 100 psf (strength design load in accordance with ASCE 7-10 and -16) is considered.
- ⁷ The joist span, L_j , is measured from the face of the support to the centerline of the beam support.
- ⁸ Loading considers a joist overhang of $L_j/4$.
- ⁹ Maximum allowable overhang cannot exceed $L_B/4$.
- ¹⁰ Beams are assumed to be braced at post supports.
- ¹¹ The deflection limits shown below may not prevent cracking of brittle decking material. Deflection limits shall be evaluated by the Engineer of Record, and stricter limits used if deemed necessary.
 - a. For the primary span, $L = L_B$
 - b. For the overhang, $L = 2 * L_B/4$, Note: Only downward deflection considered.

Load Combination	Allowable Deflection
Dead + Live	$L / 240$
Live	$L / 360$
Wind	$L / 180$





Table 3 – Deck Beam Spans (L_B) for Multi-Span Joists ^{1, 2, 3, 4, 5, 6, 8, 9, 10, 11}

Beam Type	Live Load (psf)	Dead Load (psf)	Joist Spans ⁷ (L _J) Less Than or Equal to:							
			3'	4'	6'	8'	10'	12'	14'	15'
BP253	40	5	8' - 7"	7' - 10"	6' - 7"	5' - 8"	5' - 1"	4' - 8"	4' - 4"	4' - 2"
		22	8' - 4"	7' - 3"	5' - 11"	5' - 2"	4' - 8"	4' - 3"	3' - 11"	3' - 10"
	100	5	6' - 4"	5' - 8"	4' - 8"	4' - 1"	3' - 8"	3' - 4"	3' - 1"	3' - 0"
		22	6' - 2"	5' - 5"	4' - 5"	3' - 10"	3' - 5"	3' - 2"	2' - 11"	2' - 10"
RT4X8X3/16	40	5	15' - 5"	14' - 0"	12' - 2"	11' - 1"	10' - 3"	9' - 6"	8' - 9"	8' - 6"
		22	14' - 10"	13' - 6"	11' - 10"	10' - 6"	9' - 5"	8' - 7"	8' - 0"	7' - 9"
	100	5	11' - 4"	10' - 3"	9' - 0"	8' - 2"	7' - 4"	6' - 8"	6' - 3"	6' - 0"
		22	11' - 4"	10' - 3"	9' - 0"	7' - 9"	7' - 0"	6' - 4"	5' - 11"	5' - 8"
RT6X6X1/4	40	5	14' - 7"	13' - 3"	11' - 6"	10' - 6"	9' - 8"	9' - 0"	8' - 3"	8' - 0"
		22	14' - 1"	12' - 9"	11' - 2"	9' - 11"	8' - 11"	8' - 1"	7' - 7"	7' - 4"
	100	5	10' - 9"	9' - 8"	8' - 6"	7' - 9"	6' - 11"	6' - 4"	5' - 11"	5' - 8"
		22	10' - 9"	9' - 8"	8' - 6"	7' - 4"	6' - 7"	6' - 0"	5' - 7"	5' - 4"

Notes on next page.





Notes for Table 2:

- ¹ The aluminum grade for the BP253 is 6063-T6, and 6061-T6 for the RT4X8 and RT6X6.
- ² IBC/IRC 2012/2015/2018 loading and deflection criteria used for calculations.
- ³ Single span beam used in serviceability calculations.
- ⁴ Dead load includes self-weight of joist and a 5 psf or 22 psf allowance for decking.
- ⁵ Snow load allowance of 40 psf is considered.
- ⁶ Wind uplift allowance of 100 psf (strength design load in accordance with ASCE 7-10 and -16) is considered.
- ⁷ The joist span, L_j , is measured from the centerline of the beam support to the centerline of the beam support or from face of support to centerline of the beam support.
- ⁸ Loading considers two-span joist condition with both spans equal to L_j .
- ⁹ Maximum allowable overhang cannot exceed $L_B/4$.
- ¹⁰ Beams are assumed to be braced at post supports.
- ¹¹ The deflection limits shown below may not prevent cracking of brittle decking material. Deflection limits shall be evaluated by the Engineer of Record, and stricter limits used if deemed necessary.
 - a. For the primary span, $L = L_B$
 - b. For the overhang, $L = 2 * L_B/4$, Note: Only downward deflection considered.

Load Combination	Allowable Deflection
Dead + Live	$L / 240$
Live	$L / 360$
Wind	$L / 180$



Table 4 – Maximum Joist Spans and Overhangs ^{1,2,3,4,5,6,7,9}

Joist Type	Dead Load (psf)	Live Load (psf)	Joist Spacing (o.c.)			
			12" O.C.	16" O.C.	12" O.C.	16" O.C.
			Allowable Span (L _J)		Allowable Overhang ⁸ (L _O)	
SJ253	5	40	14' - 5"	13' - 1"	2' - 6"	2' - 8"
		100	10' - 7"	9' - 8"	2' - 7"	2' - 5"
	22	40	14' - 0"	12' - 9"	2' - 6"	2' - 9"
		100	10' - 7"	9' - 8"	2' - 7"	2' - 5"
SJ254	5	40	15' - 0"	13' - 7"	2' - 8"	2' - 10"
		100	11' - 0"	10' - 0"	2' - 9"	2' - 6"
	22	40	14' - 7"	13' - 4"	2' - 9"	2' - 11"
		100	11' - 0"	10' - 0"	2' - 9"	2' - 6"

¹ Aluminum grade is 6063-T6.

² IBC/IRC 2012/2015/2018 loading and deflection criteria used for calculations.

³ Single span joist used in serviceability calculations.

⁴ Dead load includes self-weight of joist and a 5 psf or 22 psf allowance for decking.

⁵ Snow load allowance of 40 psf is considered.

⁶ Wind uplift allowance of 100 psf (strength design load in accordance with ASCE 7-10 and -16) is considered.

⁷ Joist spans, L_J, are valid for single and multi-span conditions.

⁸ Maximum allowable overhang cannot exceed L_J/4

⁹ The deflection limits shown below may not prevent cracking of brittle decking material. Deflection limits shall be evaluated by the Engineer of Record, and stricter limits used if deemed necessary.

a. For the primary span, L = L_J

b. For the overhang, L = 2*L_O

Load Combination	Allowable Deflection
Dead + Live	L / 240
Live	L / 360
Wind	L / 180

**Table 5 – Maximum Roof Joist (RJ251) Spans** ^{1, 2, 3, 4, 5, 6}

Live Load (psf)	Joist Spacing (o.c.)		
	12"	16"	24"
60	5' – 2"	4' – 9"	4' – 1"
100	4' – 4"	4' – 0"	3' – 6"

¹ Aluminum grade is 6063-T6.

² Single span joist used in serviceability calculations.

³ Dead load includes self-weight of joist and 22 psf allowance for decking.

⁴ Snow load allowance of 40 psf is considered.

⁵ Wind uplift allowance of 100 psf (strength design load in accordance with ASCE 7-10 and -16) is considered.

⁶ Accounts for roof joist connections.

Table 6 – DexSpan Deck Allowable Post Heights ^{1,2,3,4,5,7,9}

Post Type	Joist Span Type	Allowable Post Height (L _p)
RT4X4X1/4	Single	6' – 0"
	Multi ^{6,8}	5' – 0"
RT6X6X1/4	Single	10' – 0"
	Multi ^{6,8}	10' – 0"

¹ Post aluminum grade is 6061-T6.

² Dead load includes self-weight of joists and beams and a 22 psf allowance for decking.

³ Snow load allowance of 40 psf is considered.

⁴ Live load includes 40 and 100 psf gravity loads and 7 lbs per square foot of deck area lateral load.

⁵ Assumes L_B /4 and L_J /4 overhangs. The joist span, L_J, is measured from the face of the support to the centerline of the beam support. The beam span, L_B, is measured between post support centerlines.

⁶ Multi-span joist conditions consider pattern loading.

⁷ Post heights are valid for joist and beam types included in this report.

⁸ Multi-span joist conditions apply to decks with multiple joist support beams.

⁹ Assumes lateral deflection limit L_p /50.

¹⁰ Post spacing not to exceed the maximum beam spans in Table 3.



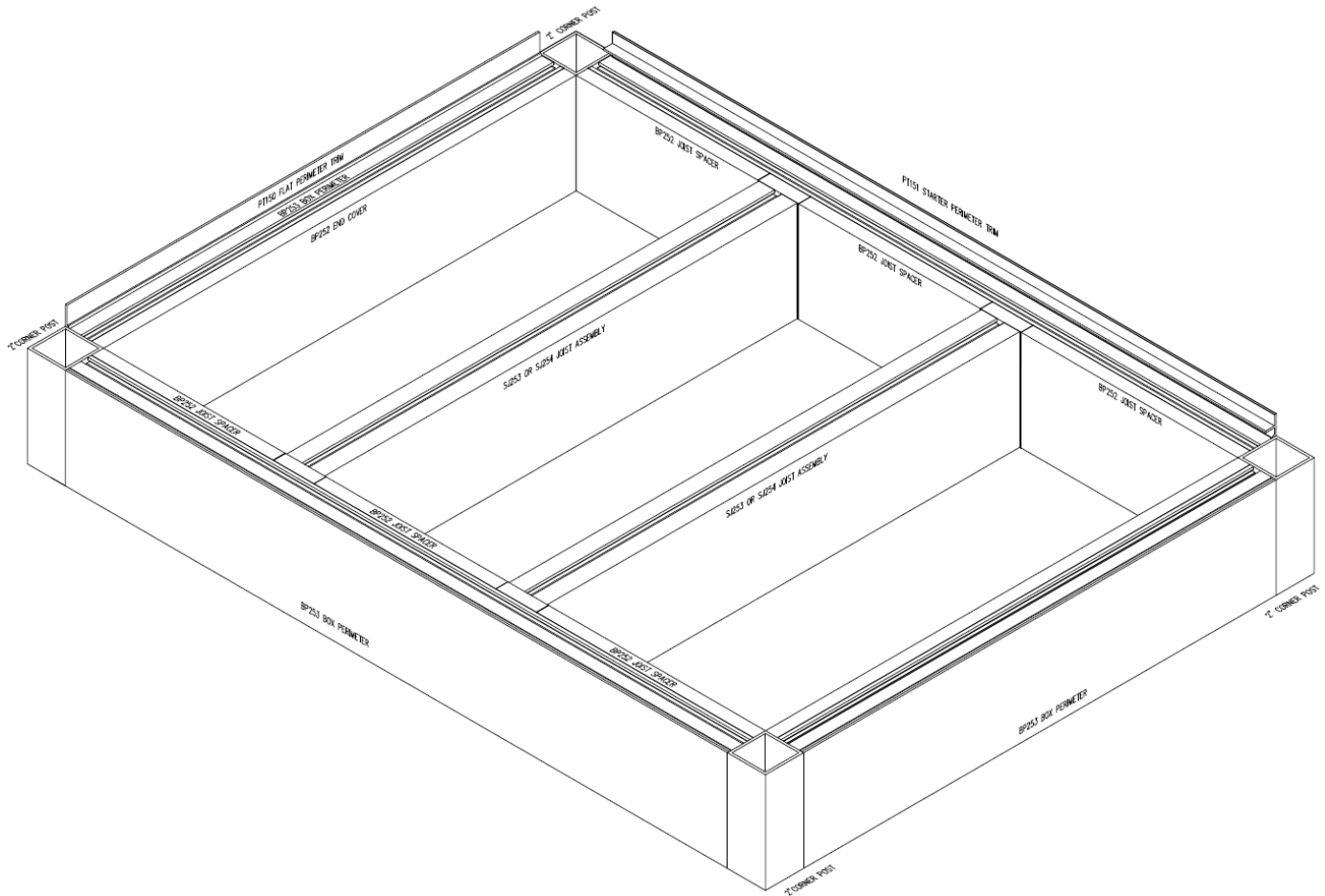


Figure 1 – DexSpan System Assembly

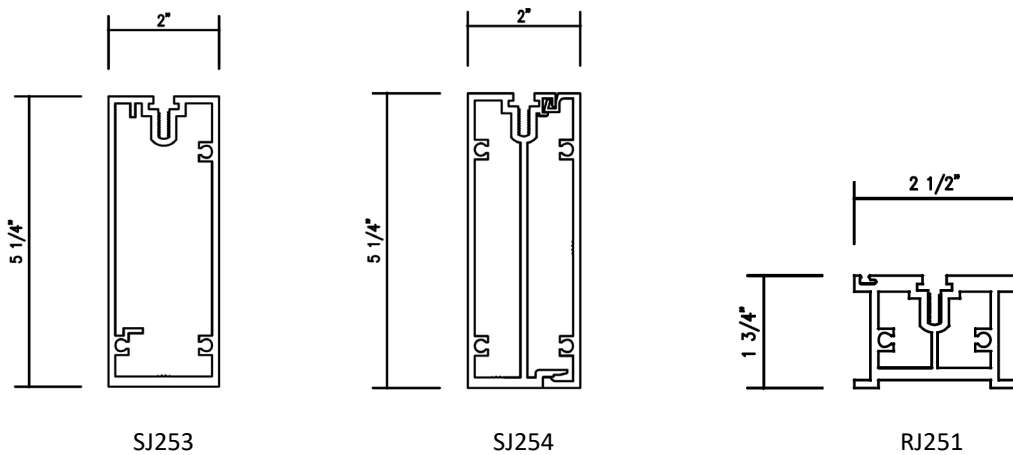


Figure 2 – Joist Section Profiles



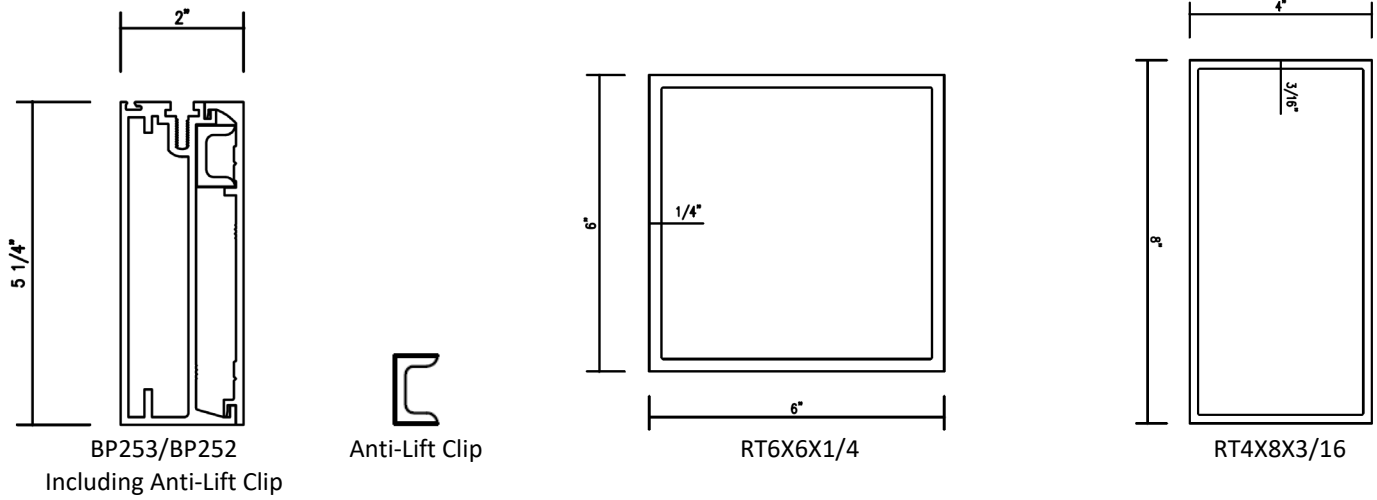


Figure 3 – Deck Beam Section Profiles

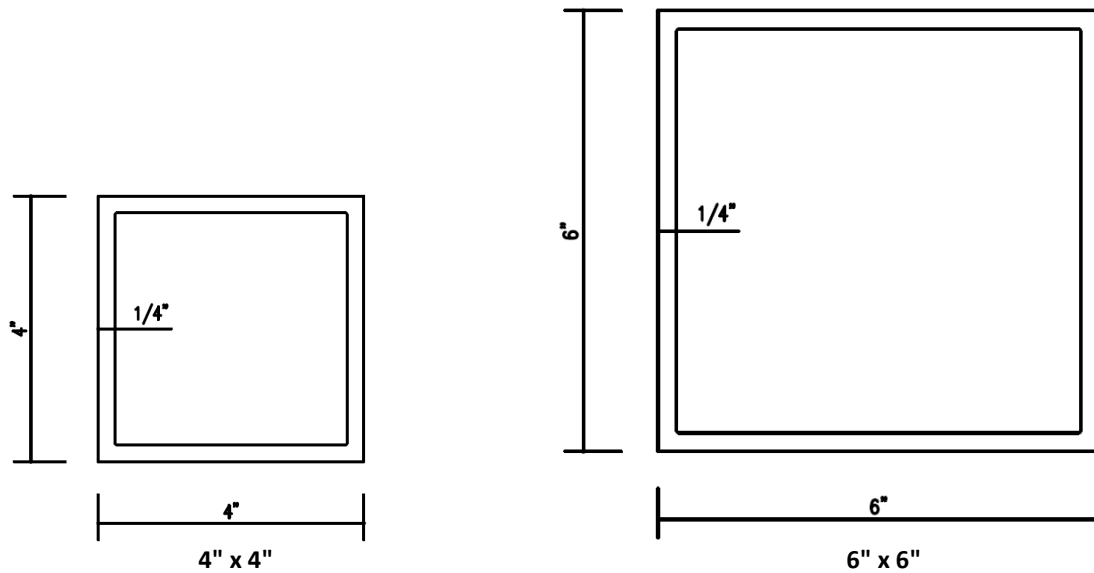


Figure 4 – Aluminum Support Posts Section Profiles

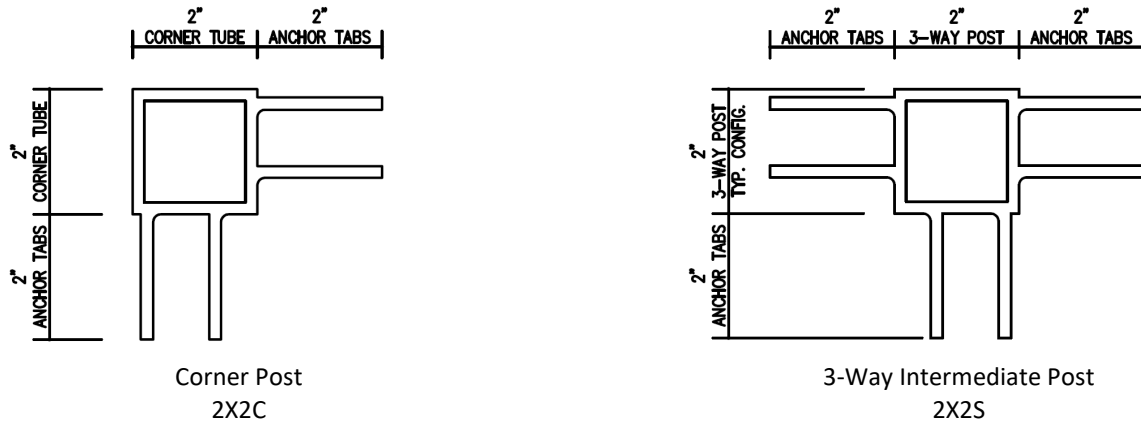


Figure 5 – Rail Post Brackets

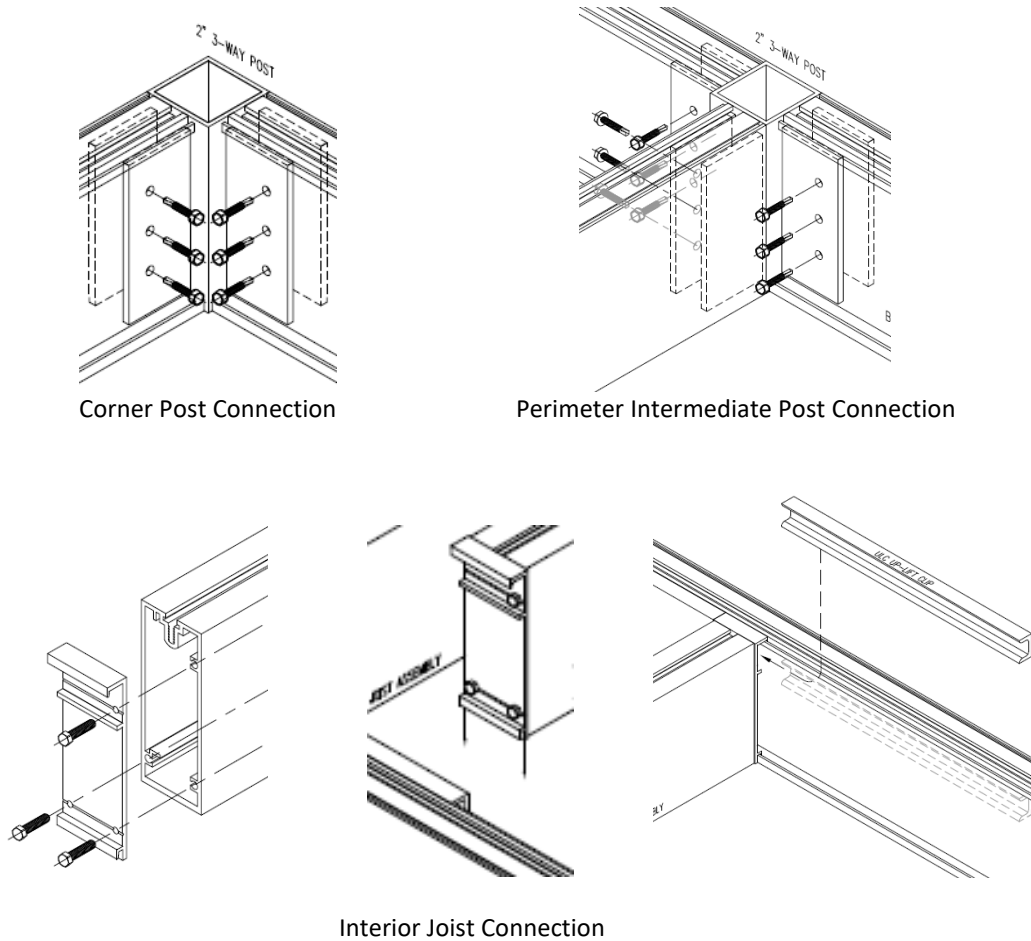


Figure 6 – Joist Connections to Box Perimeter Beam

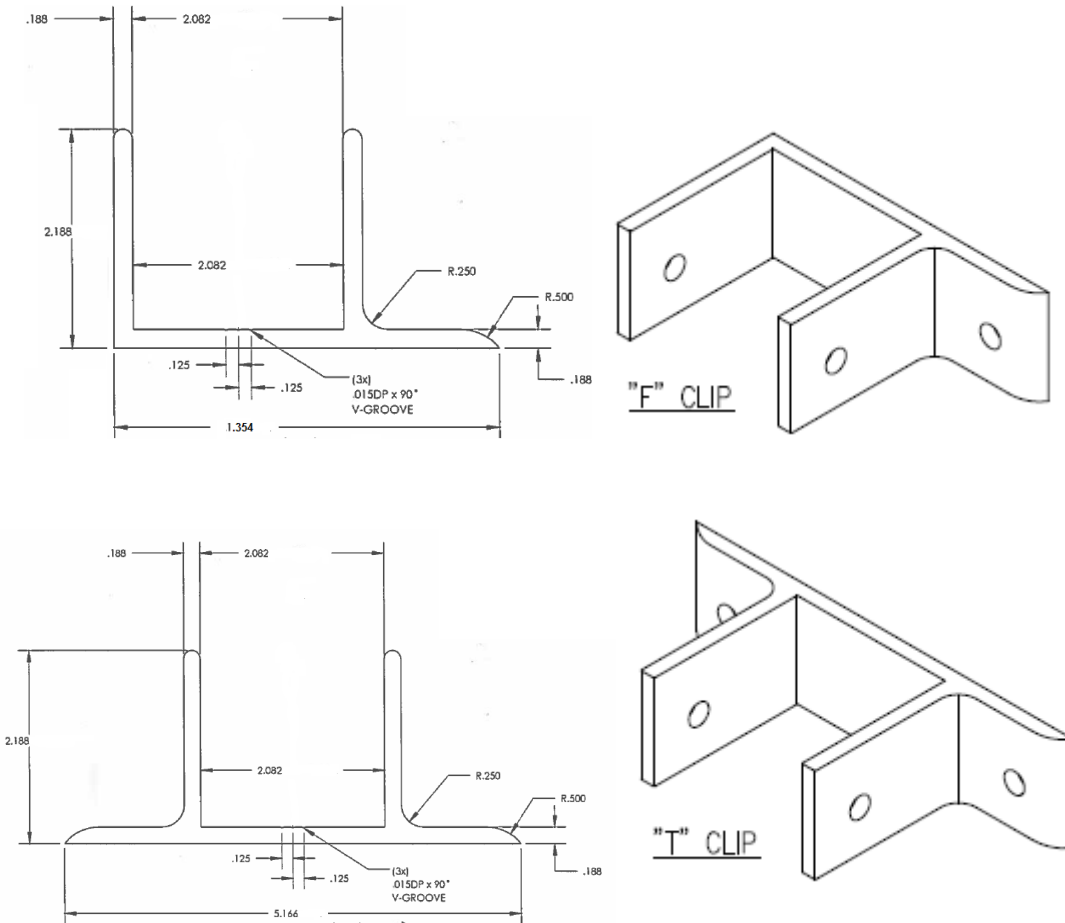


Figure 7 – Aluminum “F” and “T” Clips for Roof Joist Connections

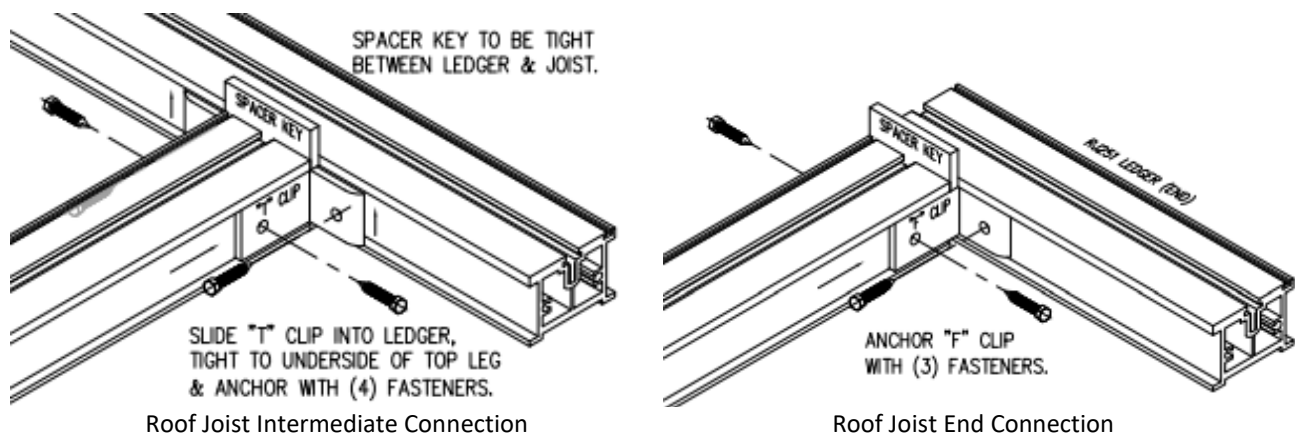
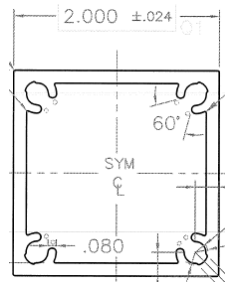
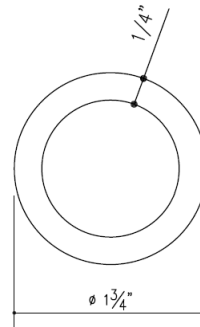


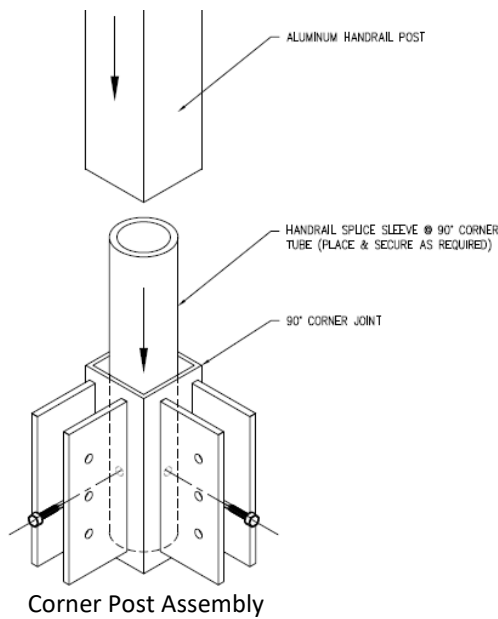
Figure 8 – Roof Joist Connections to Perimeter Roof Joist



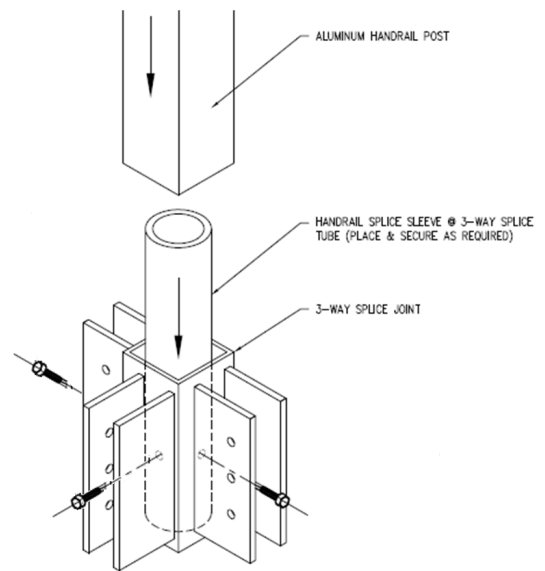
2" Guardrail Post



Post Sleeve



Corner Post Assembly



Perimeter Post Assembly

Figure 9 – Guardrail Support Post

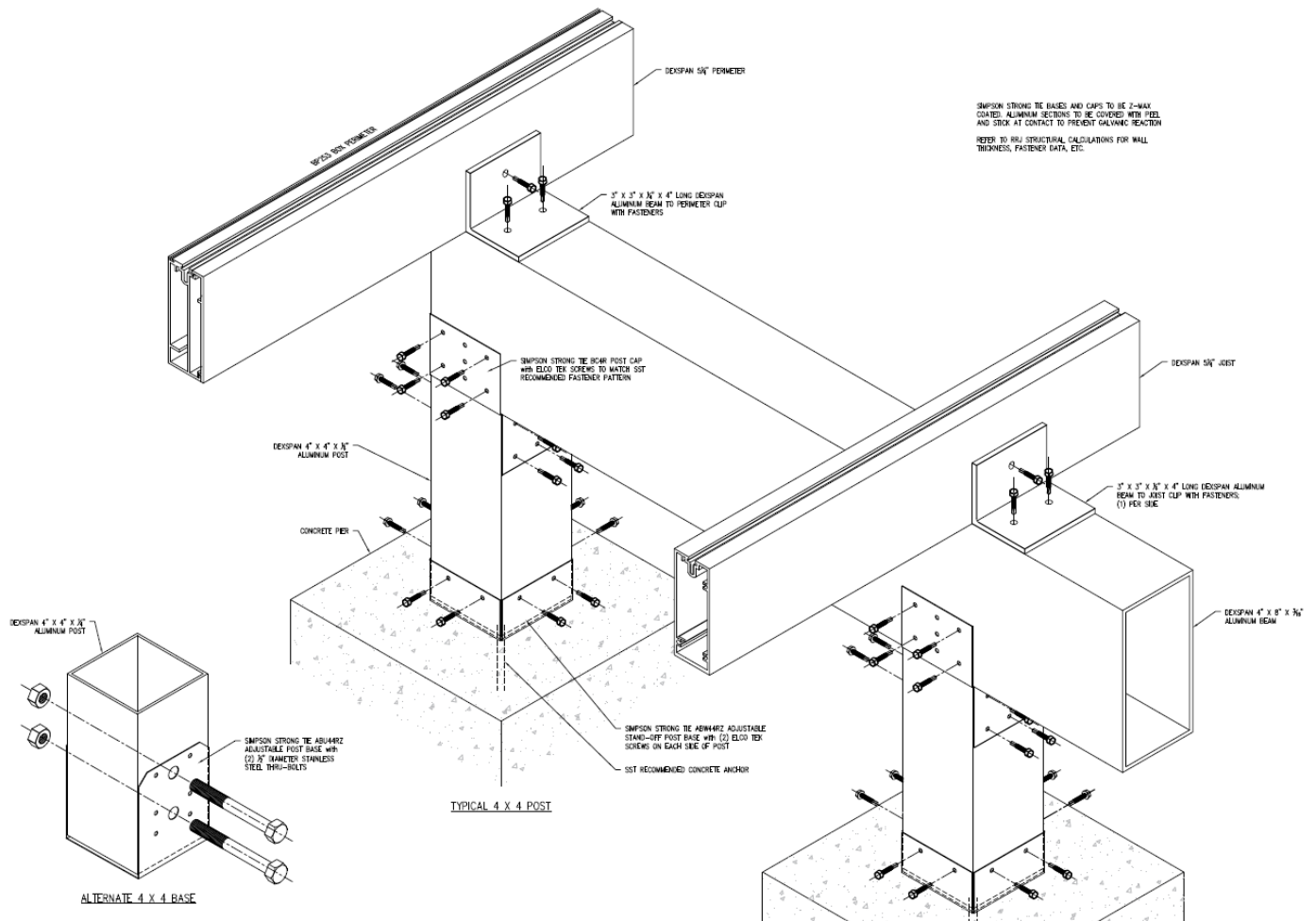


Figure 10 – DexSpan 4X4 and 4X8 Post Beam Connections



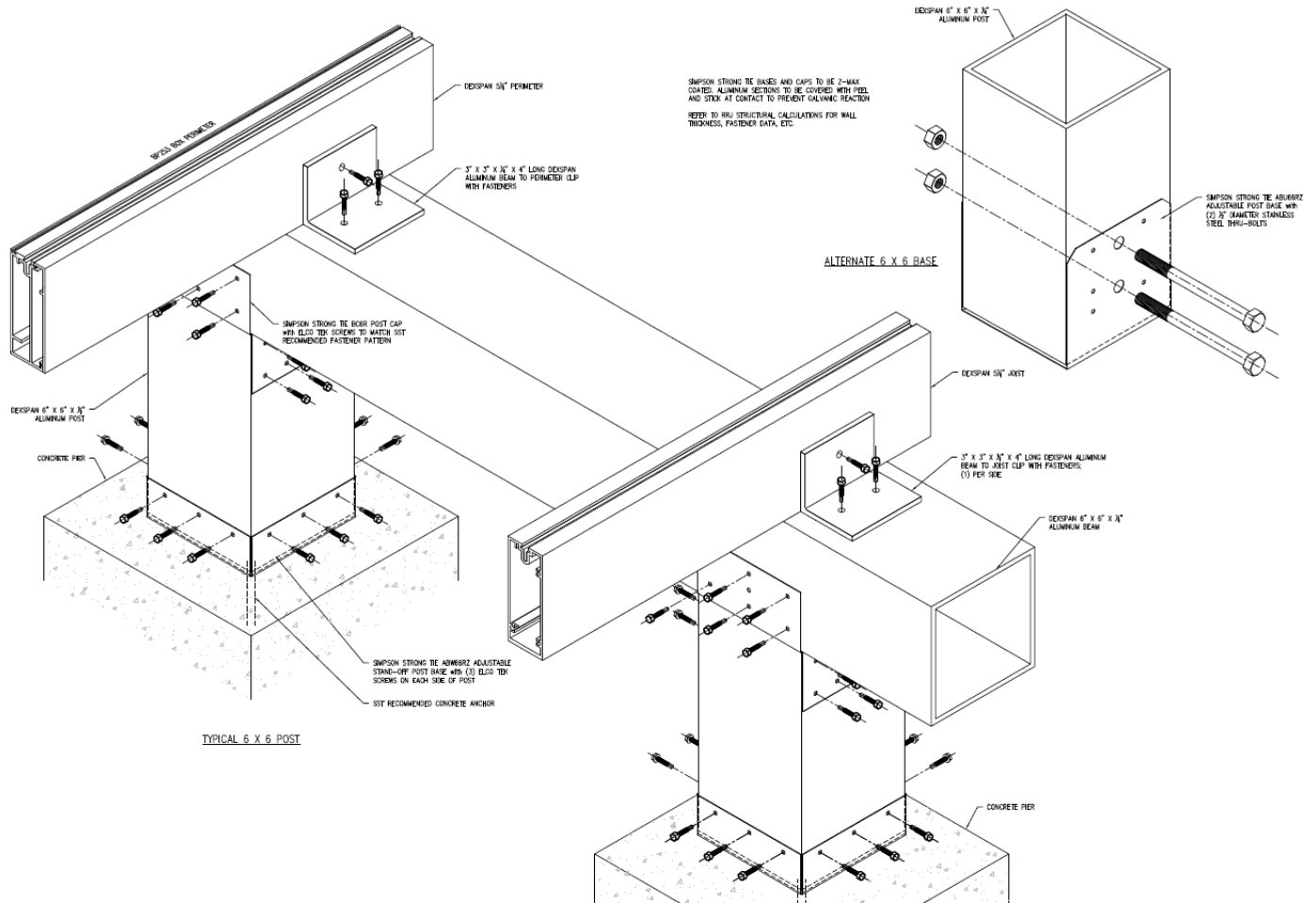


Figure 11 – DexSpan 6X6 Post Beam Connections

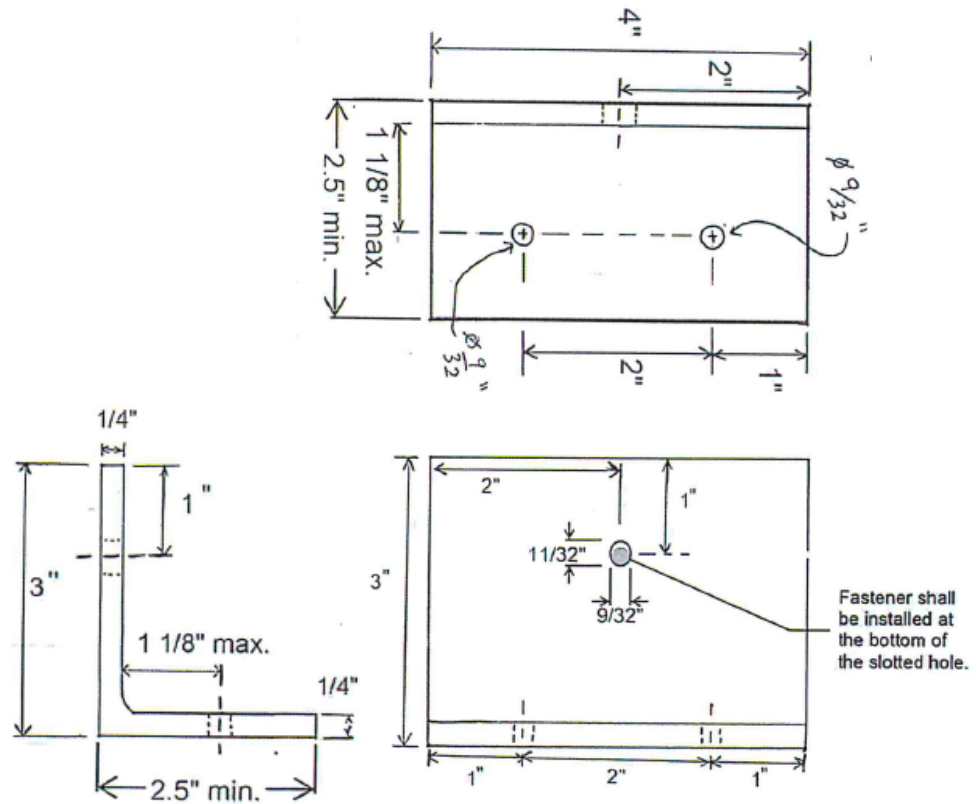


Figure 12 – Aluminum Clip Angle for Joist to Deck Beam Connections

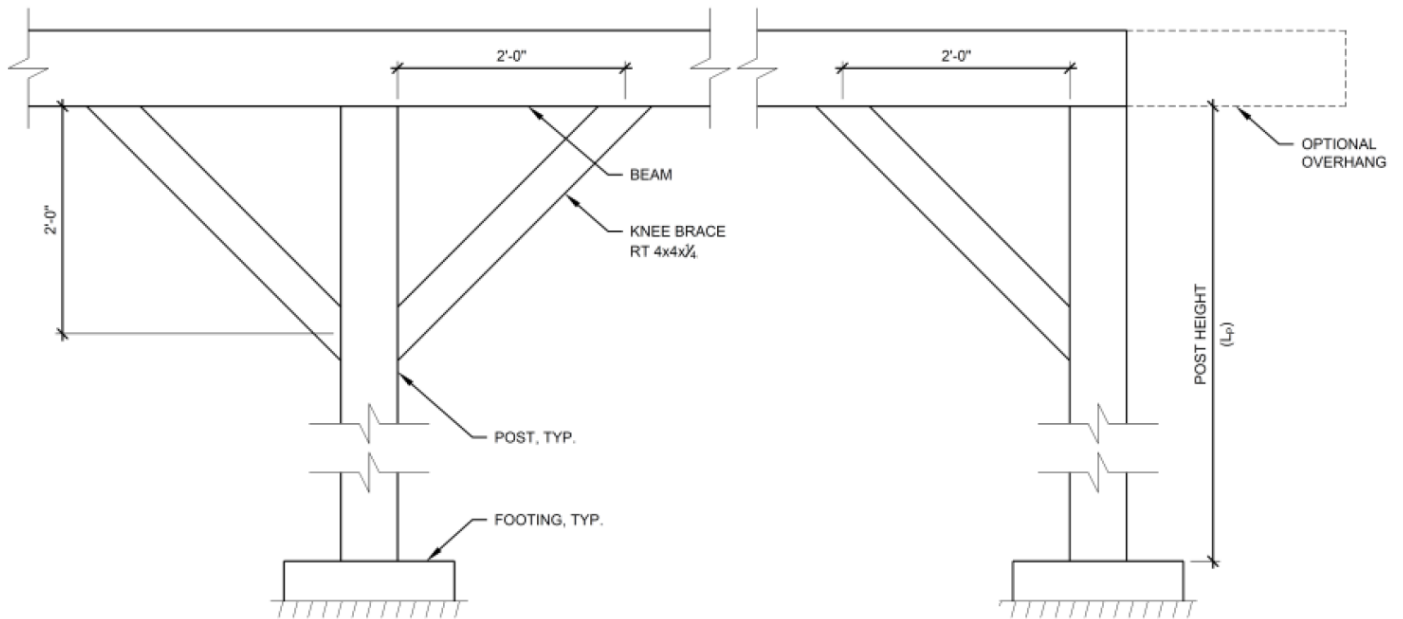


Figure 13 – DexSpan Support Post Bracing