Report of:

Typical anchoring fasteners for wood and concrete

- National Building Code – 2019 Alberta Edition - Part 9
- 2018 British Columbia Building Code - Part 9
- 2015 National Building Code of Canada - Part 9
- 2012 Ontario Building Code - Part 9

WARNING **Only use Peak® MountainView™ Spigot with 12 mm Peak® MountainView™ Tempered Glass Railing Panels along with a complete Peak® MountainView™ railing system, including Top Rails. Failure to do so may result in death or serious injury.**

No representation or warranty is given that your particular application of these products complies with relevant building codes or that the fasteners provided or used are appropriate for your application. Consult with professionals and local building officials before beginning work: (i) to ensure compliance with relevant building codes for your application and for your proposed use of fasteners; (ii) to ensure the integrity of the structural components in connection with which these products are to be used; (iii) to identify appropriate safety gear that is to be used during installation such as a safety harness when working above ground; (iv) to ensure that the work area is free from utilities, services and hazards; and (v) to clarify any instructions or warnings that may not be clear. Work in a safe manner wearing protective gear such as gloves, eyewear, headwear, footwear and clothing. When using tools comply with operation manuals and instructions. Metal and glass may have sharp edges and could fragment or splinter during or as a result of handling or cutting. Do not use these products in connection with any substance that is or may be harmful or corrosive to the products. Inspect and maintain these products and the structural components that they are used in connection with on a regular basis, using professionals when appropriate.

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Peak Products Manufacturing Inc.
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Peak® MountainView™ 12mm Glass Railing with Stainless Steel Anchorage of Railing Components to Structures

Engineering Review for Compliance with
Division B Part 9 – Housing and Small Buildings
(1 and 2 Dwelling Units) of the Following Codes

2019 Alberta Building Code
2018 British Columbia Building Code
2015 National Building Code of Canada
2012 (with 2019 Amendment) Ontario Building Code

May 14, 2021

Table of Contents

Purpose and Scope

Peak Products Manufacturing Inc. (Peak) manufactures the Peak® MountainView™ 12mm Glass Railing with Stainless Steel system and components for use at edges of decks, stairs and landings.

This report by L.H. Schwindt & Company Inc. (LHS) confirms the adequacy of attachment to structures, of railing components listed in the following table when attached using the specified fasteners.

Item	Component	Structure	Specified Fasteners
A	Post and Spigot	Wood	Self-Drilling Wood Screw Selection
B	Post and Spigot	Concrete	Concrete Anchor Selection
C	End Bracket (at deck rail perpendicular termination)	Wood Concrete	Screw selection for wood structure; Anchor selection for concrete structure

Limitations

1. The findings of this evaluation are applicable only for use with specified components of Peak® MountainView™ 12mm Glass Railing with Stainless Steel .
2. Adequacy of railing component designs has been established by Peak, independently of this evaluation.
3. Railing configuration and other non-structural matters must be established by others, to be in accordance with local building regulations.
4. Materials and construction for decks, stairs and landings are subject to design, permitting, and inspection in accordance with local codes and regulations, and are not within Peak's or LHS's responsibility.
5. Any structures supporting railings must be part of an assembly with sufficient overall strength and stability to resist all applied loads, including forces from railings.
6. Local authorities may require proposed installations to be evaluated by a locally licensed engineer.
7. This review was based on independent testing of self-drilling wood screws, on engineering assessment of concrete anchor manufacturers' data, and on documented good construction practice. Product and assembly testing were not in the scope of this review.
8. Specified fasteners are to be used only in accordance with manufacturer's instructions.
9. Any variances from the assumptions stated herein may affect adequacy of anchorage, and are not evaluated within the scope of this report.

Applicable Codes

This review was conducted with respect to the requirements of Division B Part 9 – Housing and Small Buildings (1- and 2-dwelling units, in the following codes.

- 2019 Alberta Building Code
- 2018 British Columbia Building Code
- 2015 National Building Code of Canada
- 2012 (with 2019 Amendment) Ontario Building Code

In the 2015 National Building Code of Canada, sentence 9.8.8.1.(1) requires guards at edges of areas "…including but not limited to flights of steps and ramps, exterior landings, porches, balconies, mezzanines, galleries and raised walkways", and the other applicable codes include similar wording. Where this report refers to decks, stairs, or landings, the findings may be considered applicable to other structures that are similarly constructed.

Components and Assembly – General Description

The Peak® MountainView™ 12mm Glass Railing with Stainless Steel post and spigot are manufactured with bases with 4 holes for anchorage. The reader is referred to appended Peak drawings for the mounting templates.

Post and Spigot bases are to be anchored to the horizontal top surface of a deck, stair or landing structure, using fasteners suited to the structure material and subject to the following descriptions and the appended drawings.

End Brackets are designed to secure the ends of Peak® MountainView™ 12mm Glass Railing with Stainless Steel top rails to vertical mounting surfaces (typically walls, posts or columns), where rails will be oriented perpendicular to the mounting surfaces.

Wood-framed structures were assumed to be No. 1 or 2 or "select" Spruce-Pine-Fir, graded according to the guidelines of the National Lumber Grades Authority (NLGA). Pressure treated materials in these categories are included. Anchorage to wood structures of any lumber with Specific Gravity less than 0.42, or manufactured or synthetic materials, or where frequent wetting, extreme temperatures, or sustained loading can occur, may require alternative details including increased screw thread embedment.

Analysis

○ General Information

Guard height directly affects the magnitude of moment transferred via the Post Bases and Spigots to the structure, and of tension force applied to the fasteners. Guard height prescribed in the Applicable Codes is 1070mm (3'-6") above deck surface; this is the standard height of Peak® MountainView™ 12mm Glass Railing with Stainless Steel.

A horizontal point load of 1.0kN (225LB), applied perpendicular to a post at the prescribed guard height, causes the maximum moment for anchorage of Post Bases and Spigots. The horizontal load may be inward or outward. Code-specified horizontal uniform and point loads applied between posts or on guard panel elements do not govern base anchorage for Peak® MountainView™ 12mm Glass Railing with Stainless Steel.

Adequacy of Post Base and Spigot anchorage was established as follows:
1. Considered applied live load; calculated resulting moment at the base-to-deck surface interface;
2. Calculated pull-out force on each of two fasteners in tension;
3. Compared with available pull-out strength in N/mm (LB per inch) for the self-drilling wood screws in wood to determine screw selection and thread engagement length, or the concrete anchor capacity according to embedment depth;
4. Reviewed fastener embedment with respect to grain orientation, or anchor embedment with respect to edge distance and spacing.

For anchorage of End Brackets to wood or masonry structures, the maximum horizontal load affecting fasteners is a 1.0kN (225LB) point load applied perpendicular to the top rail of a guard assembly adjacent to a wall termination.

The maximum vertical-downward load on top rail (from 1.5kN per metre continuous load, not concurrent with horizontal load), is 0.75kN (169LB) applied via a post or via the glass panel to a Spigot.

A Post Base and Spigot - Anchorage to Wood Structure using Self-Drilling Wood Screws

Post Bases and Spigots are to be secured to the top surface of a wood-framed deck (or landing or similar structure) or to a stair tread using four self-drilling wood screws selected from the table in the appended drawings, installed in accordance with manufacturer's instructions and as follows.

This method was evaluated for load compliance with the Applicable Codes, on a wood-framed assembly with blocking local to the bases, where the railing is installed parallel or perpendicular to the deck joists, at a corner, or on a stair.

Blocking must be the same material grade as deck framing, sawn square for correct fit-up, and fastened to the deck or stair framing as required by local codes. The installer should consider location of the blocking screws with respect to the post screws, to avoid internal screw interference.

The full contact area of each Post Base or Spigot is to bear directly on the surfaces of deck boards or stair treads, which must be of firm sound material such as sawn lumber. Any spacer or shim must be firm, solid, cover the full contact area of the Post Base or Spigot, and be prevented from shifting out of place.

Base screws are to be installed vertically, perpendicular to the grain of lumber in the deck joists and blocking, and must have thread engagement with the joists or stair stringers and blocking. The calculated unfactored (service load) screw tension of 5.94kN (1,340LB) was used to determine minimum embedded thread lengths as listed in the table in the appended drawings. On stair stringers where vertical screws will penetrate at an angle to the grain, thread embedment measured perpendicular to grain must meet or exceed the listed value.

Self-drilling wood screws were tested for pull-out from wood and found acceptable, as identified in the appended drawings. The screws are marketed as lag screw replacements, not requiring pilot holes. They have smaller shank diameters and deeper threads than standard wood screws of the same nominal diameter, and have a flanged head with hexalobular (star-shaped) internal socket for driving. All screws at any base should be the same selection.

Screw length selections are such that the portion of screw within non-structural deck boards or stair treads of typical thicknesses will be un-threaded.

B Post Base and Spigot - Concrete Anchor Selection

Post bases and spigots are to be anchored directly to the level top surface of a concrete deck, stair, or landing, using products selected from the table in the appended drawings, installed in accordance with manufacturer's instructions. All anchors at any base should normally be the same product.

Concrete is to have 28-day compressive strength at least 20MPa (3,000psi), with materials, mix design, admixtures, batching, placement, and inspection according to local codes and good commercial practice. Cracked concrete (as defined in CSA standard A23.3) was assumed for analysis.

The Post Base or Spigot is to bear directly on the concrete surface; any spacer or shim must be firm, solid, cover the full contact area of the base, and be prevented from shifting out of place.

The calculated unfactored (service load) screw tension of 5.94kN (1,340LB) was used to determine minimum embedment depths applicable to certain anchors, as listed in the table in the appended drawings.

C End Bracket - Screw Selection

The Peak® MountainView™ 12mm Glass Railing with Stainless Steel End Bracket Attachment includes stainless steel hex-head wood screws 1/4" dia. x 2" long with EPDM washers (2 screws for each rail mount). The supplied screws are suitable, subject to the following.

Mounting surfaces are to be vertical, firm sound material such as sawn lumber (structure or blocking). The specified attachment detail is not suitable for use over any non-structural siding such as insulation-backed wall finishes, or vinyl, metal, or wood cladding. For mounting to concrete or masonry walls, alternate fasteners must be used as noted on the drawings.

The 1.0kN horizontal force to the railing results in a shear force of 0.5kN (113LB) per screw; the 1.35kN vertical force applies 0.675kN (152LB) per screw.

Conclusion

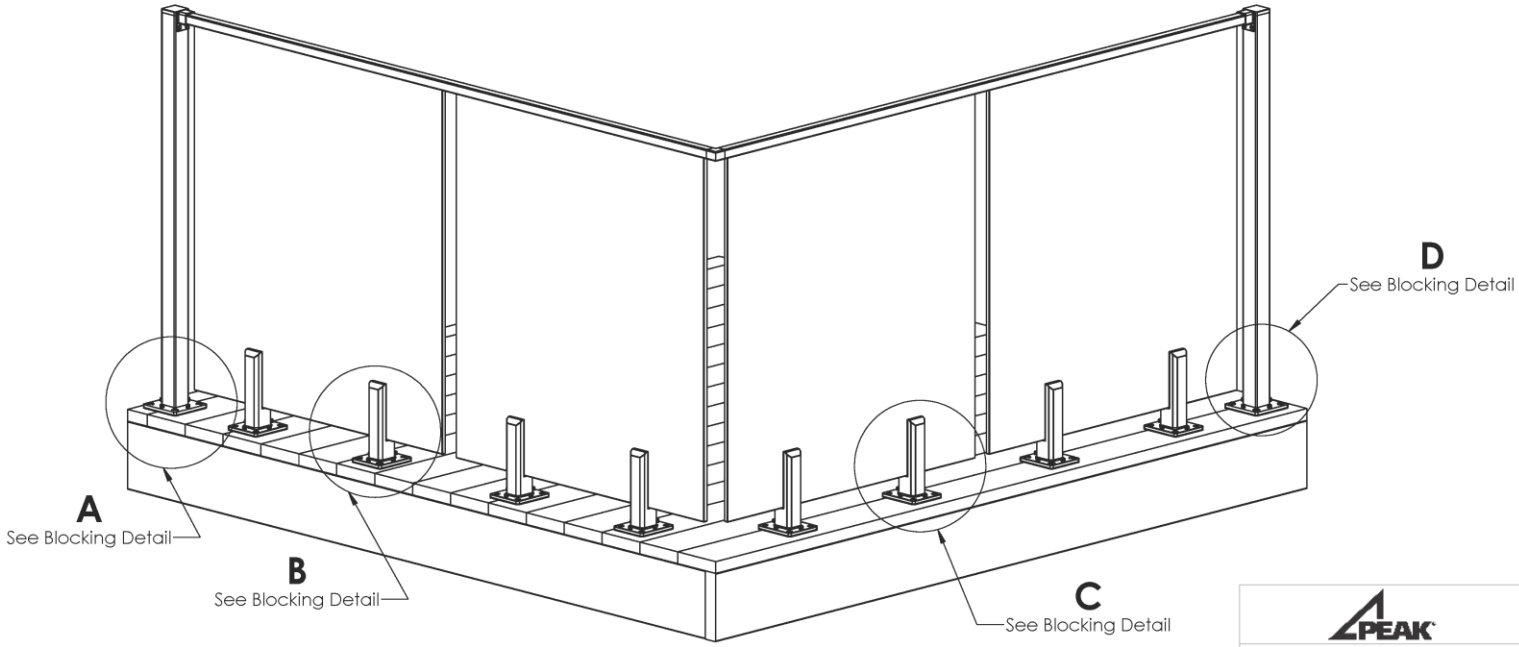
We found the fasteners specified in this report and appended drawings to be adequate for code compliance, in the applicable buildings and subject to the assumptions and limitations described in this report. If site-specific conditions vary from the descriptions or the appended drawings, the installer must confirm fastener selection with assistance of a professional engineer.

Regards,

L. H. SCHWINDT & COMPANY INC.

J. David Howard, P.Eng.

WOOD DECK ATTACHMENT



Attach Posts and Spigots using four (4) fasteners each, selected from the table below.
Spigot and Post fasteners shall be installed into blocking and/or joists arranged as described in the Blocking Detail drawing

Screw Option	MINIMUM SCREW EMBEDMENT (1)	MAXIMUM DECK BOARD THICKNESS (2)
RSS Model No.10281 - 3/8 in x 6 in	89 mm [3.5 in]	54 mm [2.1 in]
RSS Model No.10287 - 3/8 in x 8 in	89 mm [3.5 in]	115 mm [4.1 in]

(1) Into sound deck material as described in this report
(2) Based on base thickness of 8mm (0.31 in.) plus a 2mm leveling plate

PEAK

TITLE
Peak® MountainView™
Part 9 Wood Deck Attachment

PART FILE
DECK -PMV Wood Fastener Attachment

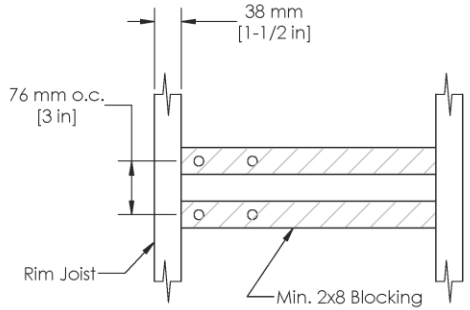
DWG REV
A

DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

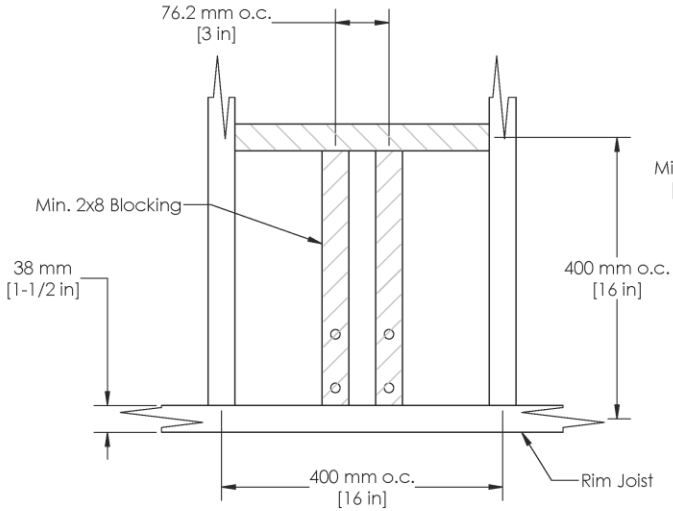
SIZE B | DWG. NO. DECK - PMV Wood Fastener Attachment -GRK

SCALE: 1:11 | SHT REV 2017-05-16 | Sheet 1 of 7

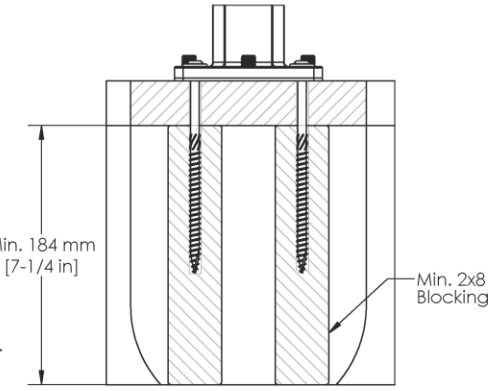
SPIGOT BLOCKING DETAIL



BLOCKING DETAIL B



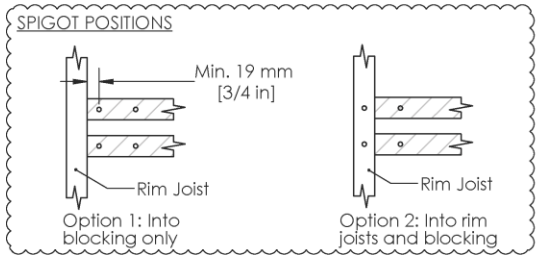
BLOCKING DETAIL C



Blocking attachment hardware shall not interfere with spigot attachment screws

NOTES:

- Blocking and joists shall be minimum 2x8 and depth under spigot attachment screws shall be at least 25.4 mm [1 in] deeper than actual screw penetration
- Nails, screws, and other fasteners shall not cause splitting of wood elements
- Nails, screws, and other fasteners shall be resistant to corrosion
- Ensure deck construction fasteners do not interfere with spigot attachment screws
- Spigot attachment screws shall be driven into the middle third of the thickness of the blocking or rim joists over which they are positioned



PEAK

TITLE
Peak® MountainView™
Part 9 Wood Deck Spigot Blocking Detail

PART FILE
DECK -PMV Wood Fastener Attachment

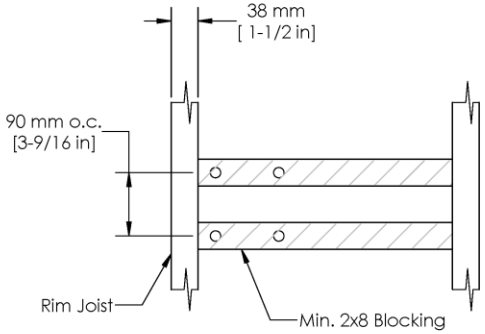
DWG REV
A

DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

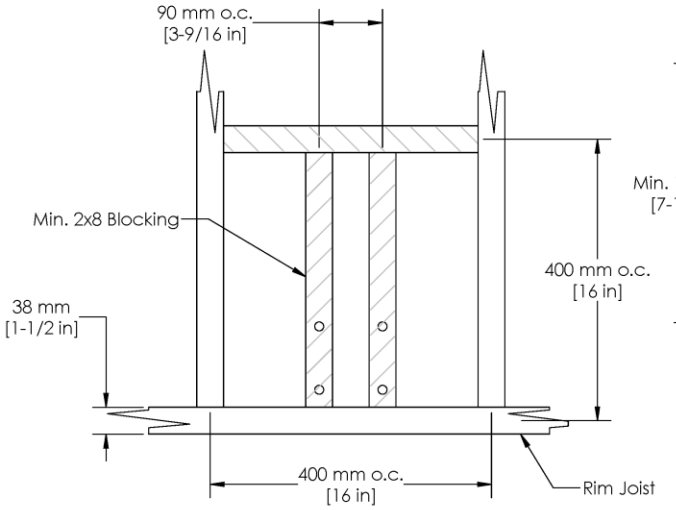
SIZE B | DWG. NO. DECK -PMV Blocking Detail

SCALE: 1:6 | SHT REV 2017-05-16 | Sheet 2 of 7

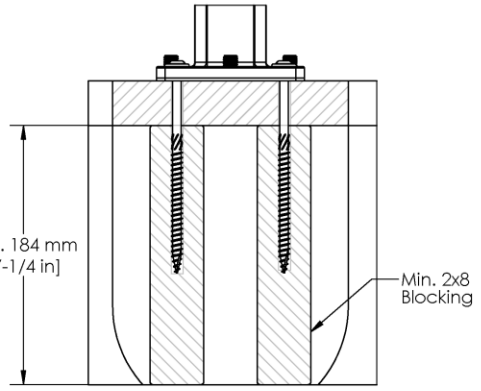
POST BLOCKING DETAIL



BLOCKING DETAIL A



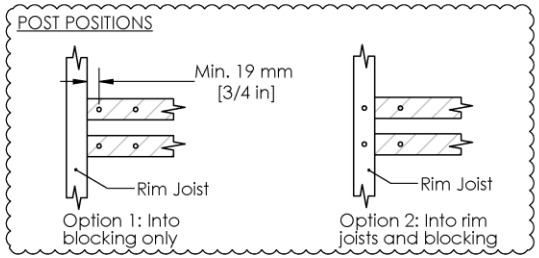
BLOCKING DETAIL D



Blocking attachment hardware shall not interfere with post attachment screws

NOTES:

- Blocking and joists shall be minimum 2x8 and depth under post attachment screws shall be at least 25.4 mm [1 in] deeper than actual screw penetration
- Nails, screws, and other fasteners shall not cause splitting of wood elements
- Nails, screws, and other fasteners shall be resistant to corrosion
- Ensure deck construction fasteners do not interfere with post attachment screws
- Post attachment screws shall be driven into the middle third of the thickness of the blocking or rim joists over which they are positioned



PEAK

TITLE
Peak® MountainView™
Part 9 Wood Deck Post Blocking Detail

PART FILE
DECK -PMV Wood Fastener Attachment

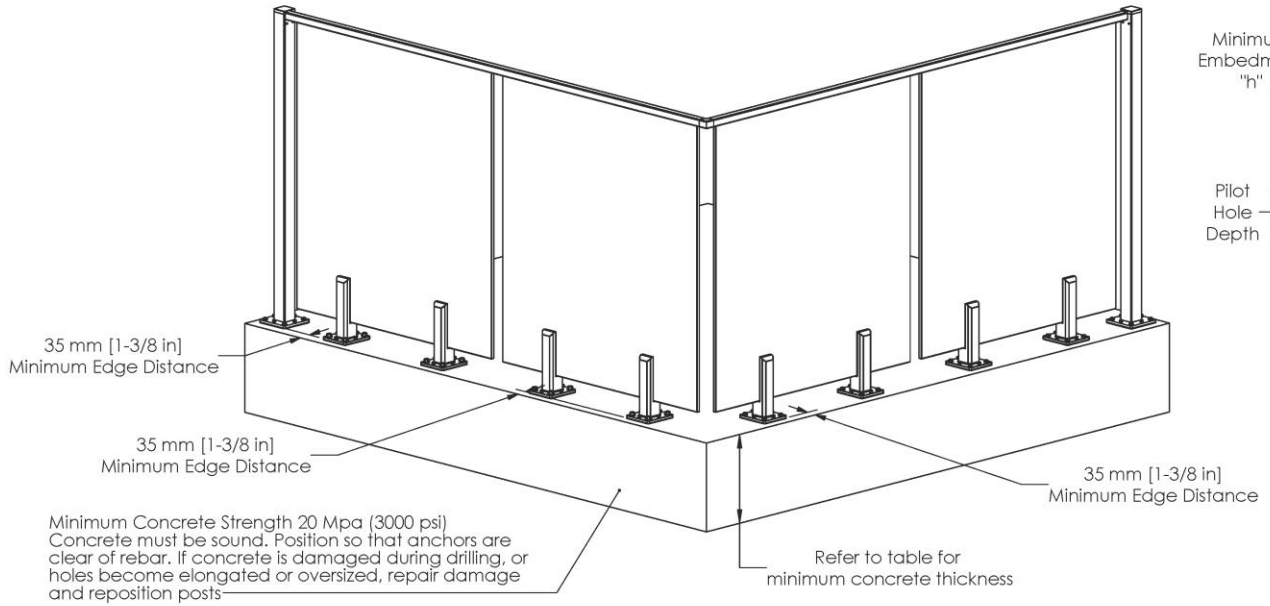
DWG REV
A

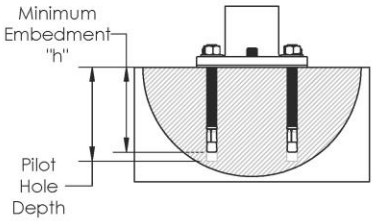
DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

SIZE B | DWG. NO. DECK -PMV Blocking Detail

SCALE: 1:6 | SHT REV 2017-05-16 | Sheet 3 of 7

CONCRETE DECK ATTACHMENT





Attach Posts and Spigots using four (4) fasteners each, selected from the table below.
Fasteners shall be installed according to manufacturer's instructions.

FASTENER (1)	MINIMUM EMBEDMENT DEPTH "h" (2)	MINIMUM EDGE DISTANCE	PILOT HOLE DIAMETER	MINIMUM CONCRETE THICKNESS
3/8" x 4" Buildex Tapcon+ (3)	76 mm [3 in]	35 mm [1-3/8 in]	3/8 in	111 mm [4-3/8 in]
3/8" x 3-3/4" Hilti Kwik Bolt 3	70 mm [2-3/4 in]	35 mm [1-3/8 in]	3/8 in	102 mm [4 in]

(1) Equivalent stainless steel or hot-dipped galvanized anchors are recommended for exterior applications
(2) Into concrete
(3) Anchor must be branded Tapcon+ (read as "Tapcon plus")

PEAK

TITLE
Peak® MountainView™
Part 9 Concrete Deck Attachment

PART FILE
DECK -PMV Concrete Attachment

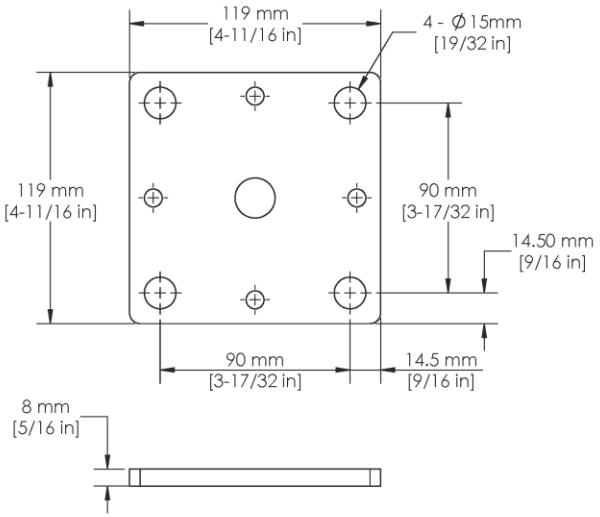
DWG REV
A

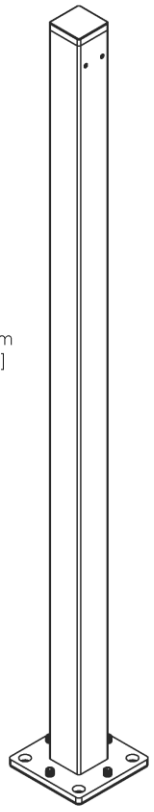
DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

SIZE B | DWG. NO. DECK - PMV Concrete Fastener Attachment

SCALE: 1:11 | SHT REV 2017-05-16 | Sheet 4 of 7

POST AND SPIGOT MOUNTING TEMPLATES





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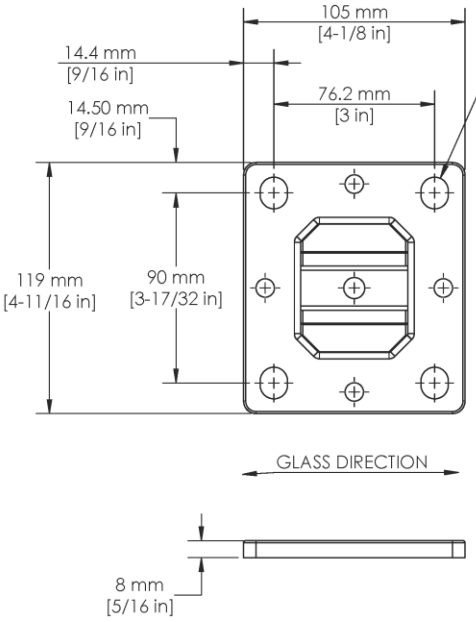
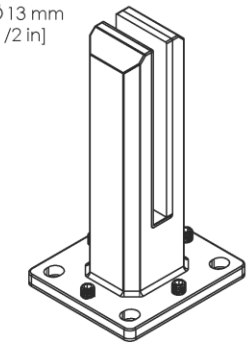
SKU: 32504





SPIGOT
SKU: 32010

PEAK

TITLE
Peak® MountainView™
Post and Spigot

PART FILE
Report assembly P9 PMV

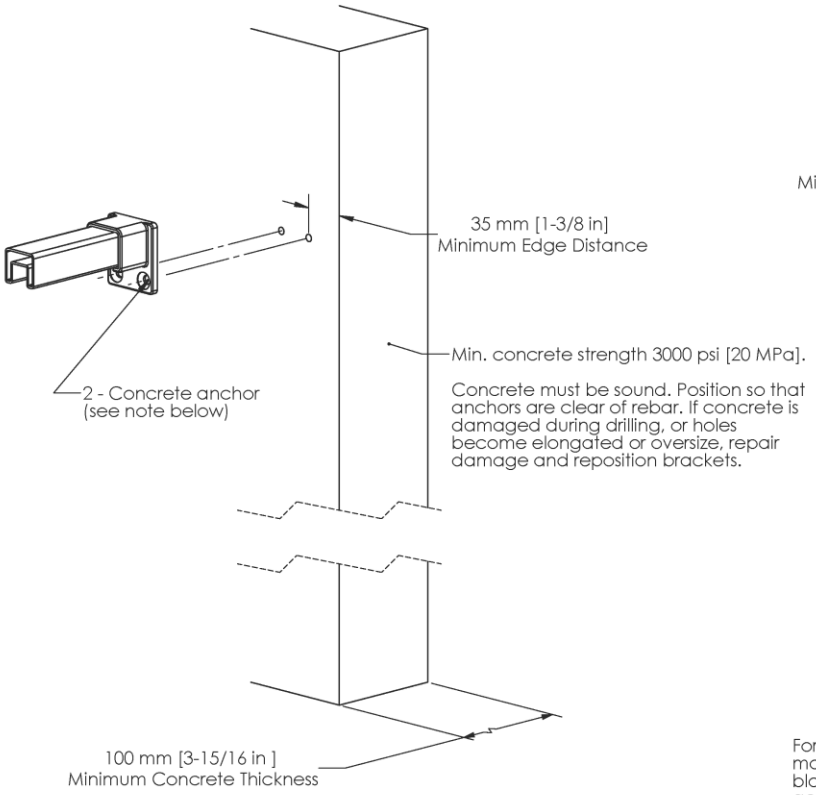
DWG REV
A

DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

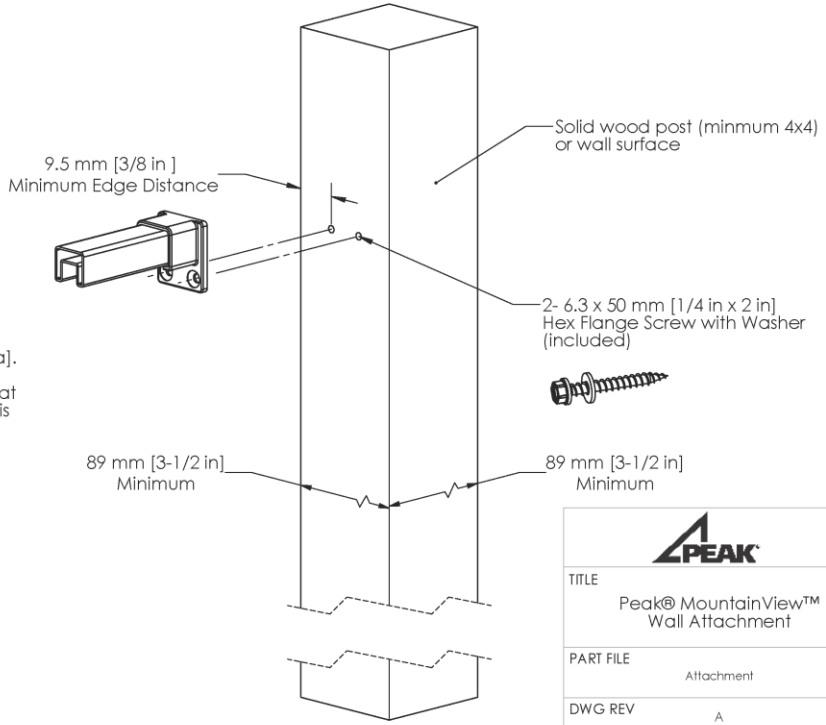
SIZE	DWG. NO.	
B	Report assembly P9 PMV- Posts and Spigot	
SCALE: 1:4	SHT REV 2017-05-16	Sheet 5 of 7

END BRACKET ATTACHMENT

CONCRETE



WOOD



For walls with non-structural cladding over wood, mount wall brackets only to sound wood or secure blocking. Screws to penetrate wood frame in accordance with local codes.

Concrete Fasteners (not included)
Option 1: 2 x Hilti KWIK Bolt 3, 1/4 in diameter x 2 in minimum embedment
Fasteners shall be stainless steel for exterior locations.
Option 2: 2 x Tapcon Hex Concrete Screw Anchor, 1/4 in x 2-1/4 in

PEAK

TITLE
Peak® MountainView™
Wall Attachment

PART FILE
Attachment

DWG REV
A

DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

SIZE B | DWG. NO. Report assembly P9 PMV - Connectors

SCALE: 1:10 | SHT REV 2017-05-16 | Sheet 6 of 7

END BRACKET MOUNTING TEMPLATE

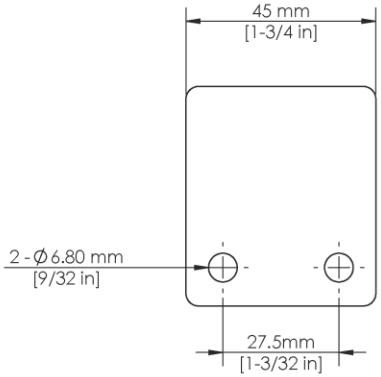
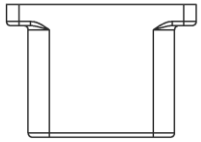
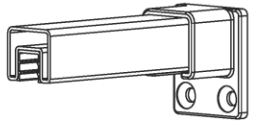
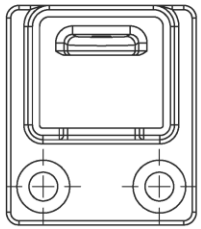


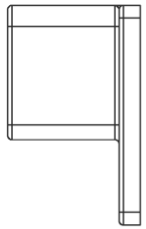
PLATE THICKNESS: 5mm

END BRACKET
SKU: 32520









PEAK

TITLE
Peak® MountainView™
End Bracket

PART FILE
Report assembly P9 PMV

DWG REV
A

DIMENSIONS ARE IN MM UNLESS NOTED
DO NOT SCALE DRAWING

SIZE	DWG. NO.	
B	Report assembly P9 PMV - Connectors	
SCALE: 1:2	SHT REV 2017-05-16	Sheet 7 of 7