



STRUCTURAL DESIGN

ENCLOSED BUILDING

**MAXIMUM 30'- 0" WIDE X 16'- 0" HEIGHT-
BOX EAVE FRAME AND BOW FRAME**

19 May 2020

Revision 4

M&A Project No. 17257S/18241S/19326S/20102S

Prepared for:

**Twin Carports
781 W. Lebanon St.
Building B
Mt. Airy, NC 27030**

Prepared by:

Moore and Associates Engineering and Consulting, Inc.

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North Augusta, SC 29841**

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ENGINEERING AND CONSULTING**

MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.		DRAWN BY: JM	TWIN CARPORTS, LLC 781 W. LEBANON ST. BUILDING B MT. AIRY, NC 27030 30'-0"x16'-0" ENCLOSED STRUCTURE		
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		CLIENT: TWIN CARPORTS	SHT. 1	DWG. NO: SK-3	REV. 4

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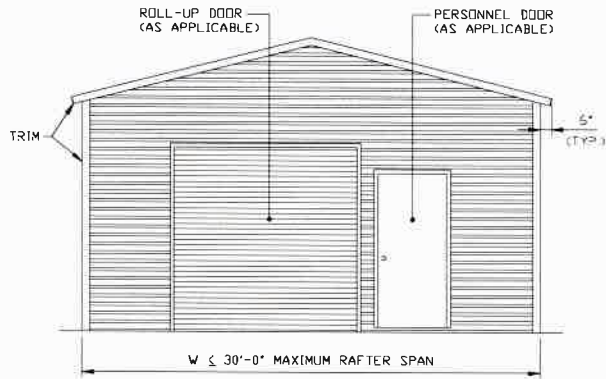
INSTALLATION NOTES AND SPECIFICATIONS

1. DESIGN IS FOR MAXIMUM 30'-0" WIDE x 16'-0" EAVE HEIGHT ENCLOSED STRUCTURES.
2. DESIGN WAS DONE IN ACCORDANCE WITH THE 2018 NORTH CAROLINA BUILDING CODE, 2018 INTERNATIONAL BUILDING CODE (IBC), 2015 IBC AND 2012 IBC.
3. DESIGN LOADS ARE AS FOLLOWS:
 - A) DEAD LOAD = 1.5 PSF
 - B) LIVE LOAD = 12 PSF
 - C) GROUND SNOW LOAD = 45 PSF (MAXIMUM RAFTER/POST SPACING = 4.0 FEET)
= 35 PSF (MAXIMUM RAFTER/POST SPACING = 5.0 FEET)

NOTE: DIFFERENTIAL LOADING DUE TO SNOW DRIFTING NOT ANALYZED.
4. ULTIMATE LOW WIND SPEED (LW) 105 TO 140 MPH (NOMINAL WIND SPEED 81 TO 109 MPH).
5. END WALL COLUMNS (POST) ARE EQUIVALENT IN SIZE AND SPACING TO SIDE WALL POSTS UNLESS NOTED OTHERWISE.
6. MAXIMUM RAFTER/POST AND END POST SPACING = 5.0 FEET (UNLESS NOTED OTHERWISE).
7. RISK CATEGORY I.
8. WIND EXPOSURE CATEGORY B.
9. SPECIFICATIONS APPLICABLE TO 29 GAUGE METAL PANELS FASTENED DIRECTLY TO 2 1/2" x 2 1/2" - 14 GAUGE TUBE STEEL (TS) FRAMING MEMBERS (FOR MAXIMUM 35 PSF GROUND SNOW LOAD) OR 2 1/4" x 2 1/4" - 12 GAUGE TS FRAMING MEMBERS (FOR MAXIMUM 45 PSF GROUND SNOW LOAD) (UNLESS NOTED OTHERWISE)
10. AVERAGE FASTENER SPACING ON-CENTERS ALONG RAFTERS OR HAT CHANNELS, AND COLUMNS (INTERIOR OR END) = 10" O.C. (MAX)
11. FASTENERS CONSIST OF #12-14x3/4" SELF-DRILLING FASTENER (SDF), USE CONTROL SEAL WASHER WITH EXTERIOR FASTENERS. SPECIFICATIONS APPLICABLE ONLY FOR MEAN ROOF HEIGHT OF 20 FEET OR LESS, AND ROOF SLOPES OF 14" (3:12 PITCH) OR LESS. SPACING REQUIREMENTS FOR OTHER ROOF HEIGHTS AND/OR SLOPES MAY VARY. ROOFING WITH SLOPE LESS THAN 3:12 MUST BE LAP SEALANT.
12. ANCHORS SHALL BE INSTALLED THROUGH BASE RAIL WITHIN 6" OF EACH RAFTER COLUMN ALONG SIDES AND ENDS.
13. STANDARD GROUND ANCHORS CONSIST OF #4 REBAR W/ WELDED NUT x 30" LONG AND MAY BE USED IN SUITABLE SOIL CONDITIONS. OPTIONAL ANCHORAGE MAY BE USED IN UNSUITABLE SOILS AND MUST BE USED IN UNSUITABLE SOILS AS NOTED.
14. WIND FORCES GOVERN OVER SEISMIC FORCES. SEISMIC PARAMETERS ANALYZED ARE:
 - SOIL SITE CLASS = D
 - RISK CATEGORY I/II
 - R = 3.25 I_E = 1.0
 - S_{DS} = 2.039g V = C_sW
 - S_{D1} = 1.258g

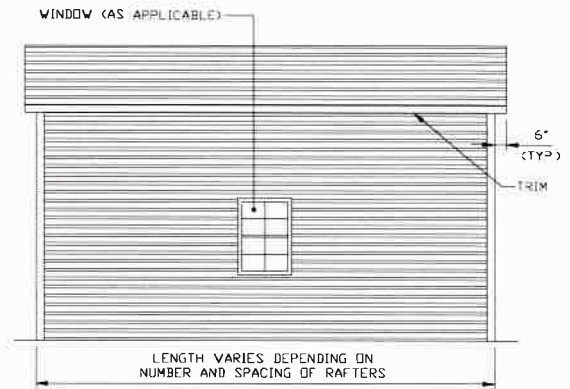
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BOX EAVE RAFTER STRUCTURE



TYPICAL END ELEVATION

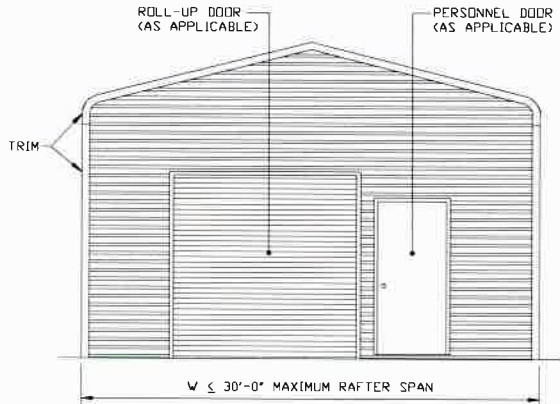
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TYPICAL SIDE ELEVATION

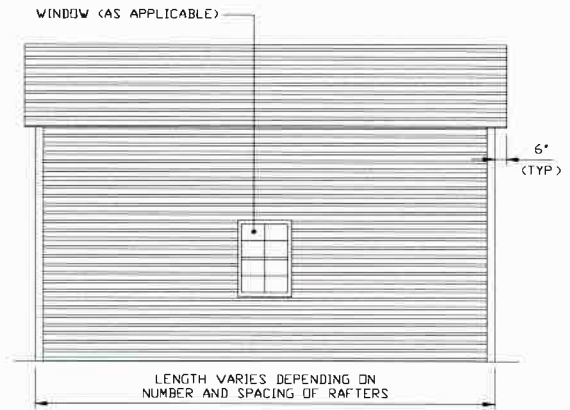
SCALE: NTS

BOW FRAME RAFTER STRUCTURE



TYPICAL END ELEVATION

SCALE: NTS



TYPICAL SIDE ELEVATION

SCALE: NTS

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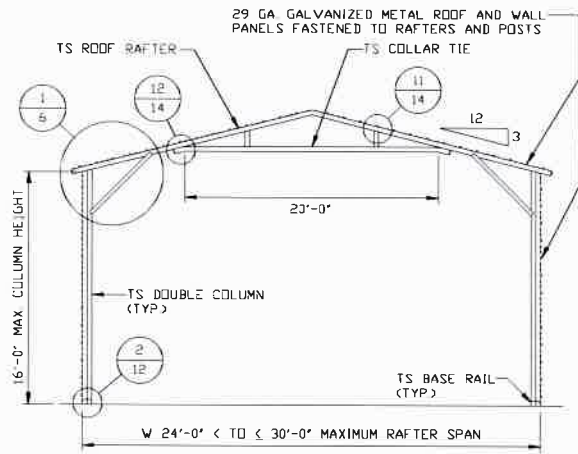
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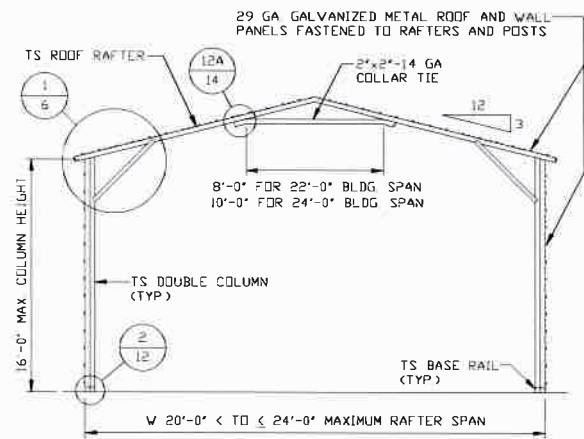
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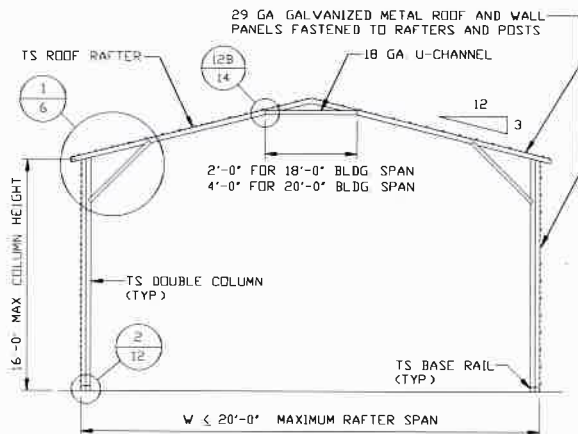
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SCALE: NTS



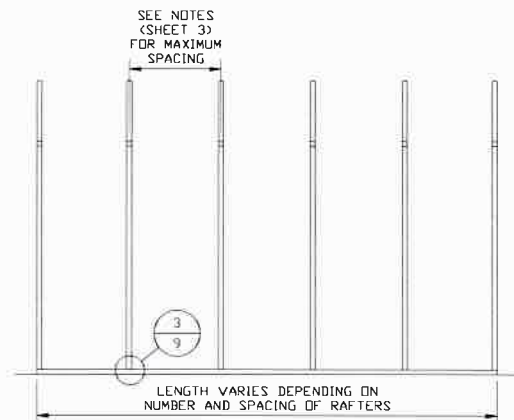
TYPICAL RAFTER/COLUMN FRAME SECTION

SCALE: NTS



TYPICAL RAFTER/COLUMN FRAME SECTION

SCALE: NTS



TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION

SCALE: NTS

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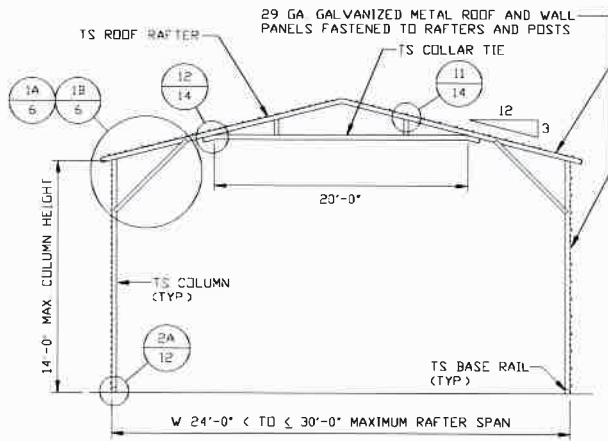
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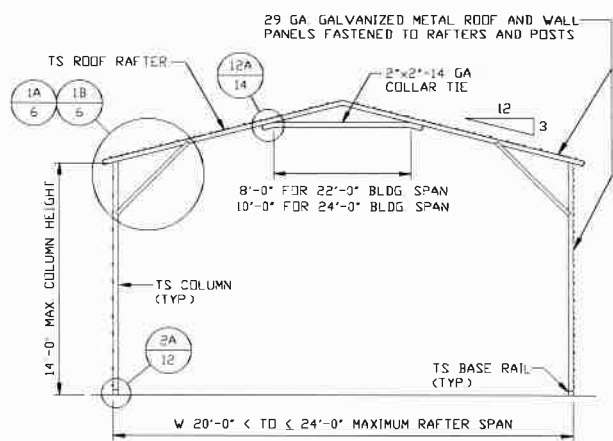
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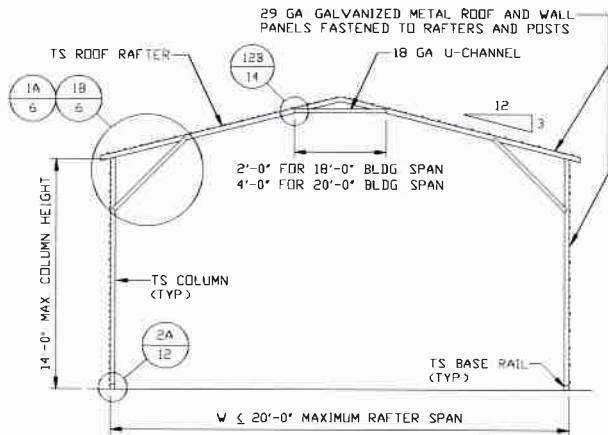
TYPICAL RAFTER/COLUMN FRAME SECTION

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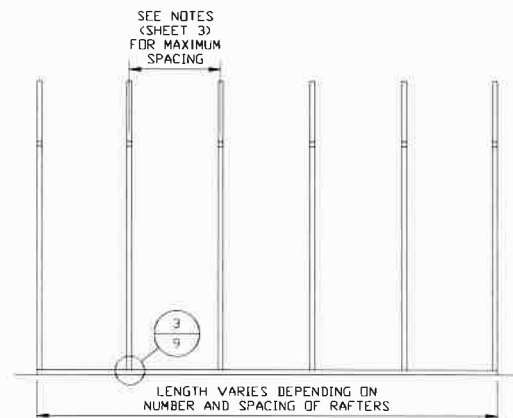
TYPICAL RAFTER/COLUMN FRAME SECTION

SCALE: NTS



TYPICAL RAFTER/COLUMN FRAME SECTION

SCALE: NTS



TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION

SCALE: NTS

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SHT. 5A

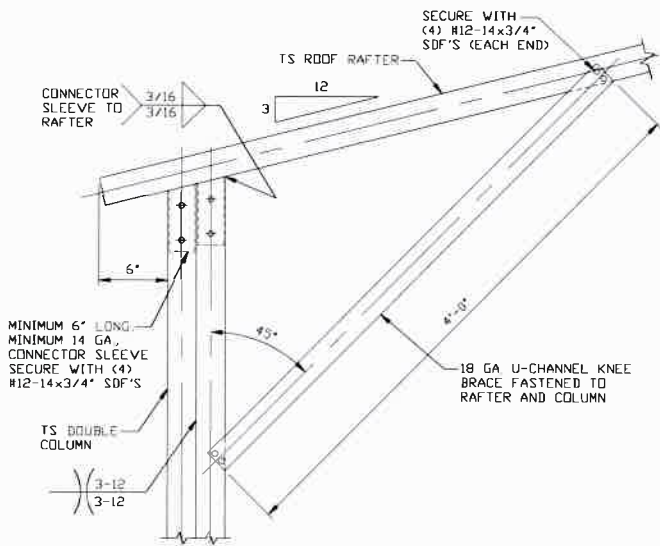
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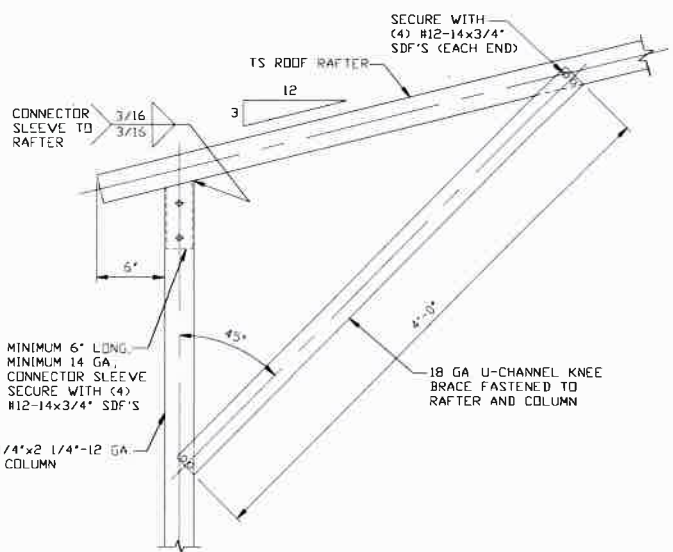
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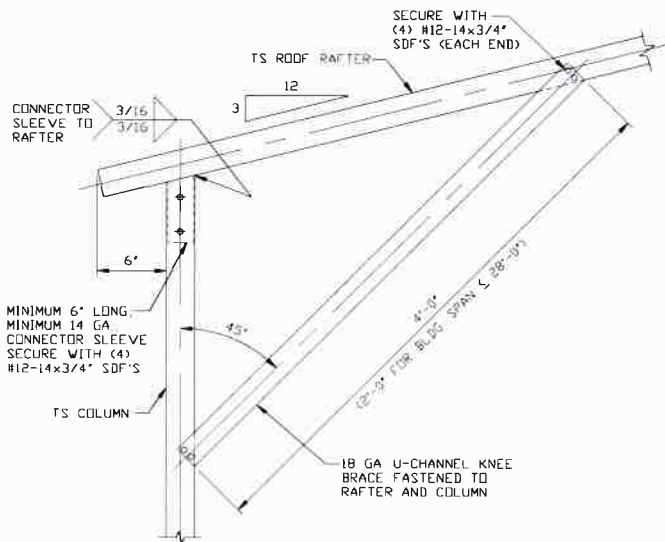
1 BOX EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS 14'-0" < TO <= 16'-0"

SCALE: NTS



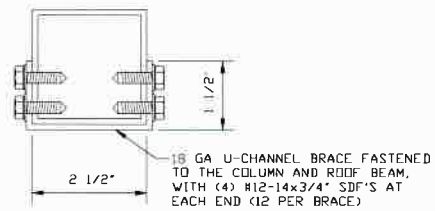
1A BOX EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS 12'-0" < TO <= 14'-0"

SCALE: NTS



1B BOX EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS <= 12'-0"

SCALE: NTS



BRACE SECTION

SCALE: NTS

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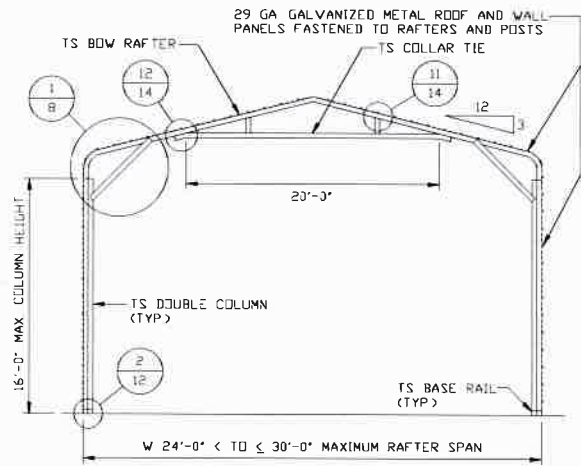
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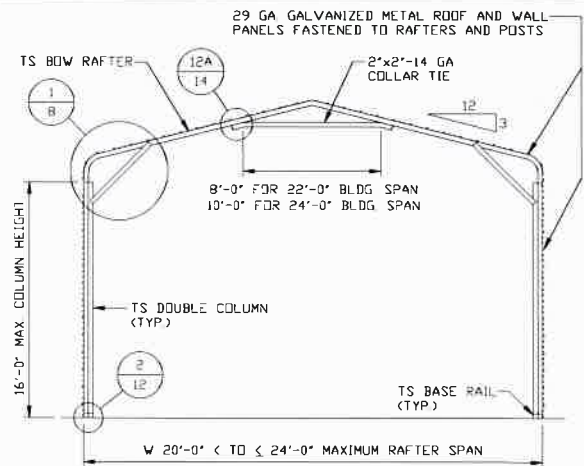
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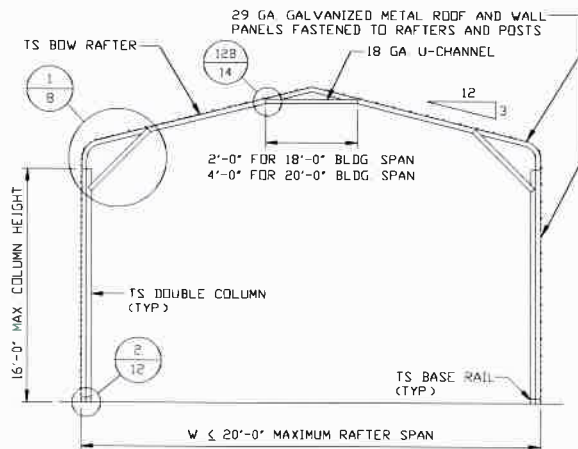
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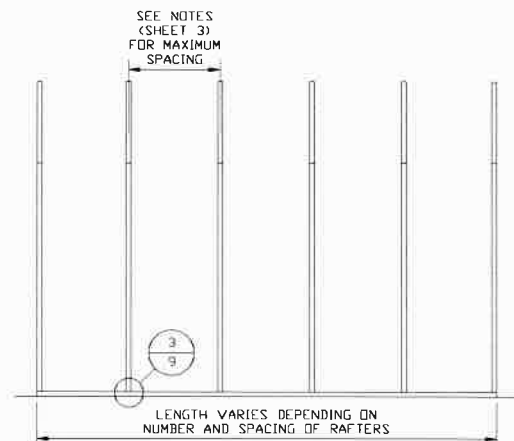
TYPICAL RAFTER/COLUMN FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN FRAMING SIDE SECTION
SCALE: NTS

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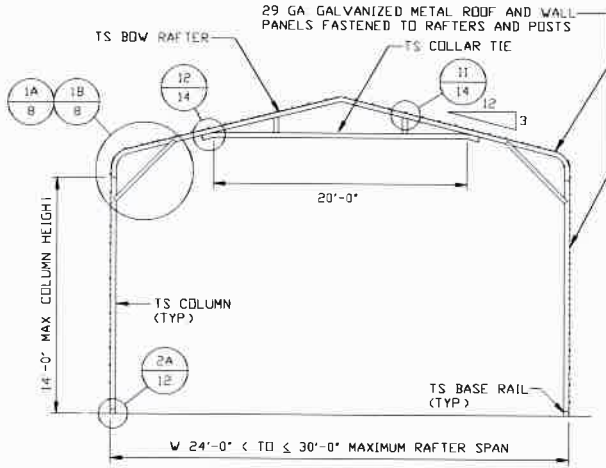
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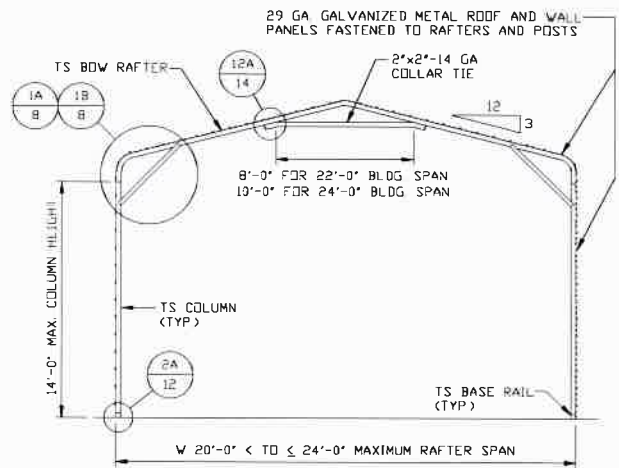
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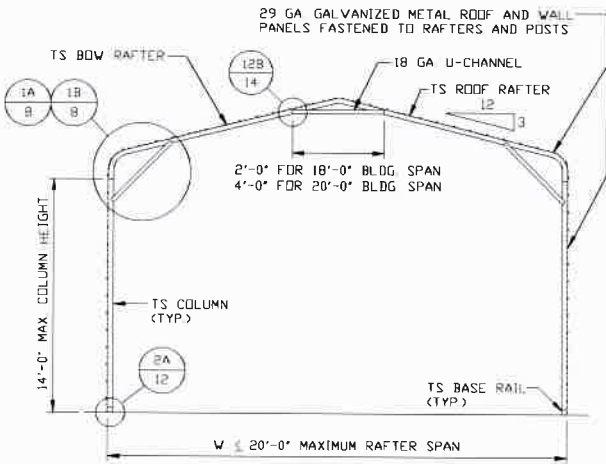
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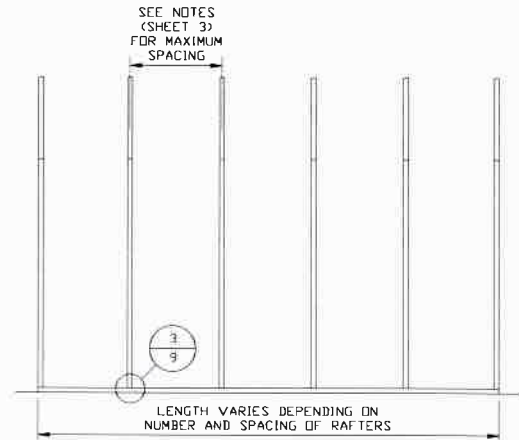
TYPICAL RAFTER/COLUMN FRAME SECTION
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TYPICAL RAFTER/COLUMN FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN FRAMING SIDE SECTION
SCALE: NTS

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SHT. 7A

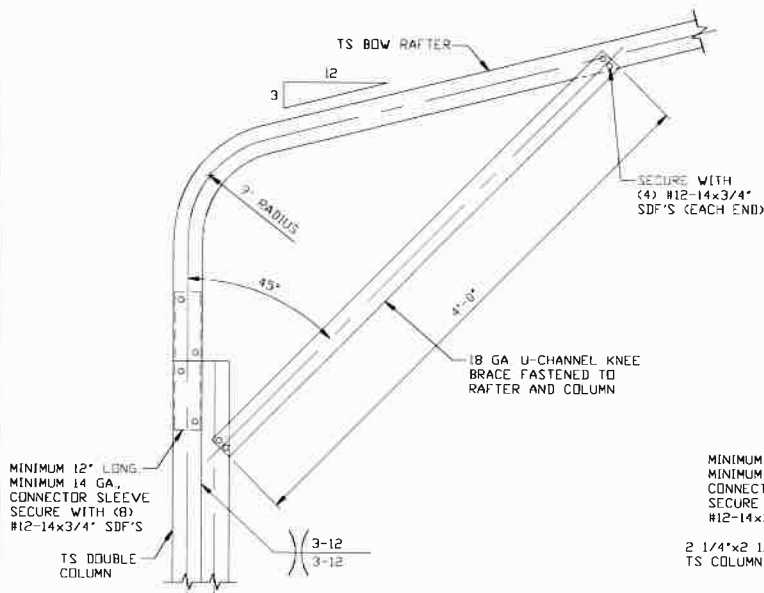
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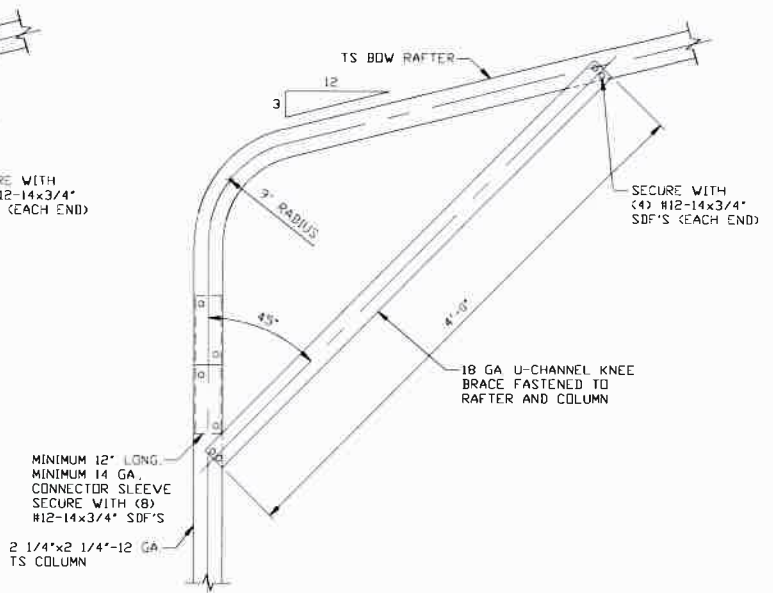
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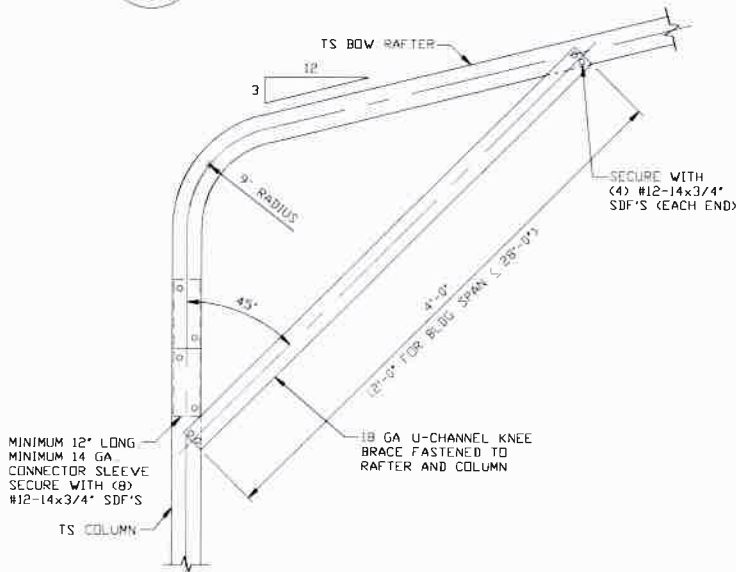
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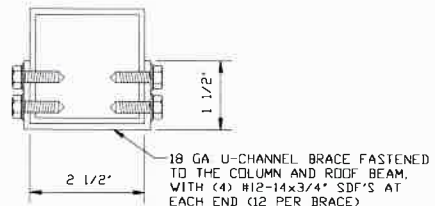
1
BOW EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS 14'-0" < TO ≤ 16'-0"
 SCALE: NTS



1A
BOW EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS 12'-0" < TO ≤ 14'-0"
 SCALE: NTS



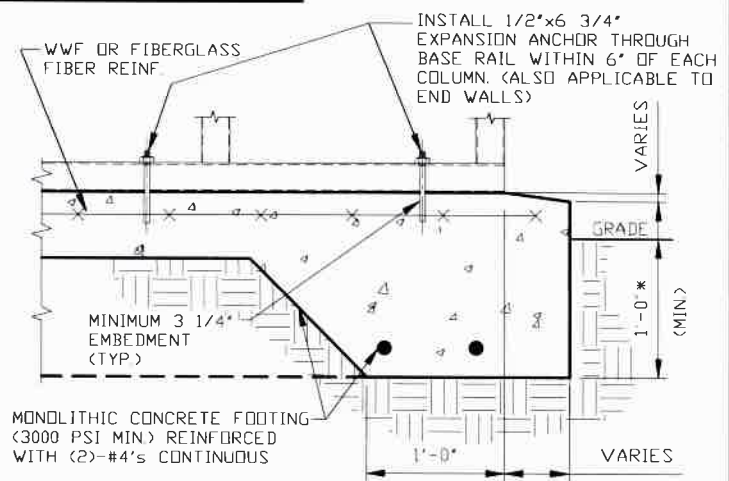
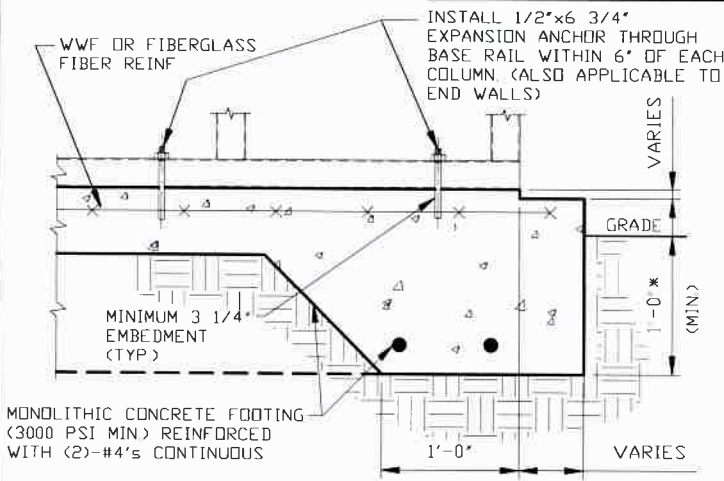
1B
BOW EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS ≤ 12'-0"
 SCALE: NTS



BRACE SECTION
 SCALE: NTS

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OPTIONAL BASE RAIL ANCHORAGE



3A

CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS
(MINIMUM ANCHOR EDGE DISTANCE IS 4")
* COORDINATE WITH LOCAL CODES/ORD

3B

CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS
(MINIMUM ANCHOR EDGE DISTANCE IS 4")
* COORDINATE WITH LOCAL CODES/ORD

GENERAL NOTES

NOTE: CONCRETE MONOLITHIC SLAB DESIGN BASED ON MINIMUM SOIL BEARING CAPACITY OF 1,500 PSF

CONCRETE:

CONCRETE SHALL HAVE A MINIMUM SPECIFIED COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS

COVER OVER REINFORCING STEEL:

FOR FOUNDATIONS, MINIMUM CONCRETE COVER OVER REINFORCING BARS SHALL BE PER ACI-318:

3" IN FOUNDATIONS WHERE THE CONCRETE IS CAST AGAINST AND PERMANENTLY IN CONTACT WITH THE EARTH OR EXPOSED TO THE EARTH OR WEATHER, AND 1 1/2" ELSEWHERE

REINFORCING STEEL:

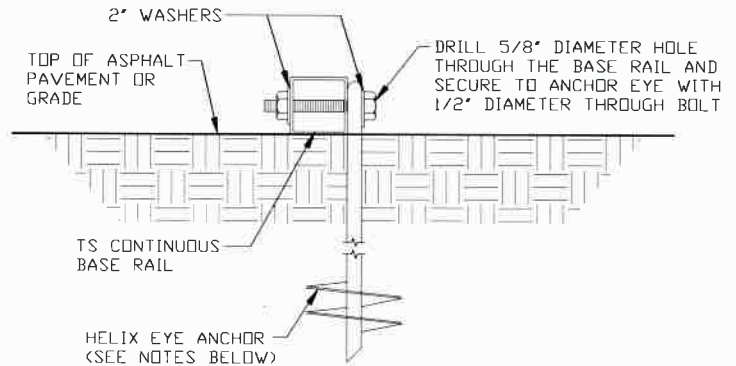
THE TURNDOWN REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. THE SLAB REINFORCEMENT SHALL BE WELDED WIRE FABRIC MEETING ASTM A185 OR FIBERGLASS FIBER REINFORCEMENT

REINFORCEMENT MAY BE BENT IN THE SHOP OR THE FIELD PROVIDED:

- 1 REINFORCEMENT IS BENT COLD
- 2 THE DIAMETER OF THE BEND, MEASURED ON THE INSIDE OF THE BAR, IS NOT LESS THAN SIX-BAR DIAMETERS
- 3 REINFORCEMENT PARTIALLY EMBEDDED IN CONCRETE SHALL NOT BE FIELD BENT

HELIX ANCHOR NOTES:

- 1 FOR VERY DENSE AND/OR CEMENTED SANDS, COARSE GRAVEL AND COBBLES, CALICHE, PRELOADED SILTS AND CLAYS, USE MINIMUM (2) 4" HELICES WITH MINIMUM 30" EMBEDMENT OR SINGLE 6" HELIX WITH MINIMUM 50" EMBEDMENT
- 2 FOR CORAL USE MINIMUM (2) 4" HELICES WITH MINIMUM 30" EMBEDMENT OR SINGLE 6" HELIX WITH MINIMUM 50" EMBEDMENT
- 3 FOR MEDIUM DENSE COARSE SANDS, SANDY GRAVELS, VERY STIFF SILTS, AND CLAYS USE MINIMUM (2) 4" HELICES WITH MINIMUM 30 INCH EMBEDMENT OR SINGLE 6" HELIX WITH MINIMUM 50" EMBEDMENT
- 4 FOR LOOSE TO MEDIUM DENSE SANDS, FIRM TO STIFF CLAYS AND SILTS ALLUVIAL FILL, USE MINIMUM (2) 6" HELICES WITH MINIMUM 50" EMBEDMENT
- 5 FOR VERY LOOSE TO MEDIUM DENSE SANDS, FIRM TO STIFFER CLAYS AND SILTS, ALLUVIAL FILL, USE MINIMUM (2) 8" HELICES WITH MINIMUM 60" EMBEDMENT



3C

GROUND BASE HELIX ANCHORAGE

SCALE: NTS (CAN BE USED FOR ASPHALT)

**MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING, INC.**

DRAWN BY: JM

CHECKED BY: PH

PROJECT MGR: WSM

CLIENT: TWIN CARPORTS

TWIN CARPORTS, LLC
781 W. LEBANON ST. BUILDING B
MT. AIRY, NC 27030
30'-0"X16'-0" ENCLOSED STRUCTURE

DATE: 5-19-20

SHT. 9

SCALE: NTS

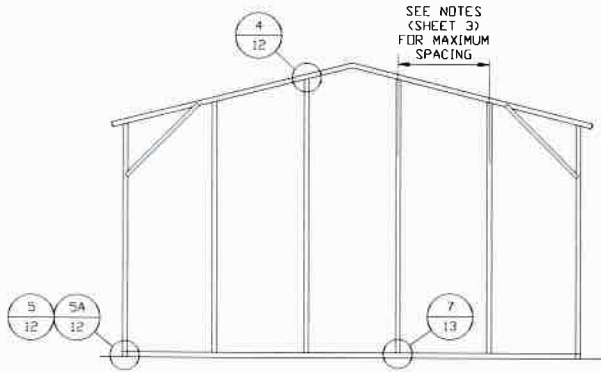
DWG. NO: SK-3

JOB NO: 17257S/18241S
/19326S/20102S

REV: 4

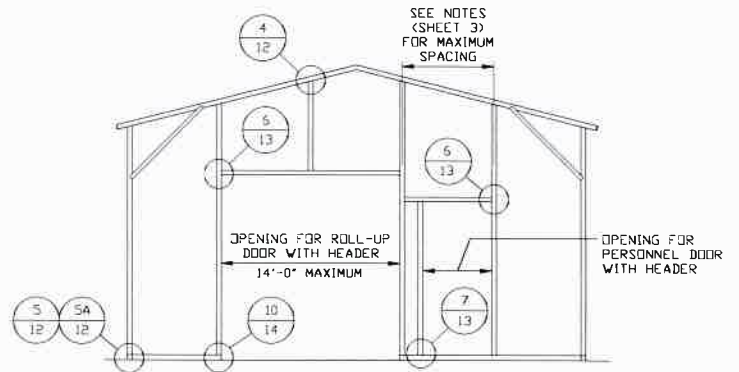
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BOX EAVE RAFTER END WALL AND SIDE WALL OPENINGS



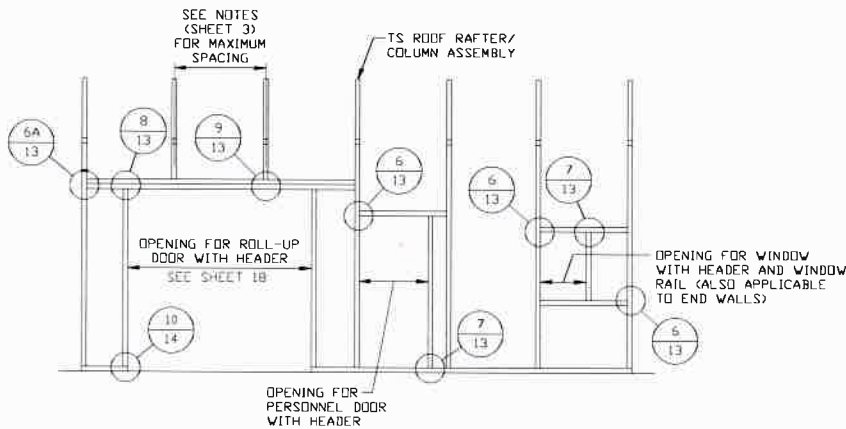
**TYPICAL BOX EAVE RAFTER
END WALL FRAMING SECTION**

SCALE: NTS



**TYPICAL BOX EAVE RAFTER END
WALL OPENINGS FRAMING SECTION**

SCALE: NTS



**TYPICAL BOX EAVE RAFTER
SIDE WALL OPENINGS FRAMING SECTION**

SCALE: NTS

**MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING, INC.**

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SCALE: NTS

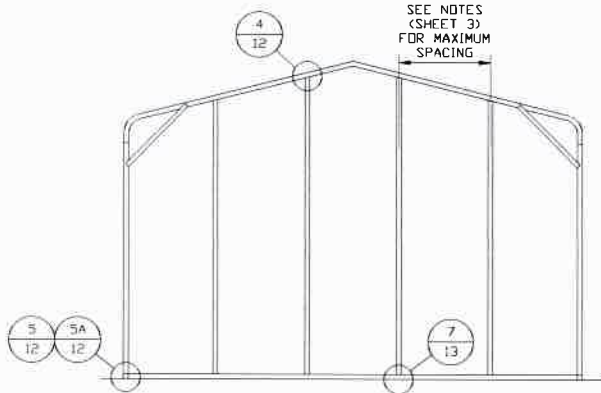
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**JOB NO: 17257S/18241S
/19326S/20102S**

REV: 4

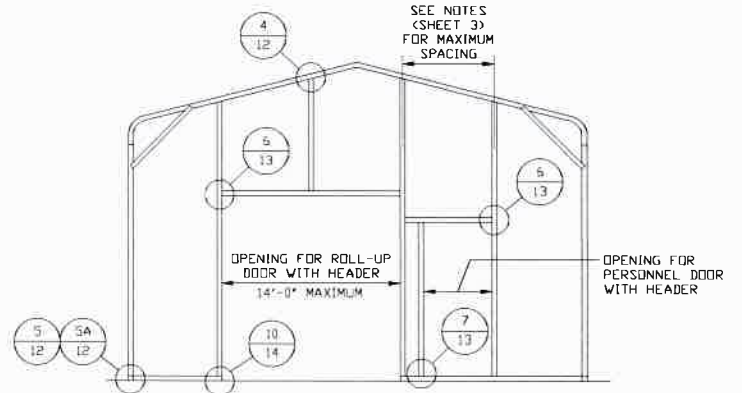
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BOW RAFTER END WALL AND SIDE WALL OPENINGS



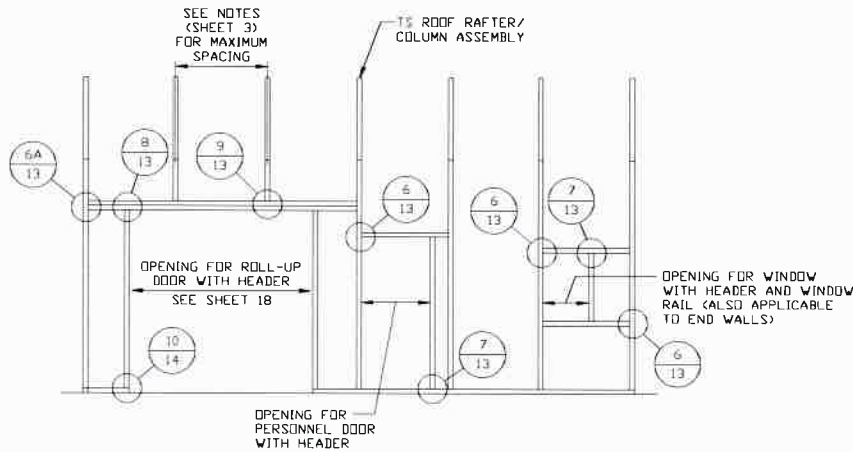
**TYPICAL BOW RAFTER
END WALL FRAMING SECTION**

SCALE: NTS



**TYPICAL BOW RAFTER END
WALL OPENINGS FRAMING SECTION**

SCALE: NTS



**TYPICAL BOW RAFTER SIDE
WALL OPENINGS FRAMING SECTION**

SCALE: NTS

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DATE: 5-19-20

SHT. 11

SCALE: NTS

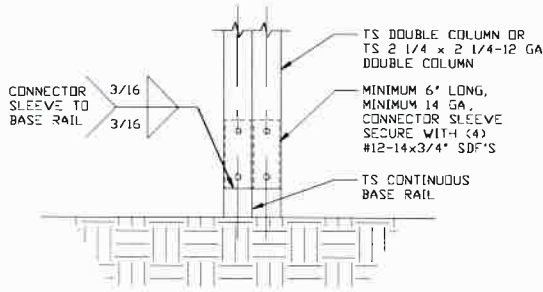
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**JOB NO: 17257S/18241S
/19326S/20102S**

REV: 4

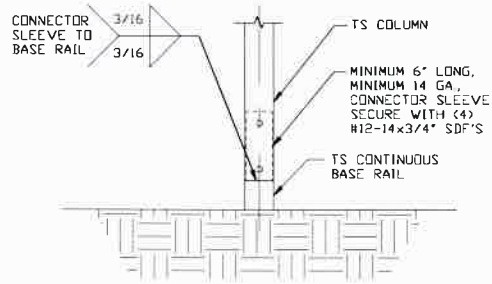
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BOW AND BOX EAVE RAFTER WALL OPENING DETAILS



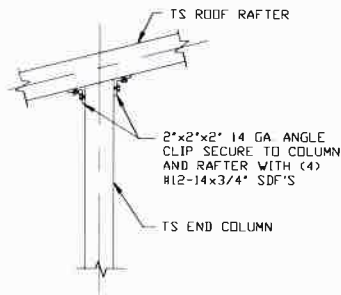
2 RAFTER COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



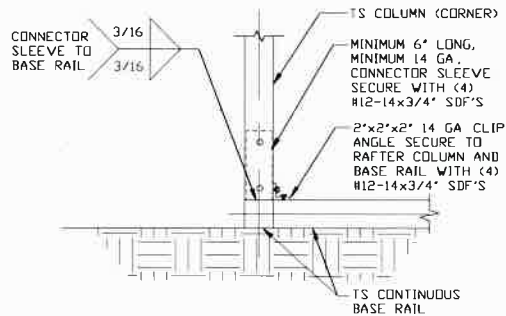
2A RAFTER COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



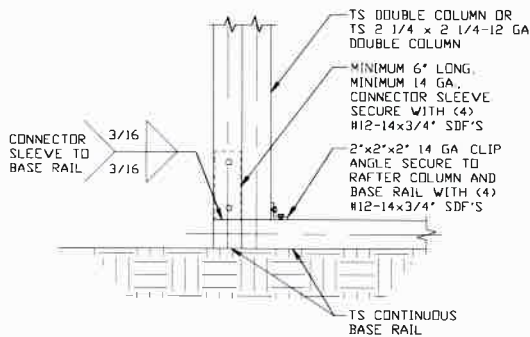
4 END COLUMN/RAFTER CONNECTION DETAIL

SCALE: NTS



5 END COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



5A END COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS

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SCALE: NTS

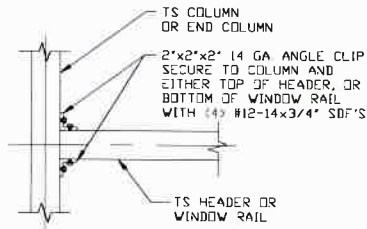
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JOB NO: 17257S/18241S
/19326S/20102S

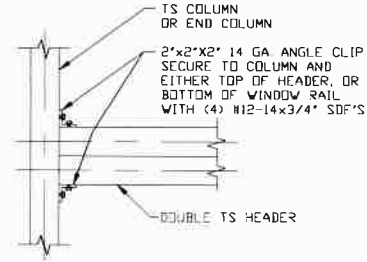
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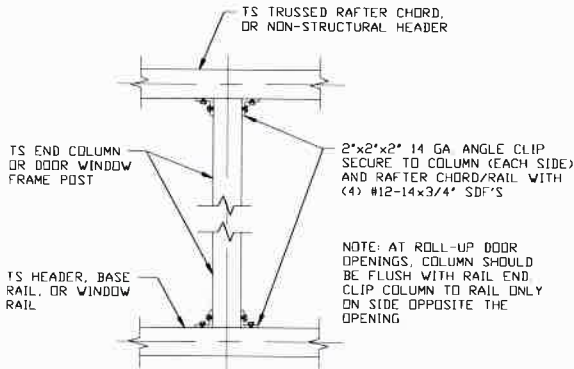
BOW AND BOX EAVE RAFTER WALL OPENING DETAILS



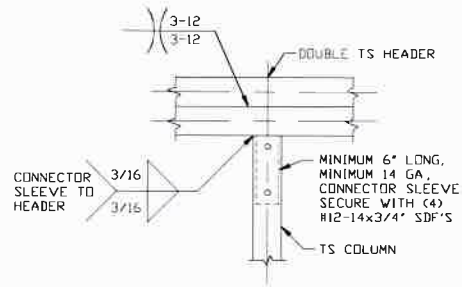
6
COLUMN OR WINDOW RAIL TO POST CONNECTION DETAIL
 SCALE: NTS



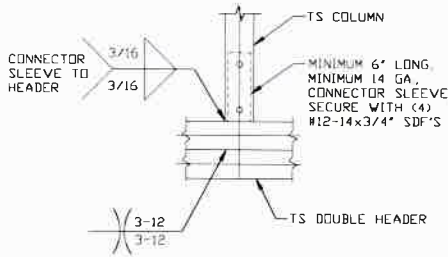
6A
COLUMN OR WINDOW RAIL TO POST CONNECTION DETAIL
 SCALE: NTS



7
COLUMN TO HEADER, BASE RAIL OR WINDOW RAIL CONNECTION DETAIL
 SCALE: NTS



8
HEADER/COLUMN CONNECTION DETAIL
 SCALE: NTS



9
HEADER/COLUMN CONNECTION DETAIL
 SCALE: NTS

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**TWIN CARPORTS, LLC
 781 W. LEBANON ST. BUILDING B
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 30'-0" x 16'-0" ENCLOSED STRUCTURE**

DATE: 5-19-20

SCALE: NTS

**JOB NO: 17257S/18241S
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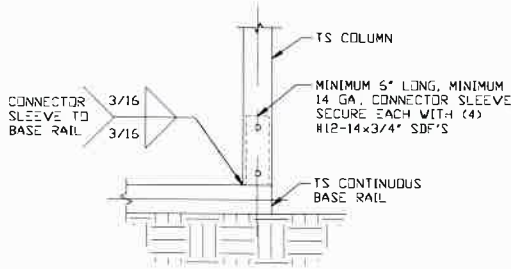
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DWG. NO: SK-3

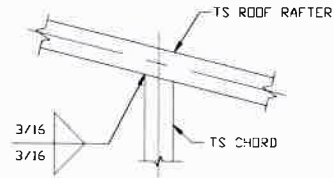
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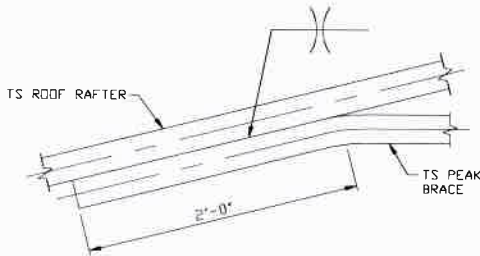
BOW AND BOX EAVE RAFTER WALL OPENING DETAILS



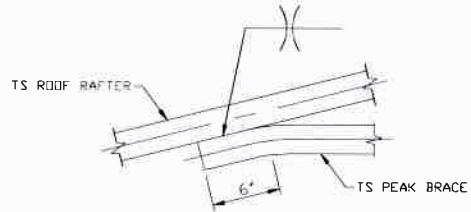
10
COLUMN/BASE RAIL CONNECTION DETAIL
 SCALE: NTS



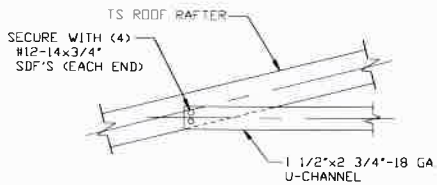
11
RAFTER TO CHORD CONNECTION DETAIL
 SCALE: NTS



12
PEAK BRACE CONNECTION DETAIL
 SCALE: NTS



12A
PEAK BRACE CONNECTION DETAIL
 SCALE: NTS



12B
ROOF RAFTER TIE CONNECTION DETAIL
 SCALE: NTS

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SCALE: NTS

SHT. 14

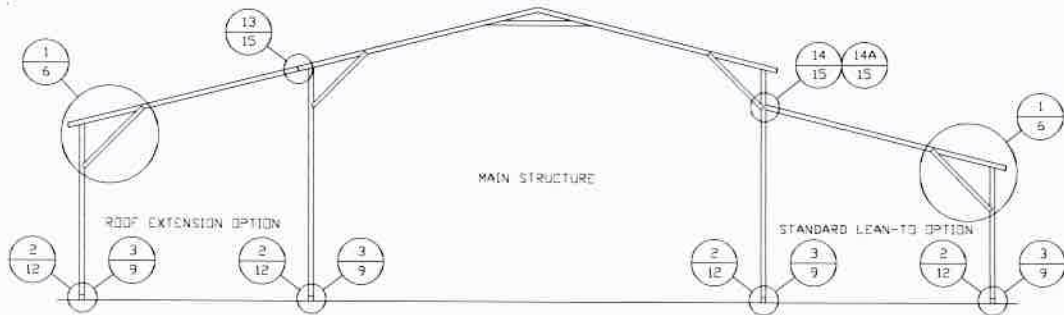
DWG. NO: SK-3

**JOB NO: 17257S/18241S
 /19326S/20102S**

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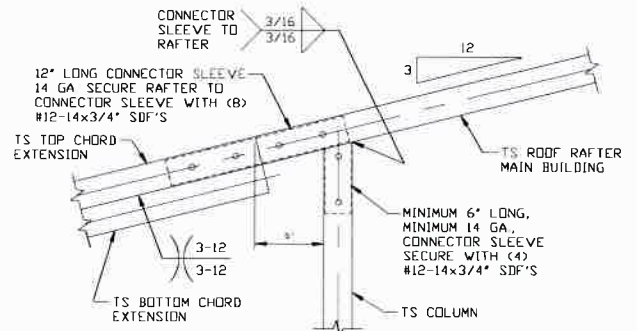
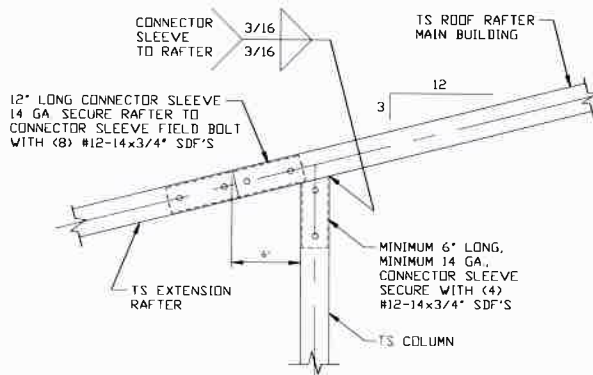
BOX EAVE RAFTER LEAN-TO OPTIONS



TYPICAL BOX EAVE RAFTER LEAN-TO OPTIONS FRAMING SECTION (BOTH OPTIONS SHOWN)

SCALE: NTS

MAXIMUM STANDARD LEAN-TO WIDTH IS 12'-0"



SIDE EXTENSION RAFTER/ COLUMN DETAIL FOR RAFTER SPANS $\leq 12'-0"$ FOR SNOW LOADS ≤ 35 PSF AND SPANS $\leq 10'-0"$ FOR SNOW LOADS 35 PSF $< TO \leq 45$ PSF

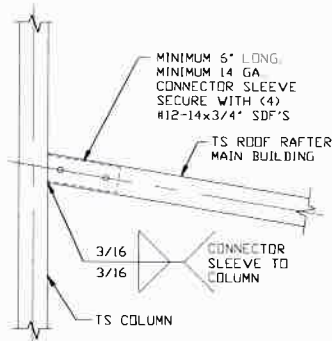
SCALE: NTS

SIDE EXTENSION RAFTER/ COLUMN DETAIL FOR RAFTER SPANS $10'-0" < TO \leq 12'-0"$ FOR SNOW LOADS 35 PSF $< TO \leq 45$ PSF

SCALE: NTS

13

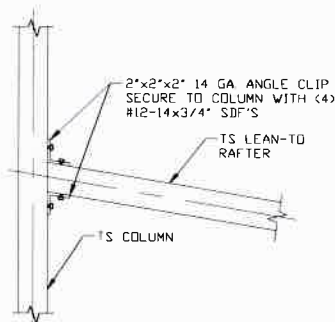
13A



LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $\leq 12'-0"$ FOR SNOW LOADS ≤ 35 PSF AND SPANS $\leq 10'-0"$ FOR SNOW LOADS 35 PSF $< TO \leq 45$ PSF

SCALE: NTS

14



OPTIONAL LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $\leq 12'-0"$ FOR SNOW LOADS ≤ 35 PSF AND SPANS $\leq 10'-0"$ FOR SNOW LOADS 35 PSF $< TO \leq 45$ PSF

SCALE: NTS

14A

**MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING, INC.**

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CLIENT: TWIN CARPORTS

TWIN CARPORTS, LLC
781 W. LEBANON ST. BUILDING B
MT. AIRY, NC 27030
30'-0"x16'-0" ENCLOSED STRUCTURE

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SCALE: NTS

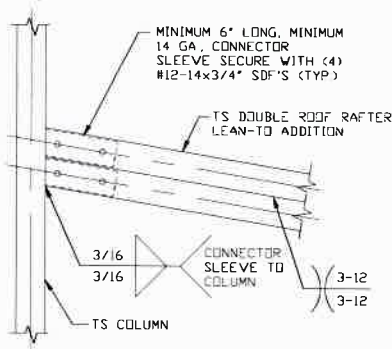
DWG. NO: SK-3

JOB NO: 17257S/18241S
/19326S/20102S

REV: 4

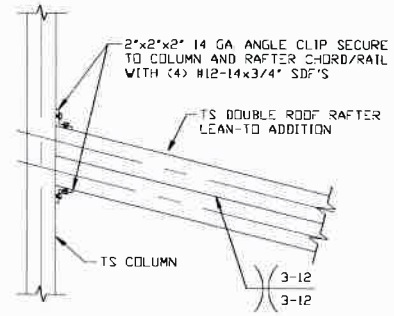
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BOX EAVE RAFTER LEAN-TO OPTIONS



14B LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS 10'-0" < TO ≤ 12'-0" FOR SNOW LOADS 35 PSF < TO ≤ 45 PSF

SCALE: NTS



14C OPTIONAL LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS 10'-0" < TO ≤ 12'-0" FOR SNOW LOADS 35 PSF < TO ≤ 45 PSF

SCALE: NTS

**MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING, INC.**

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TWIN CARPORTS, LLC
781 W. LEBANON ST. BUILDING B
MT. AIRY, NC 27030
30'-0" x 16'-0" ENCLOSED STRUCTURE

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SHT. 15A

SCALE: NTS

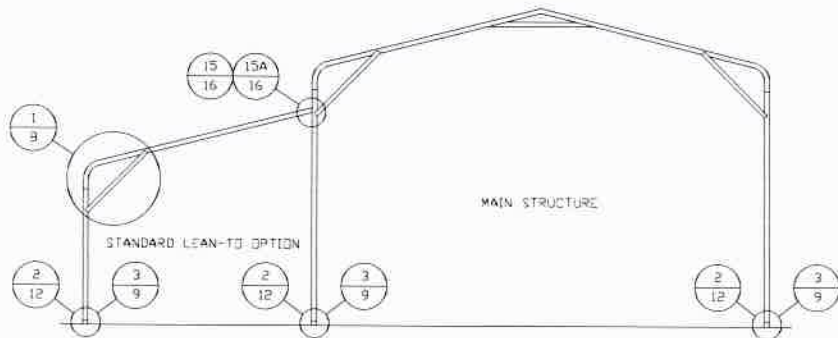
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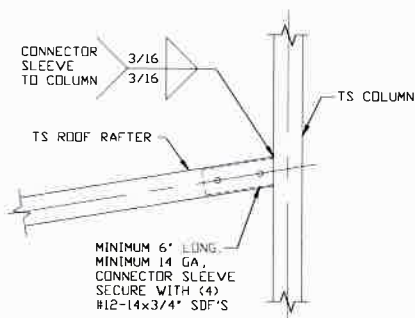
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BOW RAFTER LEAN-TO OPTION



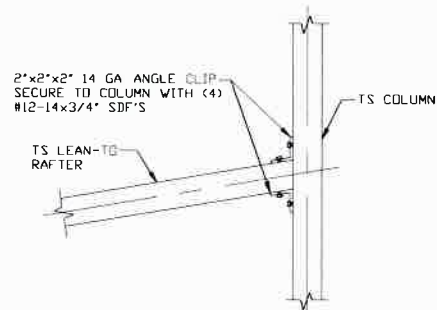
TYPICAL BOW RAFTER LEAN-TO OPTION FRAMING SECTION

SCALE: NTS
 MAXIMUM STANDARD LEAN-TO WIDTH IS 12'-0"



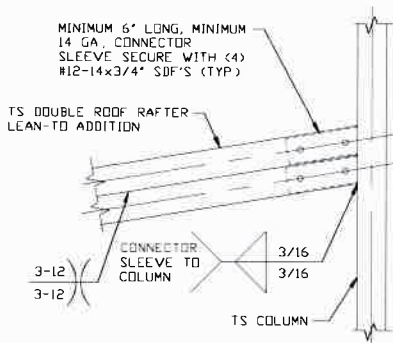
LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $\leq 12'-0"$ FOR SNOW LOADS ≤ 35 PSF AND SPANS $\leq 10'-0"$ FOR SNOW LOADS 35 PSF $< TO < 45$ PSF

15 SCALE: NTS



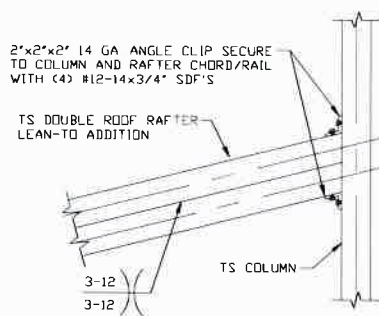
OPTIONAL LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $\leq 12'-0"$ FOR SNOW LOADS ≤ 35 PSF AND SPANS $\leq 10'-0"$ FOR SNOW LOADS 35 PSF $< TO < 45$ PSF'

15A SCALE: NTS



LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS 10'-0" $< TO <= 12'-0"$ FOR SNOW LOADS 35 PSF $< TO <= 45$ PSF

15B SCALE: NTS



OPTIONAL LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS 10'-0" $< TO <= 12'-0"$ FOR SNOW LOADS 35 PSF $< TO <= 45$ PSF

15C SCALE: NTS

MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.

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PROJECT MGR: VSM

CLIENT: TWIN CARPORTS

TWIN CARPORTS, LLC
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 30'-0"x16'-0" ENCLOSED STRUCTURE

DATE: 5-19-20

SCALE: NTS

JOB NO: 17257S/18241S
 /19326S/20102S

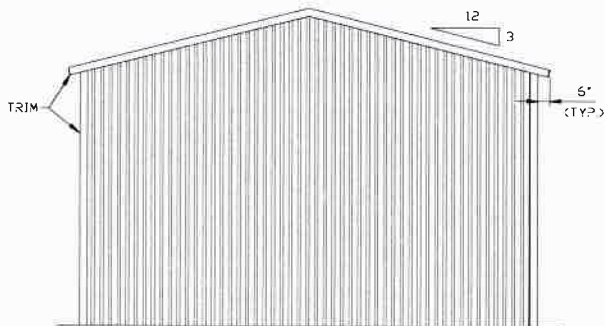
SHT. 16

DWG. NO: SK-3

REV: 4

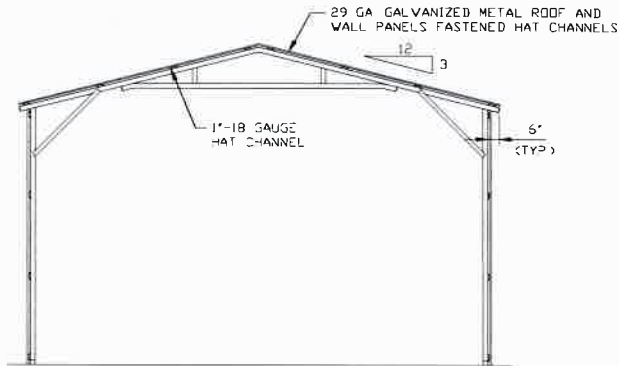
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BOX EAVE RAFTER VERTICAL ROOF/SIDING OPTION



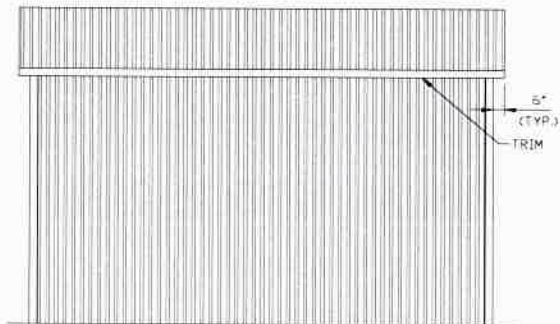
**TYPICAL END ELEVATION
VERTICAL ROOF/SIDING**

SCALE: NTS



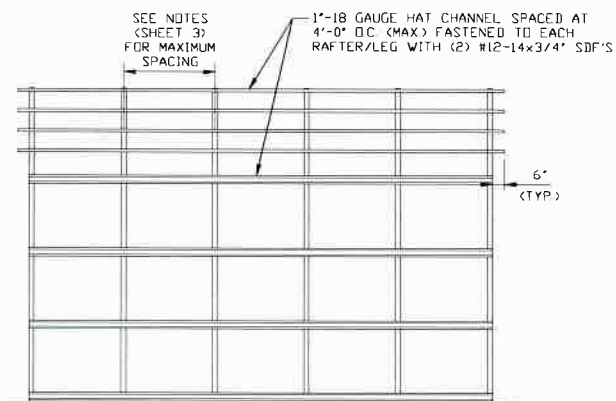
**TYPICAL SECTION VERTICAL
ROOF/SIDING OPTION**

SCALE: NTS



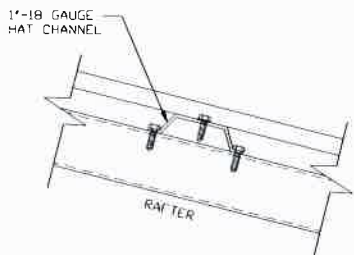
**TYPICAL SIDE ELEVATION
VERTICAL ROOF/SIDING**

SCALE: NTS



**TYPICAL FRAMING SECTION
VERTICAL ROOF/SIDING OPTION**

SCALE: NTS



PANEL ATTACHMENT

(ALTERNATE FOR VERTICAL ROOF PANELS)
SCALE: NTS

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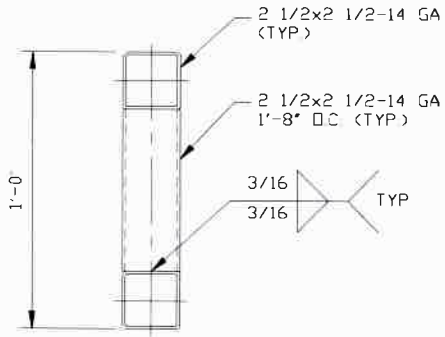
SHT. 17

DWG. NO: SK-3

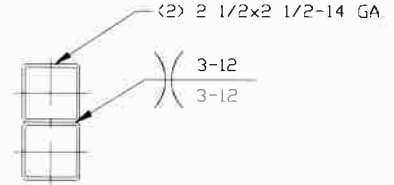
REV: 4

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OPTIONAL HEADERS



**HEADER DETAIL FOR
OPENINGS 12'-0" < LENGTH < 16'-0"**
SCALE: NTS



**HEADER DETAIL FOR
OPENINGS LENGTH < 12'-0"**
SCALE: NTS

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SHT. 18

DWG. NO SK-3

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