



## **STRUCTURAL DESIGN**

# **STANDARD PACKAGE ENCLOSED BUILDING**

**MAXIMUM 40'- 0" WIDE X 20'- 0" HEIGHT-  
BOX EAVE FRAME AND BOW FRAME**

**24 September 2020**

**Revision 0**

**M&A Project No. 20195S**

**Prepared for:**

**Universal Metal Buildings**

**9283 US 601**

**Dobson, NC 27017**

**Prepared by:**

**Moore and Associates Engineering and Consulting, Inc.**

**1009 East Avenue**

**North Augusta, SC 29841**

**401 South Main Street**

**Mount Airy, NC 27030**



**MOORE AND ASSOCIATES  
ENGINEERING AND CONSULTING**


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

**DRAWN BY: JG**

**CHECKED BY: PDH**

**PROJECT MGR: VSM**

**CLIENT: UNIVERSAL**

**UNIVERSAL METAL BUILDINGS**  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE

**DATE: 9-24-20**

**SHT. 1**

**SCALE: NTS**

**DWG. NO: SK-3**

**JOB NO: 201955**

**REV: 0**

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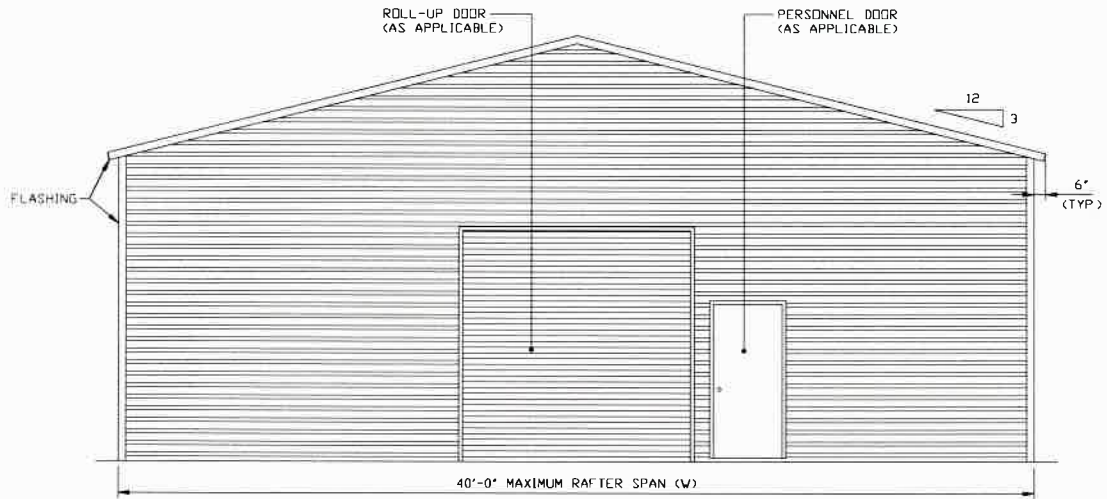
## INSTALLATION NOTES AND SPECIFICATIONS

1. DESIGN IS FOR MAXIMUM 40'-0" WIDE x 20'-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, 2012 IBC AND 2009 IBC.
3. DESIGN LOADS ARE AS FOLLOWS:
  - A) DEAD LOAD = 15 PSF
  - B) LIVE LOAD = 12 PSF
  - C) GROUND SNOW LOAD = 35 PSF

NOTE: UNBALANCED SNOW LOADS DUE TO DRIFTING HAVE NOT BEEN EVALUATED.
4. 3-SECOND GUST ULTIMATE WIND SPEED ( $V_{ULT}$ ) =  $\leq$  145 MPH (NOMINAL WIND SPEED =  $\leq$  112 MPH)
5. MAXIMUM RAFTER/COLUMN AND END COLUMN SPACING = 5.0 FEET (UNLESS NOTED OTHERWISE).
6. SIDEWALL COLUMNS AND ENDWALL COLUMNS ARE SIMILAR IN SIZE, 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 (UNLESS NOTED OTHERWISE).
10. AVERAGE FASTENER SPACING ON-CENTERS ALONG RAFTERS OR HAT CHANNELS, AND COLUMNS (INTERIOR OR END) = 10 INCHES.
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.
12. ANCHORS SHALL BE INSTALLED THROUGH BASE RAIL WITHIN 6' OF EACH COLUMN.
13. STANDARD GROUND FOUNDATION SYSTEM CONSISTS OF #4 REBAR W/ WELDED NUT x 36" LONG SOILS NAILS AND ARE APPLICABLE ONLY IN MEDIUM TO STIFF SOILS (SUITABLE SOIL). OPTIONAL FOUNDATION SYSTEMS MAY BE USED IN SUITABLE SOILS AND MUST BE USED IN UNSUITABLE SOILS. COORDINATE WITH LOCAL CODES/ORDINANCES FOR FOUNDATION SYSTEM TO BE COMPLIANT WITH FROST DEPTH PROTECTION.
14. WIND FORCES GOVERN OVER SEISMIC FORCES. SEISMIC PARAMETERS ANALYZED ARE:
  - SOIL SITE CLASS = D
  - RISK CATEGORY I
  - R = 3.25                       $I_e = 10$
  - $S_{DS} = 2.039 g$                $V = C_s W$
  - $S_{D1} = 1.258 g$

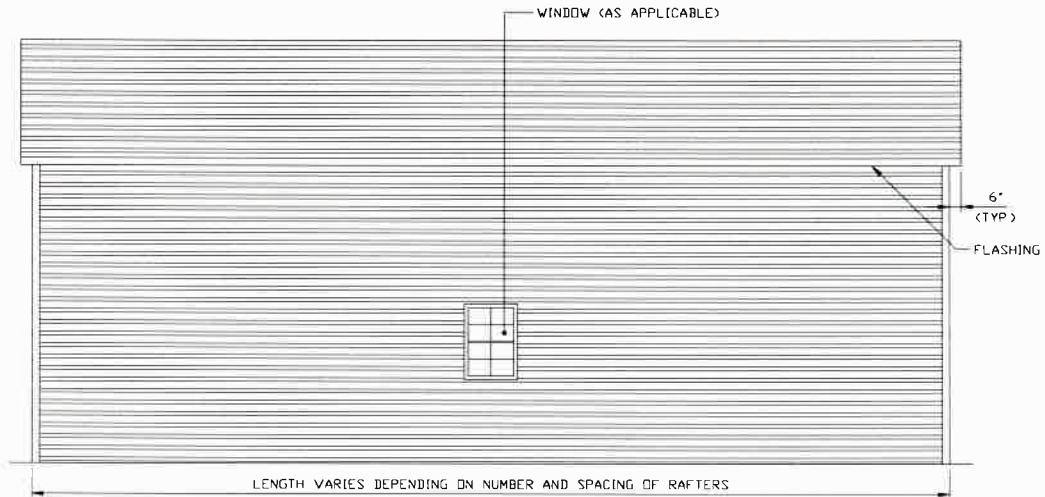
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## BOX EAVE FRAME RAFTER STRUCTURE



### TYPICAL END ELEVATION

SCALE: NTS



### TYPICAL SIDE ELEVATION

SCALE: NTS

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**UNIVERSAL METAL BUILDINGS**

9283 US 601

DOBSON, NC 27017

40'-0"x20'-0" ENCLOSED STRUCTURE

**DATE: 9-24-20**

**SHT. 4**

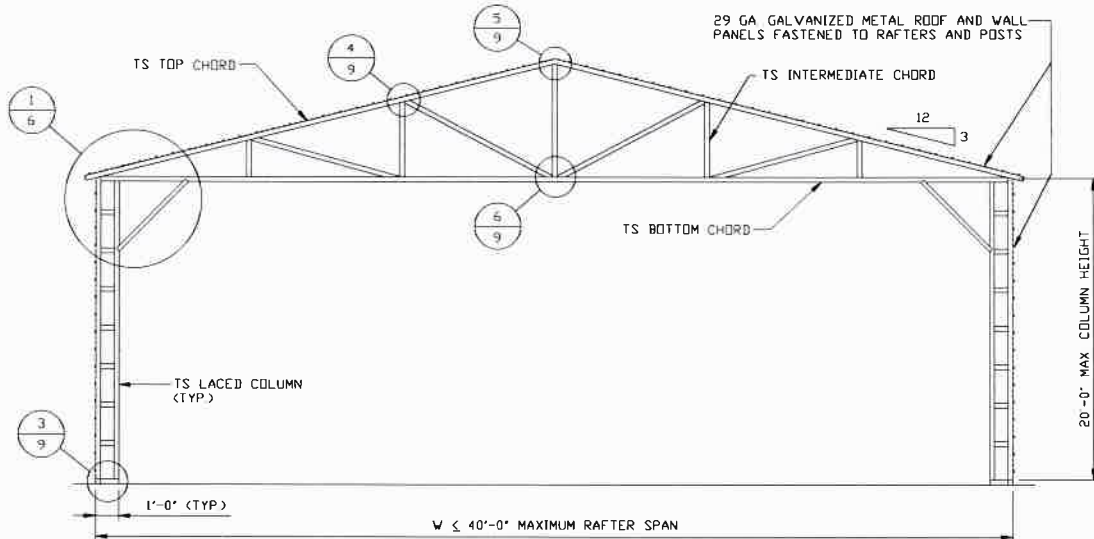
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**DWG. NO: SK-3**

**JOB NO: 20195S**

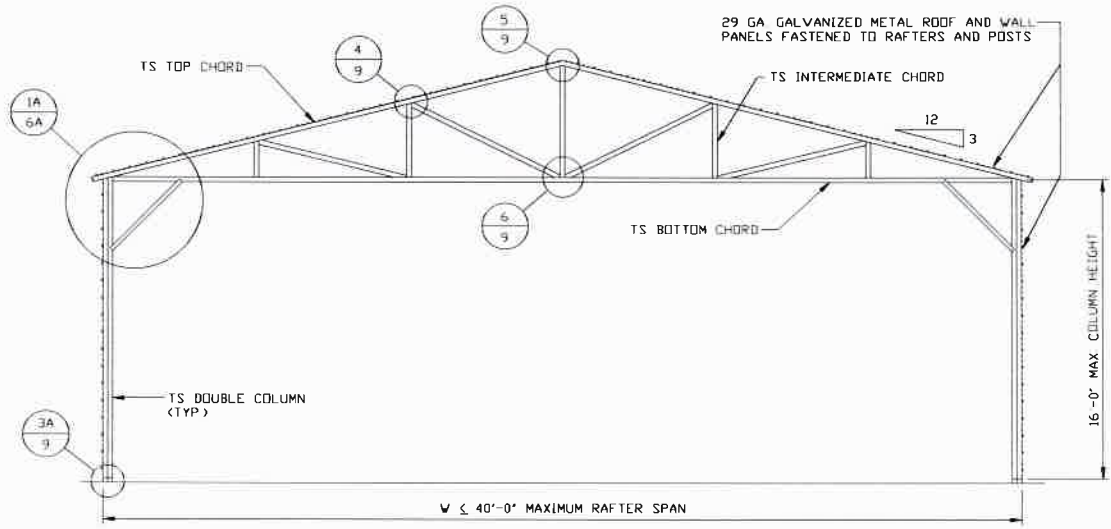
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**TYPICAL RAFTER/COLUMN FRAME SECTION**

SCALE: NTS

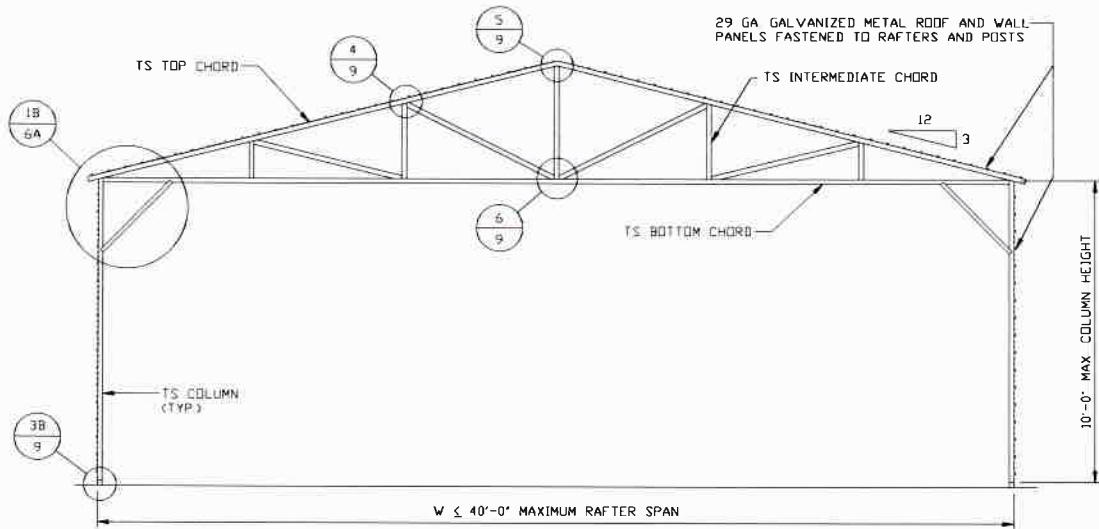


**TYPICAL RAFTER/COLUMN FRAME SECTION**

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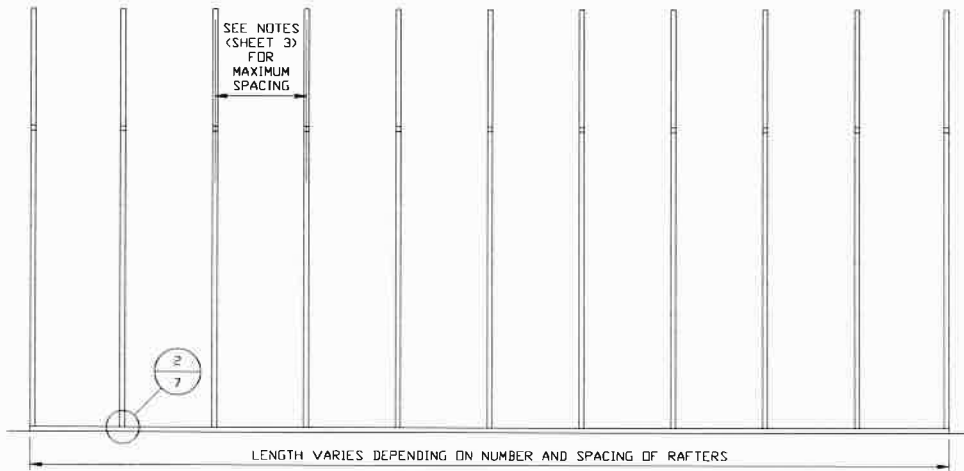
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**TYPICAL RAFTER/COLUMN FRAME SECTION**

SCALE: NTS



**TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION**

SCALE: NTS

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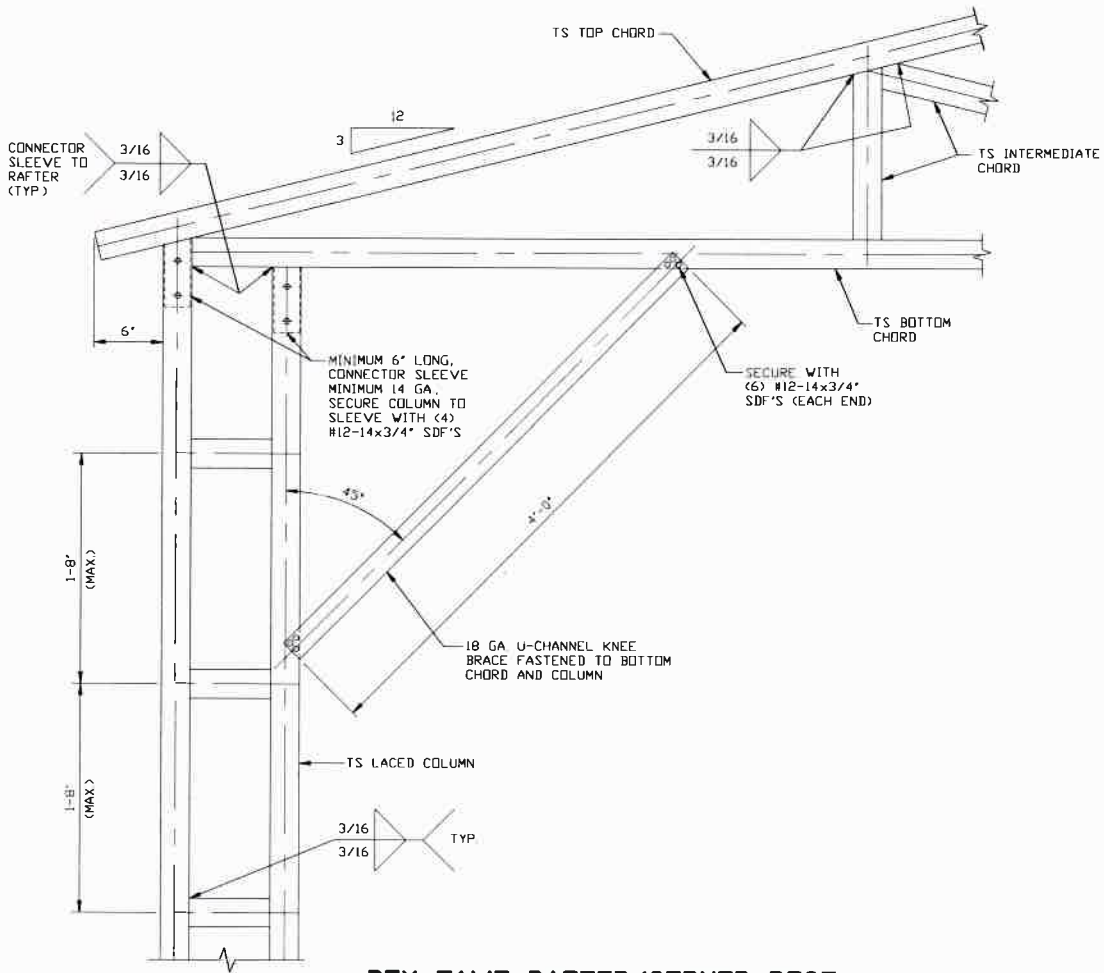
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**SHT. 5A**

**DWG. NO: SK-3**

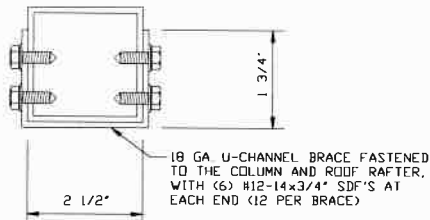
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**BOX EAVE RAFTER/CORNER POST CONNECTION DETAIL**  
**FOR HEIGHTS 16'-0" < TO ≤ 20'-0"**  
 SCALE: NTS

1



**BRACE SECTION**  
 SCALE: NTS

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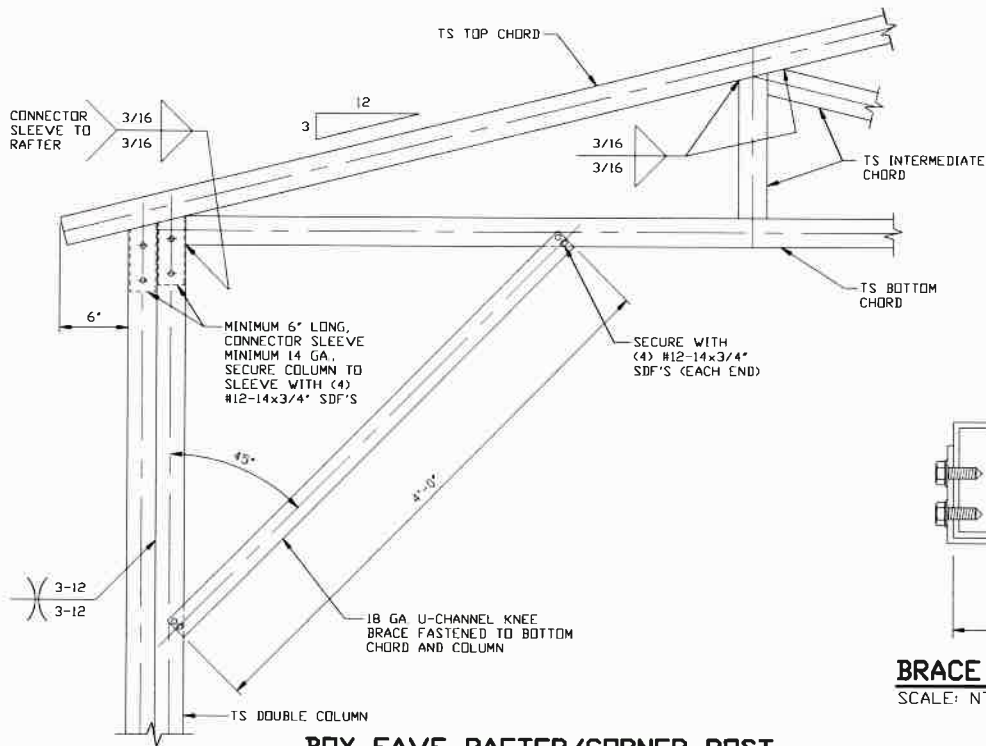
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**UNIVERSAL METAL BUILDINGS**  
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<b>CLIENT: UNIVERSAL</b>	<b>SHT. 6</b>	<b>DWG. NO: SK-3</b>	<b>REV: 0</b>

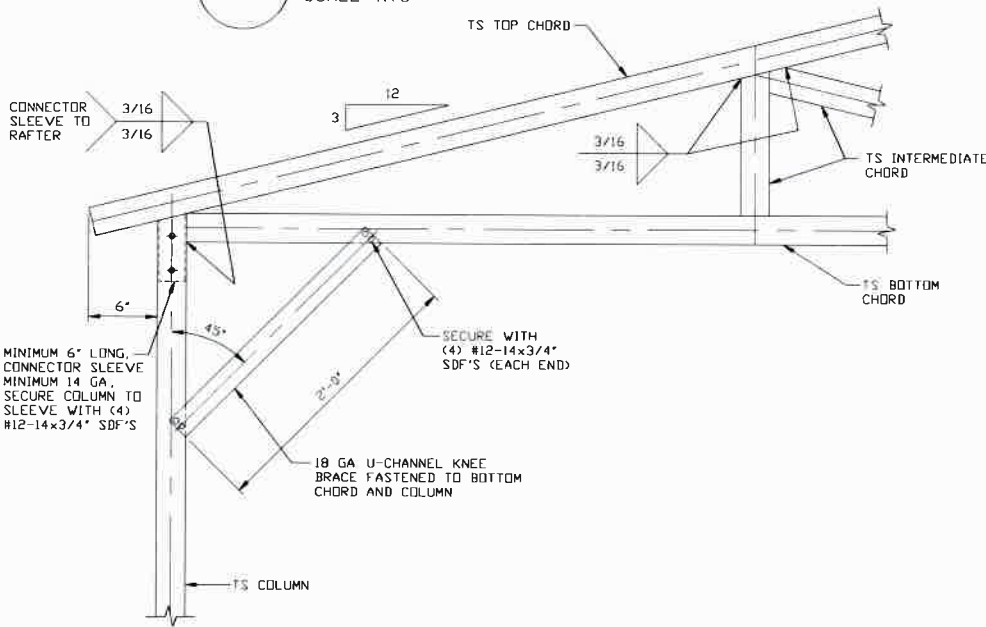




**BRACE SECTION**  
SCALE: NTS

1A

**BOX EAVE RAFTER/CORNER POST CONNECTION DETAIL FOR HEIGHTS 10'-0" < TO <= 16'-0"**  
SCALE: NTS



1B

**BOX EAVE RAFTER/CORNER POST CONNECTION DETAIL FOR HEIGHTS <= 10'-0"**  
SCALE: NTS

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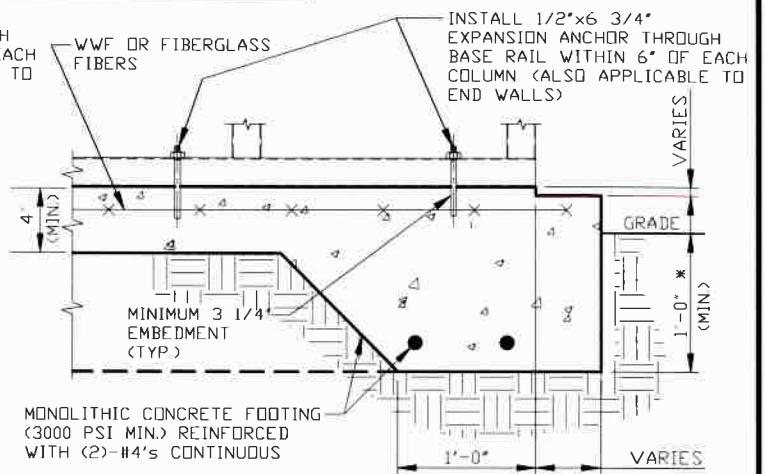
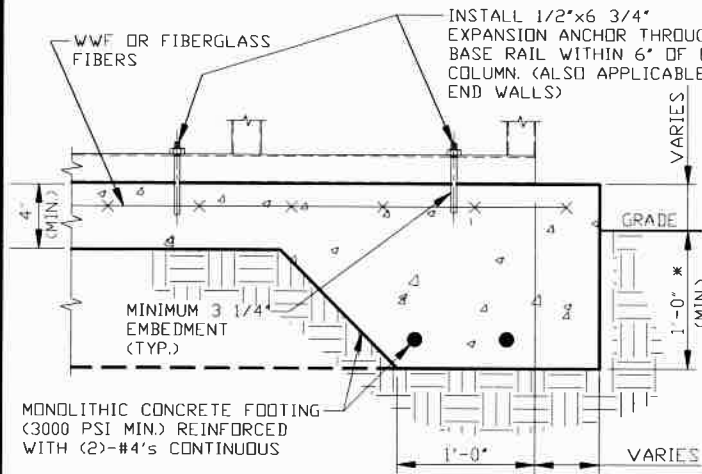
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## BASE RAIL ANCHORAGE OPTIONS



2A

### CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS  
 MINIMUM ANCHOR EDGE DISTANCE IS 4"  
 \* COORDINATE WITH LOCAL BUILDING CODE  
 AND/OR BUILDING OFFICIAL REGARDING  
 REQUIRED MINIMUM FOOTING DEPTH.

2B

### CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS  
 MINIMUM ANCHOR EDGE DISTANCE IS 4"  
 \* COORDINATE WITH LOCAL BUILDING CODE  
 AND/OR BUILDING OFFICIAL REGARDING  
 REQUIRED MINIMUM FOOTING DEPTH.

## 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.

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UNIVERSAL METAL BUILDINGS  
9283 US 601  
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**DATE: 9-24-20**

**SHT. 7**

**SCALE: NTS**

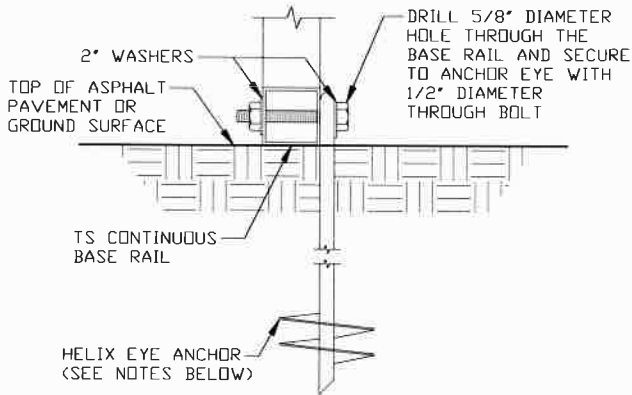
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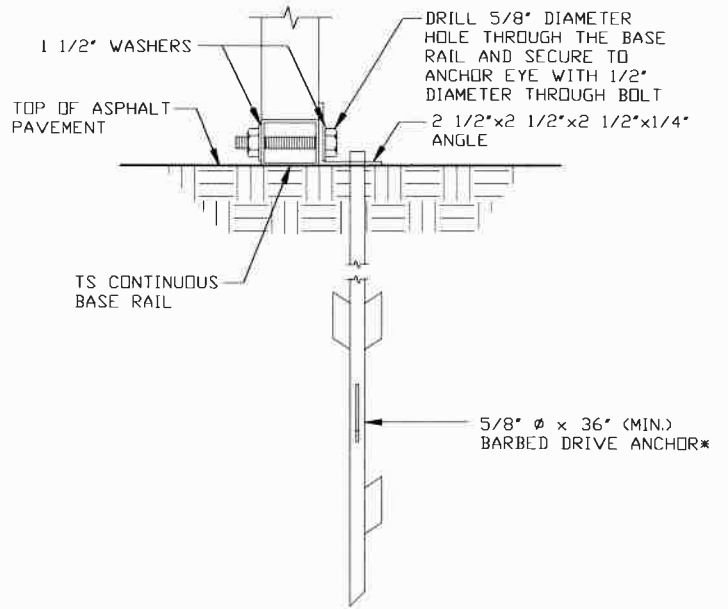
## BASE RAIL ANCHORAGE OPTIONS



2C

### GROUND BASE HELIX ANCHORAGE

SCALE: NTS  
 (CAN BE USED FOR ASPHALT)  
 \* COORDINATE WITH LOCAL BUILDING CODE  
 AND/OR BUILDING OFFICIAL REGARDING  
 REQUIRED FOOTING DEPTH.



2D

### ASPHALT BASE ANCHORAGE

SCALE: NTS  
 \* COORDINATE WITH LOCAL BUILDING CODE  
 AND/OR BUILDING OFFICIAL REGARDING  
 REQUIRED FOOTING DEPTH.

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**SHT. 7A**

**SCALE: NTS**

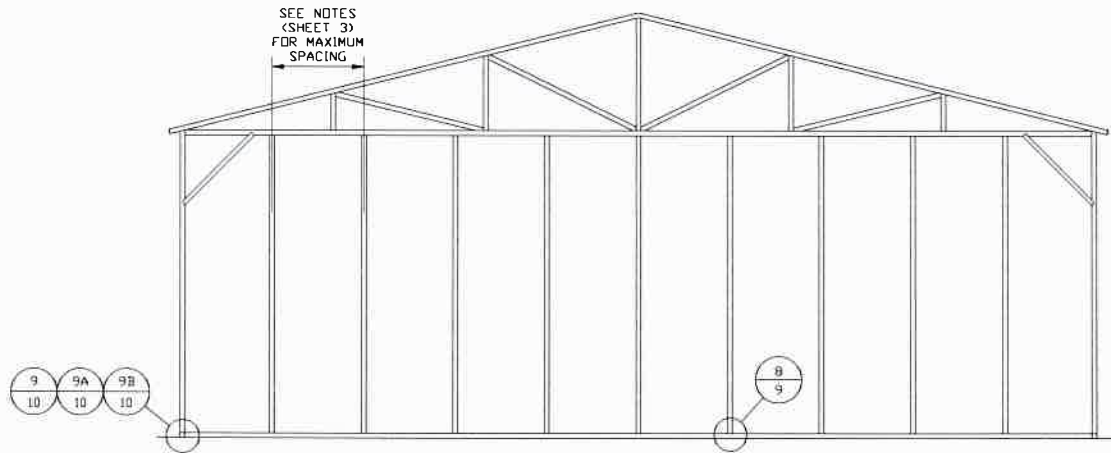
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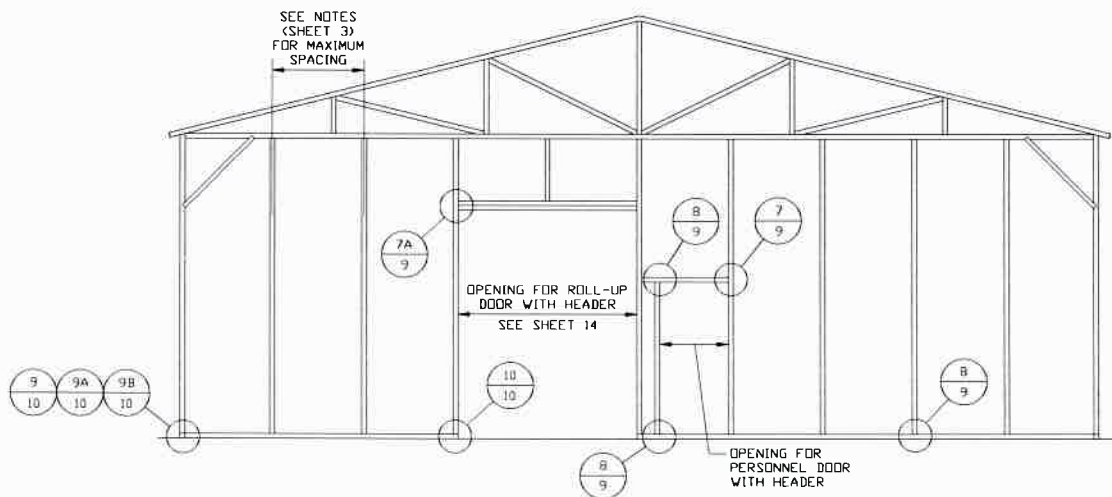
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## BOX EAVE RAFTER END WALL OPENINGS



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

SCALE: NTS



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

SCALE: NTS

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**SHT. 8**

**SCALE: NTS**

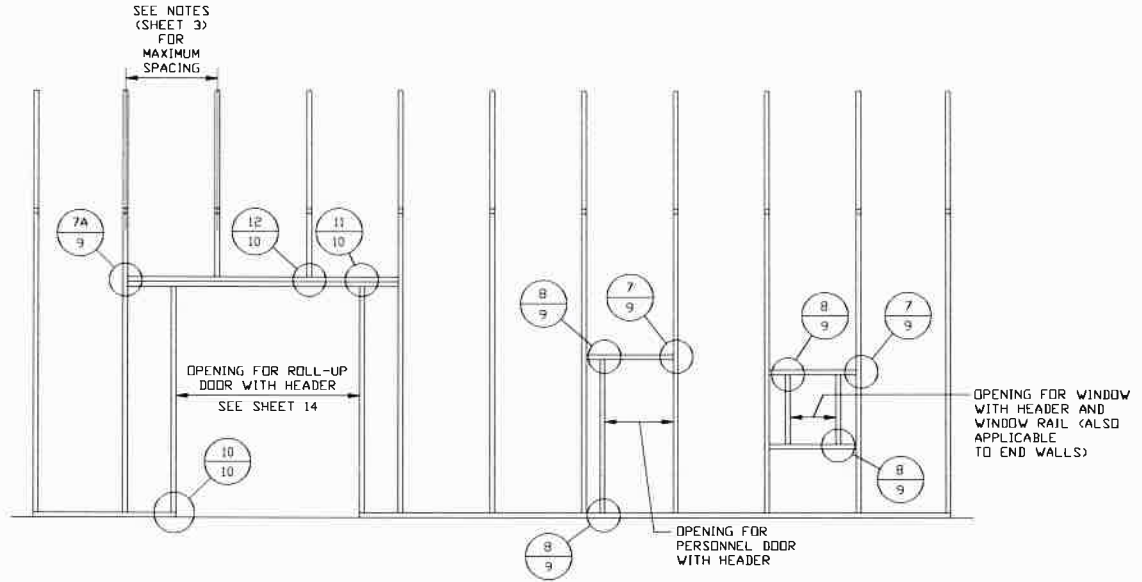
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# BOX EAVE RAFTER END WALL AND SIDE WALL OPENINGS



## TYPICAL BOX EAVE RAFTER SIDE WALL OPENINGS FRAMING SECTION

SCALE: NTS

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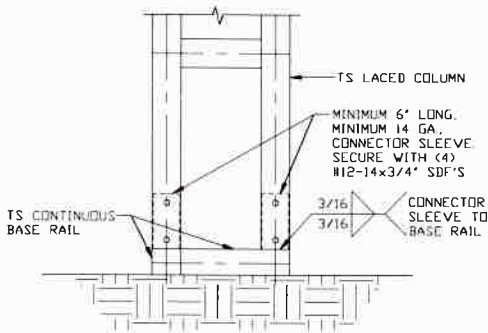
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**DWG. NO: SK-3**

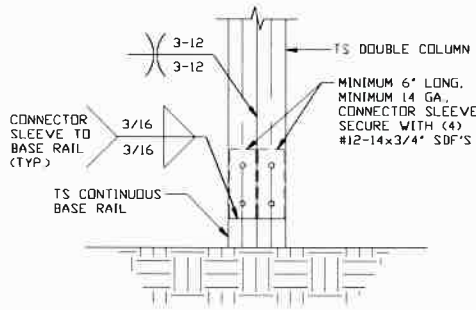
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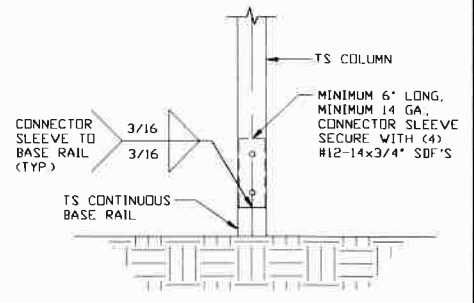
# CONNECTION DETAILS



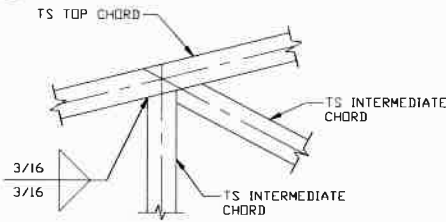
**3** POST/BASE RAIL CONNECTION DETAIL  
SCALE: NTS



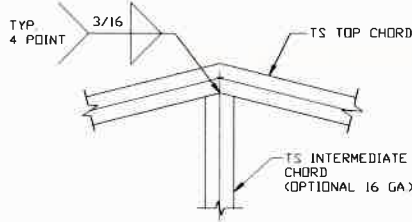
**3A** POST/BASE RAIL CONNECTION DETAIL  
SCALE: NTS



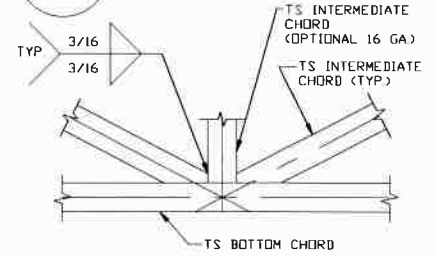
**3B** POST/BASE RAIL CONNECTION DETAIL  
SCALE: NTS



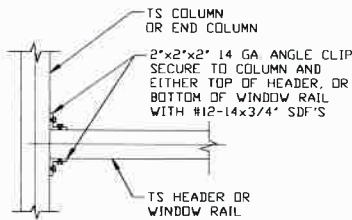
**4** INTERMEDIATE CHORD TO TOP CHORD CONNECTION DETAIL  
SCALE: NTS



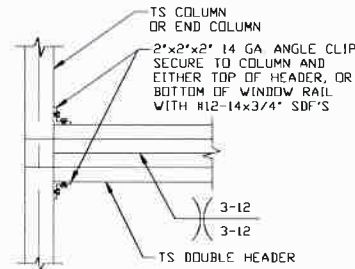
**5** CENTER POST TO RAFTER CONNECTION DETAIL  
SCALE: NTS



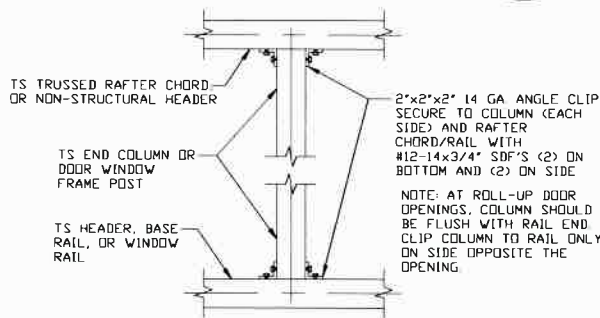
**6** CENTER POST TO BOTTOM CHORD CONNECTION DETAIL  
SCALE: NTS



**7** COLUMN OR WINDOW RAIL/WALL GIRT TO POST CONNECTION DETAIL  
SCALE: NTS



**7A** COLUMN OR WINDOW RAIL TO POST CONNECTION DETAIL  
SCALE: NTS



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

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ENGINEERING AND CONSULTING, INC.**

**DRAWN BY: JG**

**CHECKED BY: PDH**

**PROJECT MGR: WSM**

**CLIENT: UNIVERSAL**

**UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE**

**DATE: 9-24-20**

**SHT. 9**

**SCALE: NTS**

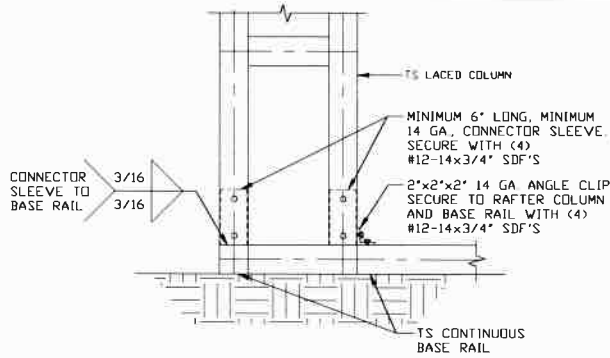
**DWG. NO: SK-3**

**JOB NO: 201955**

**REV: 0**

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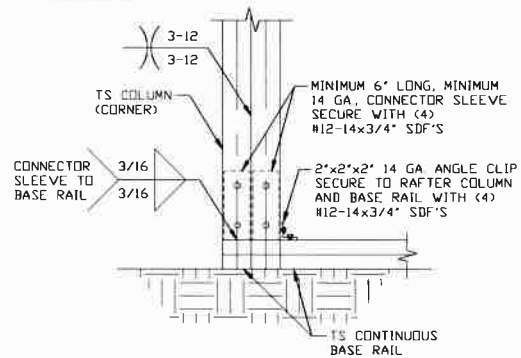
# CONNECTION DETAILS



9

## END COLUMN/BASE RAIL CONNECTION DETAIL

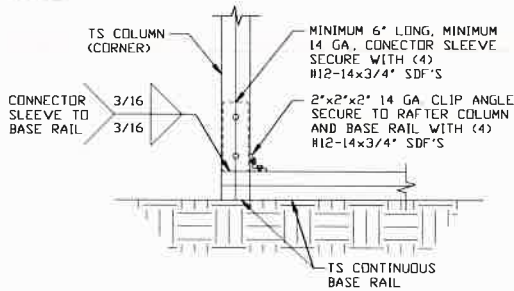
SCALE: NTS



9A

## END COLUMN/BASE RAIL CONNECTION DETAIL

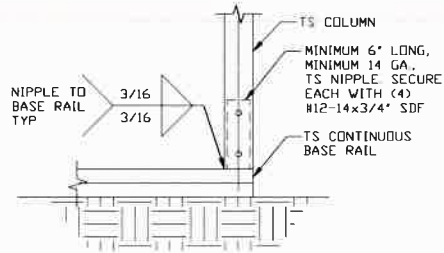
SCALE: NTS



9B

## END COLUMN/BASE RAIL CONNECTION DETAIL

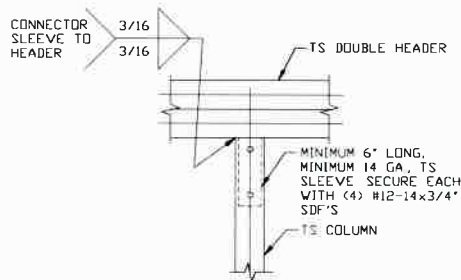
SCALE: NTS



10

## COLUMN/BASE RAIL CONNECTION DETAIL

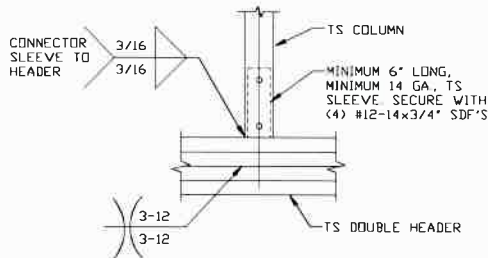
SCALE: NTS



11

## DOUBLE HEADER/COLUMN CONNECTION DETAIL

SCALE: NTS



12

## COLUMN/DOUBLE HEADER CONNECTION DETAIL

SCALE: NTS

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PROJECT MGR: WSM

CLIENT: UNIVERSAL

UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE

DATE: 9-24-20

SHT. 10

SCALE: NTS

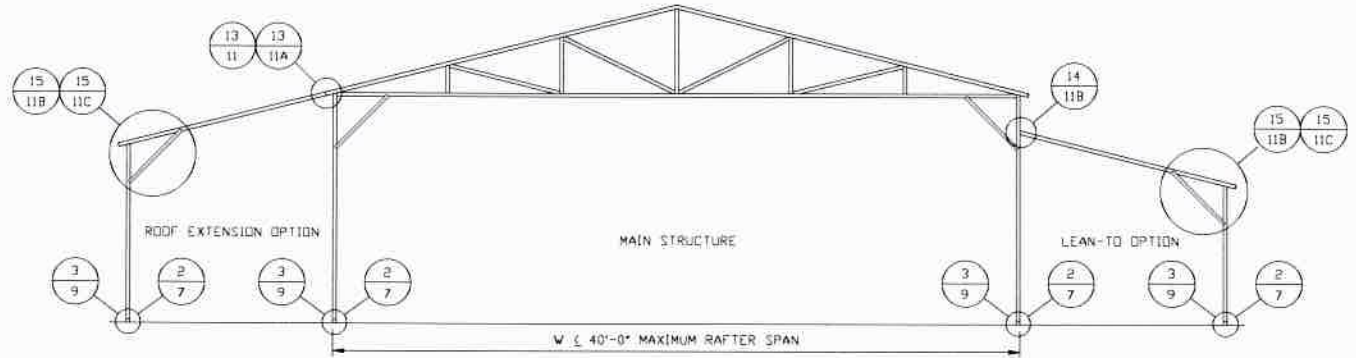
DWG. NO: SK-3

JOB NO: 201955

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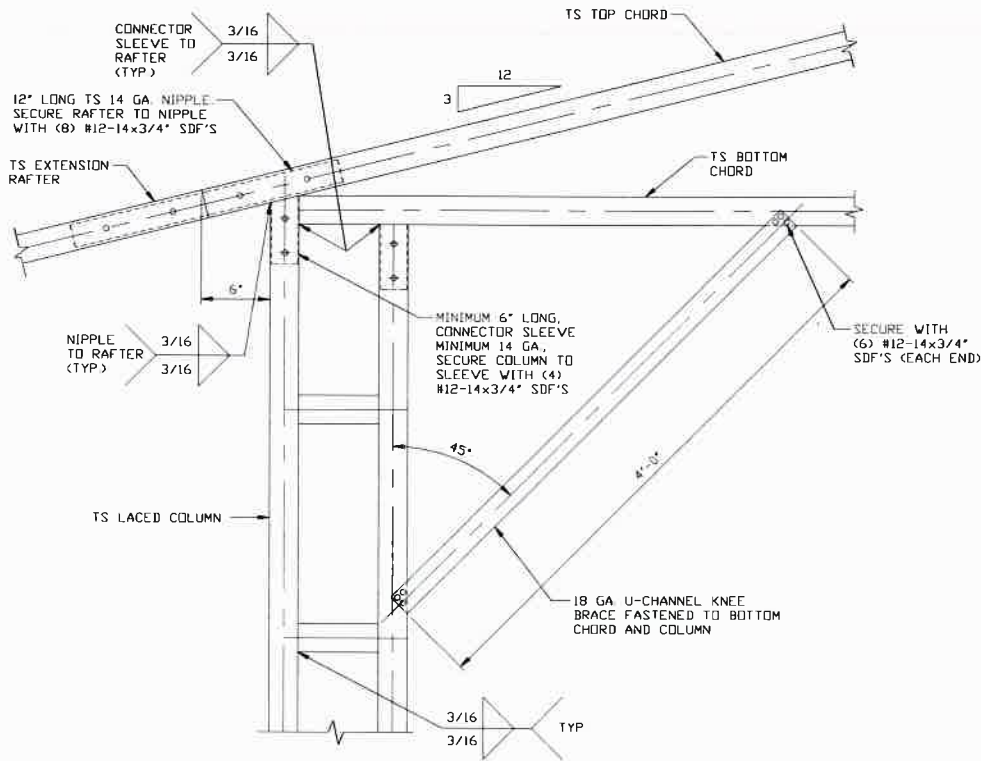
# BOX EAVE RAFTER LEAN-TO OPTIONS



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

SCALE: NTS

MAXIMUM WIDTH OF SINGLE MEMBER ROOF EXTENSION AND LEAN-TO OPTION IS 12'-0".



### SIDE EXTENSION RAFTER/ COLUMN DETAIL FOR HEIGHTS 16'-0" < TO ≤ 20'-0"

13

SCALE: NTS

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**CHECKED BY: PDH**

**PROJECT MGR: WSM**

**CLIENT: UNIVERSAL**

UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE

**DATE: 9-24-20**

**SHT. 11**

**SCALE: NTS**

**DWG. NO: SK-3**

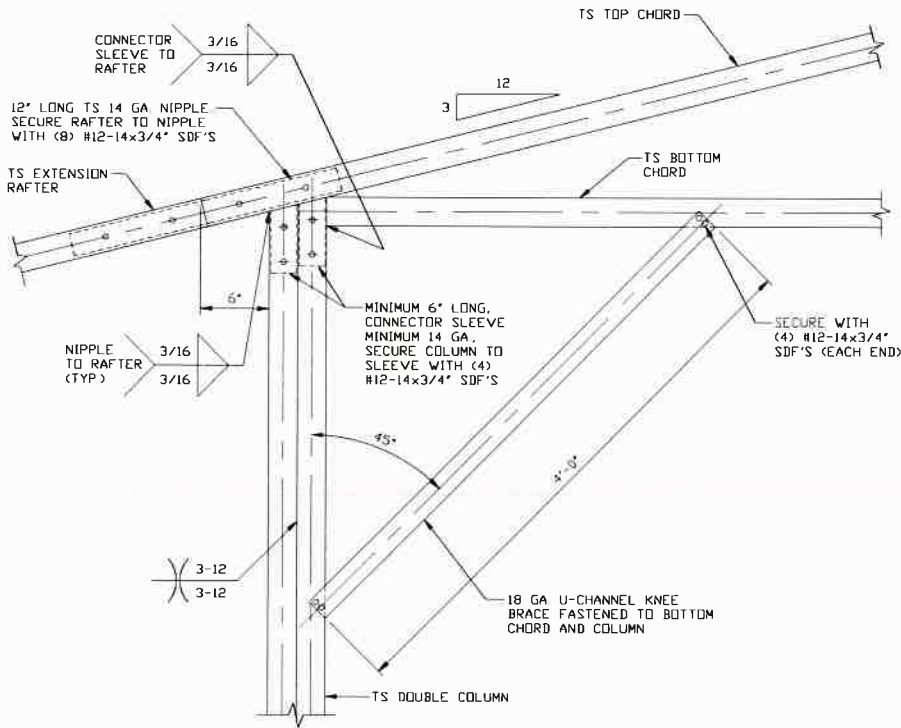
**JOB NO: 20195S**

**REV: 0**

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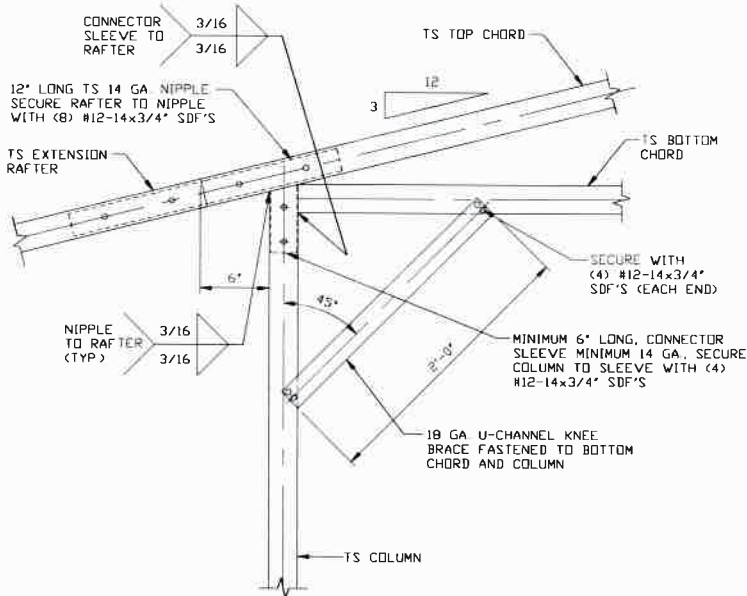


# BOX EAVE RAFTER LEAN-TO OPTIONS



**13A**

**SIDE EXTENSION RAFTER/  
COLUMN DETAIL FOR  
HEIGHTS 10'-0" < TO ≤ 16'-0"**  
SCALE: NTS



**13B**

**SIDE EXTENSION RAFTER/  
COLUMN DETAIL FOR  
HEIGHTS ≤ 10'-0"**  
SCALE: NTS

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

**DRAWN BY: JG**

**CHECKED BY: PDH**

**PROJECT MGR: WSM**

**CLIENT: UNIVERSAL**

**UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE**

**DATE: 9-24-20**

**SCALE: NTS**

**JOB NO: 201955**

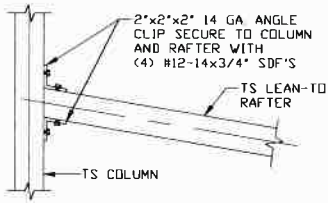
**SHT. 11A**

**DWG. NO SK-3**

**REV: 0**

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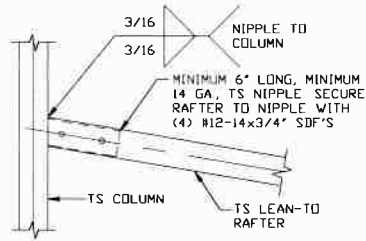
## BOX EAVE RAFTER LEAN-TO OPTIONS



**LEAN-TO RAFTER TO  
RAFTER POST  
CONNECTION DETAIL  
FOR WIDTHS  $\le 12'-0''$**

14

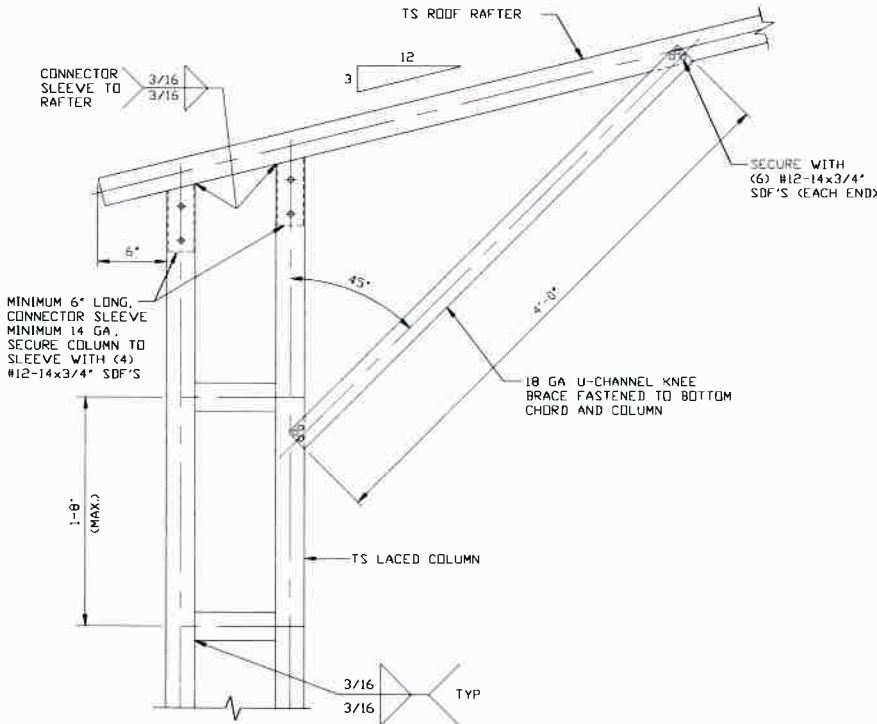
SCALE: NTS



**LEAN-TO RAFTER  
TO RAFTER POST  
CONNECTION DETAIL  
FOR WIDTHS  $\le 12'-0''$**

14A

SCALE: NTS



**ROOF EXTENSION RAFTER/  
CORNER POST DETAIL FOR  
HEIGHTS 16'-0  $< TO \le 17'-0''$**

15

SCALE: NTS

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

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CHECKED BY: PDH

PROJECT MGR: VSM

CLIENT: UNIVERSAL

UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE

DATE: 9-24-20

SHT. 11B

SCALE: NTS

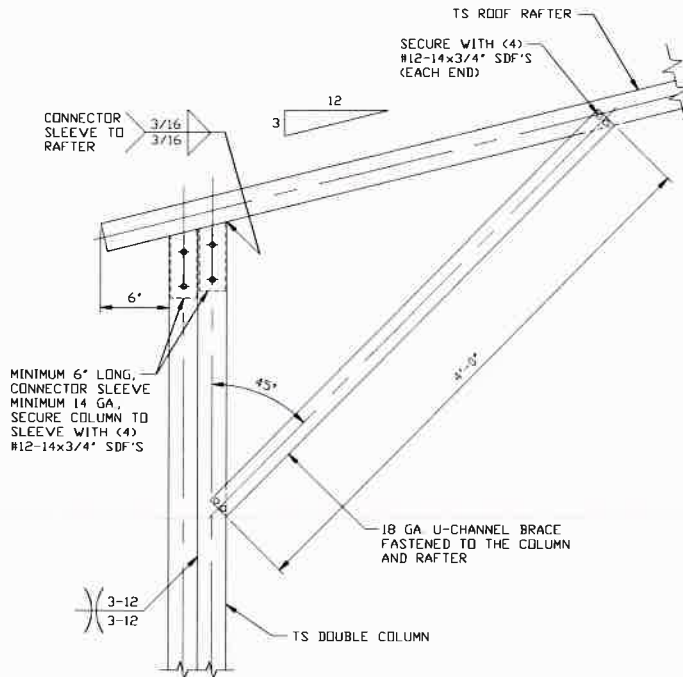
DWG. NO: SK-3

JOB NO: 20195S

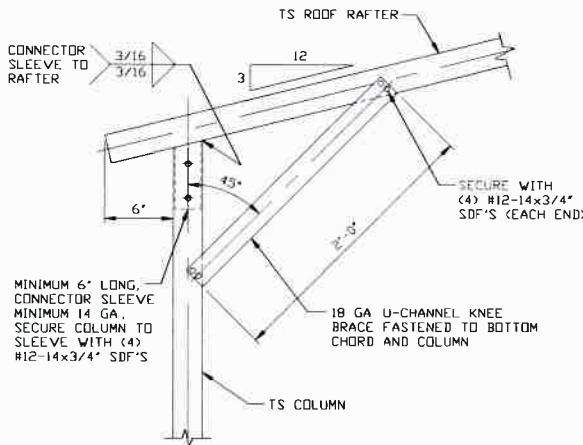
REV: 0

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# BOX EAVE RAFTER LEAN-TO OPTIONS



**15A**  
**ROOF EXTENSION RAFTER/  
 CORNER POST DETAIL FOR  
 HEIGHTS 10'-0" < TO ≤ 16'-0"**  
 SCALE: NTS



**15B**  
**ROOF EXTENSION RAFTER/  
 CORNER POST DETAIL FOR  
 HEIGHTS ≤ 10'-0"**  
 SCALE: NTS

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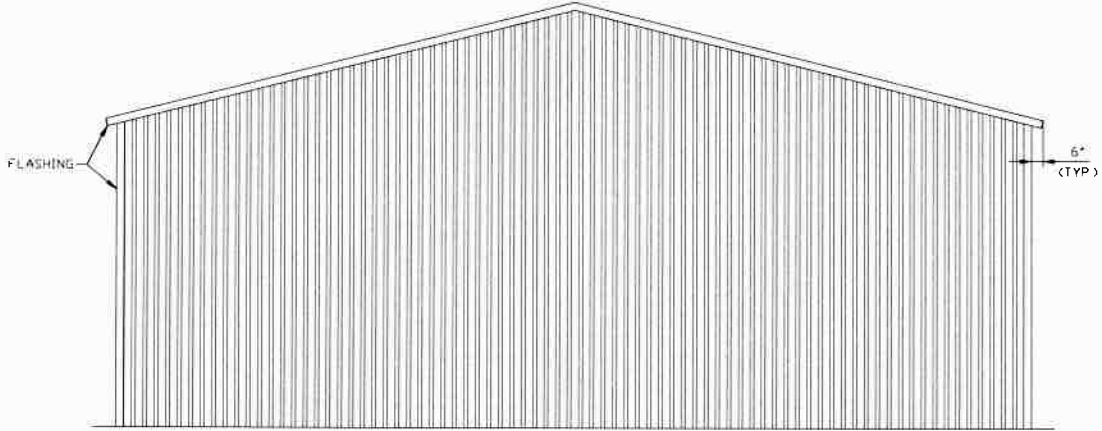
**DRAWN BY: JG**  
**CHECKED BY: PDH**  
**PROJECT MGR: VSM**  
**CLIENT: UNIVERSAL**

**UNIVERSAL METAL BUILDINGS**  
 9283 US 601  
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 40'-0"x20'-0" ENCLOSED STRUCTURE

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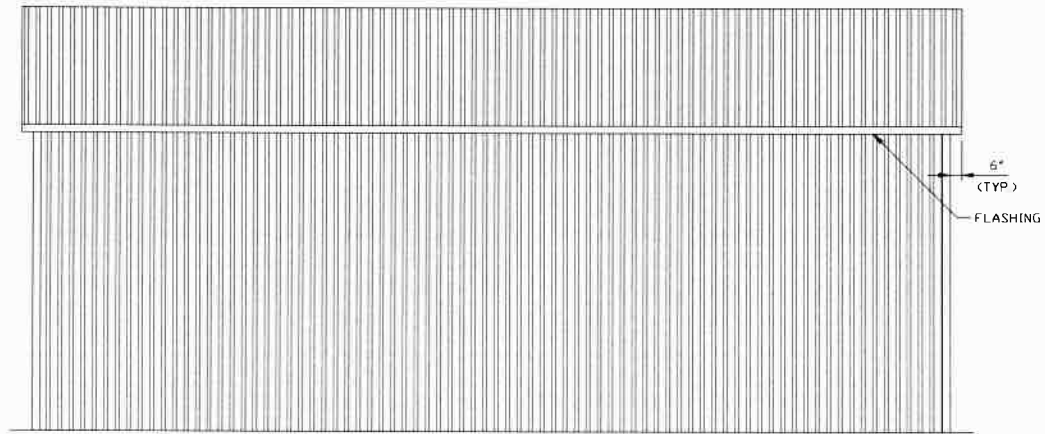
**DATE: 9-24-20**    **SCALE: NTS**    **JOB NO: 20195S**  
**SHT. 11C**    **DWG. NO: SK-3**    **REV: 0**

**BOX EAVE RAFTER VERTICAL ROOF/SIDING OPTION**



**TYPICAL END ELEVATION VERTICAL ROOF/SIDING**

SCALE: NTS



**TYPICAL SIDE ELEVATION VERTICAL ROOF/SIDING**

SCALE: NTS

**MOORE AND ASSOCIATES  
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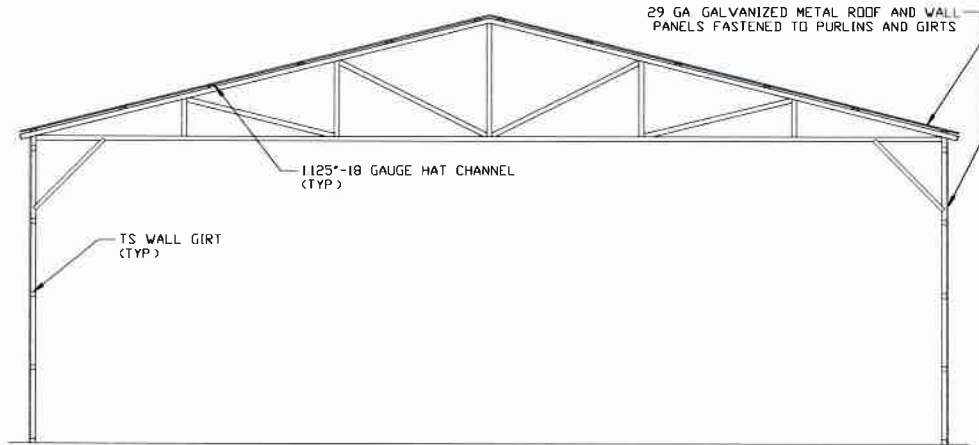
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**CHECKED BY: PDH**  
**PROJECT MGR: WSM**  
**CLIENT: UNIVERSAL**

UNIVERSAL METAL BUILDINGS  
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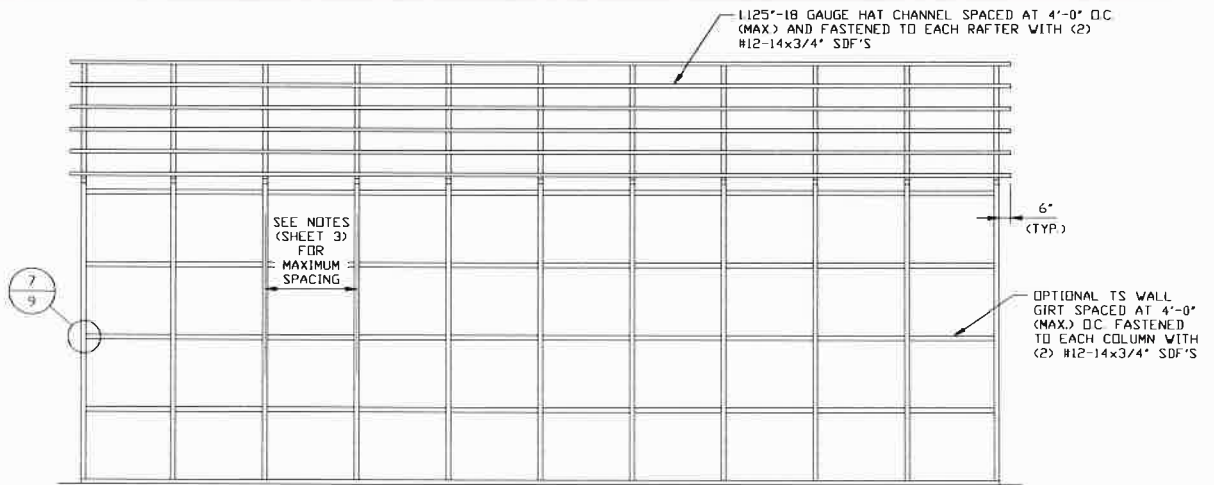
**DATE: 9-24-20**    **SCALE: NTS**    **JOB NO: 20195S**  
**SHT. 12**    **DWG. NO SK-3**    **REV: 0**

# BOX EAVE RAFTER VERTICAL ROOF/SIDING OPTION



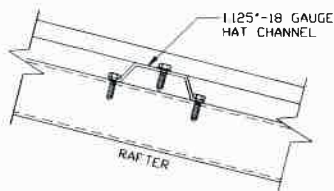
## TYPICAL SECTION VERTICAL ROOF/SIDING OPTION

SCALE: NTS



## TYPICAL FRAMING SECTION VERTICAL ROOF/SIDING OPTION WITH TS GIRTS

SCALE: NTS



### PANEL ATTACHMENT

(ALTERNATE FOR VERTICAL ROOF PANELS)  
SCALE: NTS

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

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**CHECKED BY: PDH**

**PROJECT MGR: WSM**

**CLIENT: UNIVERSAL**

UNIVERSAL METAL BUILDINGS  
9283 US 601  
DOBSON, NC 27017  
40'-0"x20'-0" ENCLOSED STRUCTURE

**DATE: 9-24-20**

**SHT. 13**

**SCALE: NTS**

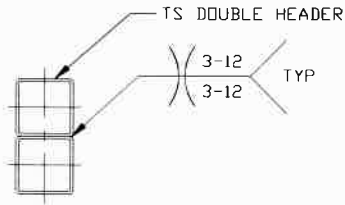
**DWG. NO: SK-3**

**JOB NO: 2019SS**

**REV: 0**

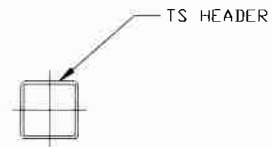
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## END WALL HEADER OPTIONS



**HEADER DETAIL FOR  
SPANS 12'-0" < TO ≤ 16'-0"**

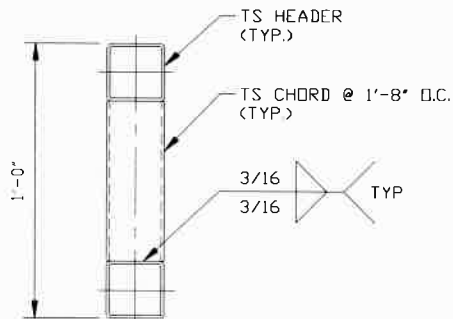
SCALE: NTS



**HEADER DETAIL FOR  
SPANS ≤ 12'-0"**

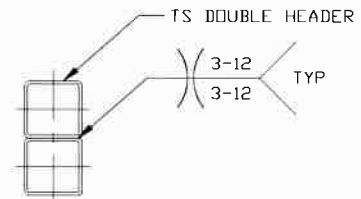
SCALE: NTS

## SIDE WALL HEADER OPTIONS



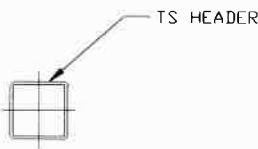
**HEADER DETAIL FOR  
SPANS 10'-0" < TO ≤ 12'-0"**

SCALE: NTS



**HEADER DETAIL FOR  
SPANS 6'-0" < TO ≤ 10'-0"**

SCALE: NTS



**HEADER DETAIL FOR  
SPANS ≤ 6'-0"**

SCALE: NTS

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**CHECKED BY: PDH**

**PROJECT MGR: WSM**

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**SHT. 14**

**SCALE: NTS**

**DWG. NO: SK-3**

**JOB NO: 20195S**

**REV: 0**

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