



## **STRUCTURAL DESIGN**

### **ENCLOSED BUILDING** **EXPOSURE B**

**MAXIMUM 30'-0" WIDE X 20'-0" EAVE HEIGHT- BOX EAVE  
FRAME AND BOW FRAME**

**18 December 2017**

**Revision 4**

**M&A Project No. 16022S/17300S**

**Prepared for:**

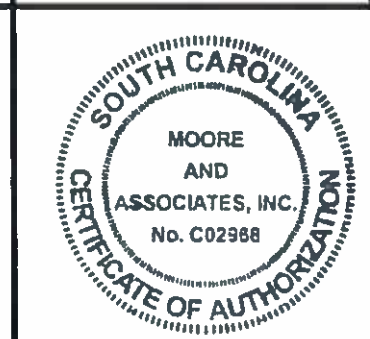
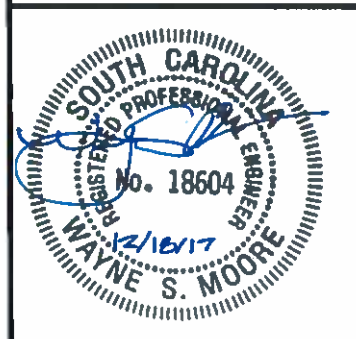
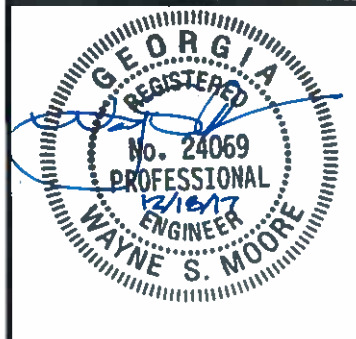
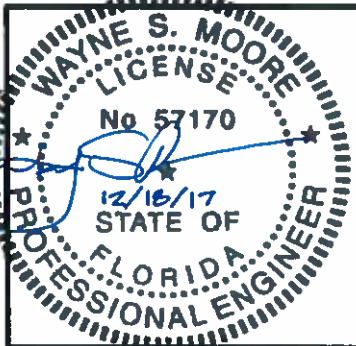
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Lake City, Florida 32025**

**Prepared by:**

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Mount Airy, NC 27030**





MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.		DRAWN BY: LT		TUBULAR BUILDING SYSTEMS 30'-0"x20'-0" ENCLOSED BUILDING EXP. B PE SEAL COVER SHEET		
		CHECKED BY: PDH				
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		CLIENT: TBS		SHT. 1	DWG. NO: SK-3	REV: 4

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**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

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**CLIENT: TBS**

**DATE: 12-18-17**

**SHT. 2**

**SCALE: NTS**

**DWG. NO: SK-3**

**JOB NO:  
16022S/17300S**

**REV: 4**

## INSTALLATION NOTES AND SPECIFICATIONS

1. DESIGN IS FOR A MAXIMUM 30'-0" WIDE x 20'-0" EAVE HEIGHT ENCLOSED STRUCTURES.
2. DESIGN WAS DONE IN ACCORDANCE WITH THE 2017 FLORIDA BUILDING CODE (FBC) 6TH EDITION, 2012 INTERNATIONAL BUILDING CODE (IBC), AND 2015 IBC.
3. DESIGN LOADS ARE AS FOLLOWS:
  - A) DEAD LOAD = 15 PSF
  - B) LIVE LOAD = 12 PSF
  - C) GROUND SNOW LOAD = 10 PSF
4. LOW ULTIMATE WIND SPEED 105 TO 140 MPH (NOMINAL WIND SPEED 81 TO 108 MPH); MAXIMUM RAFTER/POST AND END POST SPACING = 5.0 FEET.
5. HIGH ULTIMATE WIND SPEED 141 TO 170 MPH (NOMINAL WIND SPEED 109 TO 132 MPH); MAXIMUM RAFTER/POST AND END POST SPACING = 4.0 FEET.
6. LOW HAZARD RISK CATEGORY I (WIND).
7. WIND EXPOSURE CATEGORY B
8. 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 VERTICAL PANELS, 29 GAUGE METAL PANELS SHALL BE FASTENED TO 18 GAUGE HAT CHANNELS (UNLESS OTHERWISE NOTED).
9. AVERAGE FASTENER SPACING ON-CENTERS ALONG RAFTERS OR PURLINS, AND POSTS, INTERIOR = 9' OR END = 6', (MAX.)
10. 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.
11. GROUND ANCHORS SHALL BE INSTALLED THROUGH BASE RAIL WITHIN 6" OF EACH RAFTER COLUMN ALONG SIDES.
12. GROUND ANCHORS (SOIL NAILS) CONSIST OF #4 REBAR W/WELDED NUT x 30" LONG IN SUITABLE SOIL CONDITIONS MAY BE USED FOR LOW (< 108 MPH NOMINAL) WIND SPEEDS ONLY. OPTIONAL ANCHORAGE MAY BE USED IN SUITABLE SOILS AND MUST BE USED IN UNSUITABLE SOILS AS NOTED.
13. OPTIONAL BASE RAIL ANCHORAGE MAY BE USED FOR LOW AND MUST BE USED FOR HIGH WIND SPEEDS.
14. WIND FORCES GOVERN OVER SEISMIC FORCES. SEISMIC PARAMETERS ANALYZED ARE:
 

SOIL SITE CLASS = D  
 RISK CATEGORY I/II/III  
 R= 3.25      I<sub>e</sub>= 1.0  
 S<sub>DS</sub>= 1.522      V= C<sub>s</sub>W  
 S<sub>D1</sub>= 0.839

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CLIENT: TBS

**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 3

SCALE: NTS

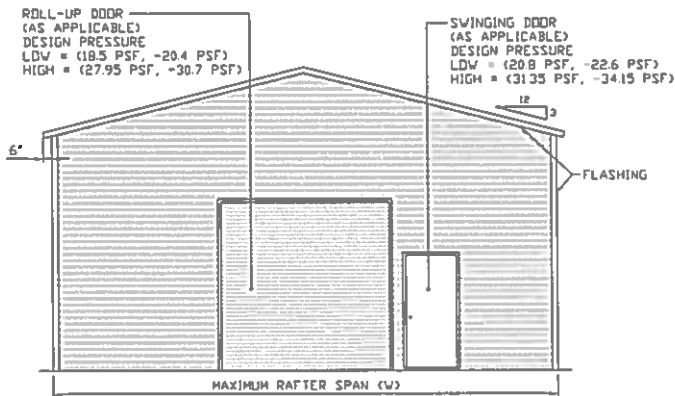
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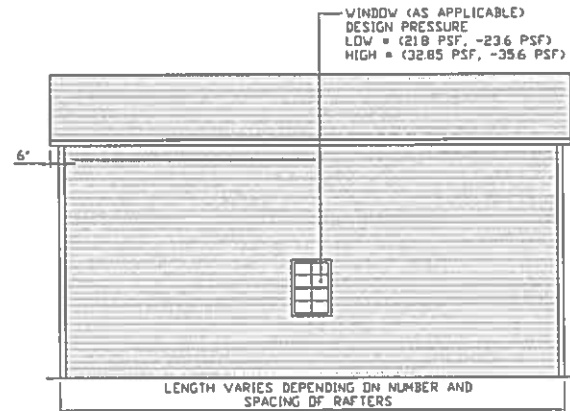
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## BOX EAVE FRAME RAFTER ENCLOSED BUILDING



**TYPICAL END ELEVATION-HORIZONTAL ROOF**

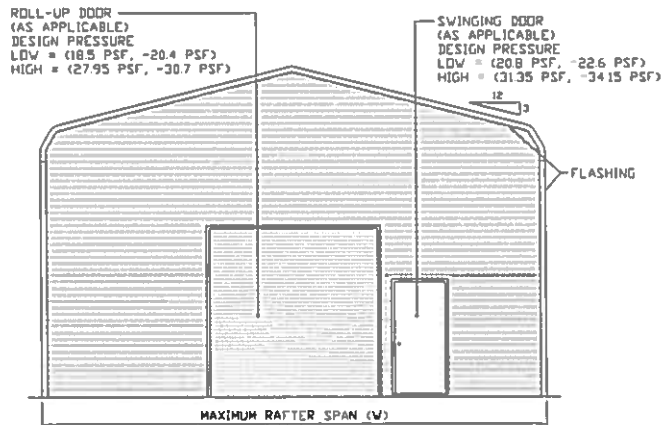
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**TYPICAL SIDE ELEVATION-HORIZONTAL ROOF**

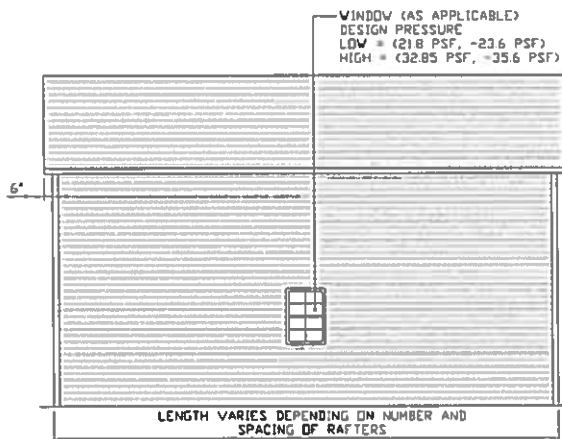
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## BOW FRAME RAFTER ENCLOSED BUILDING



**TYPICAL END ELEVATION**

SCALE: NTS



**TYPICAL SIDE ELEVATION**

SCALE: NTS

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DATE: 12-18-17

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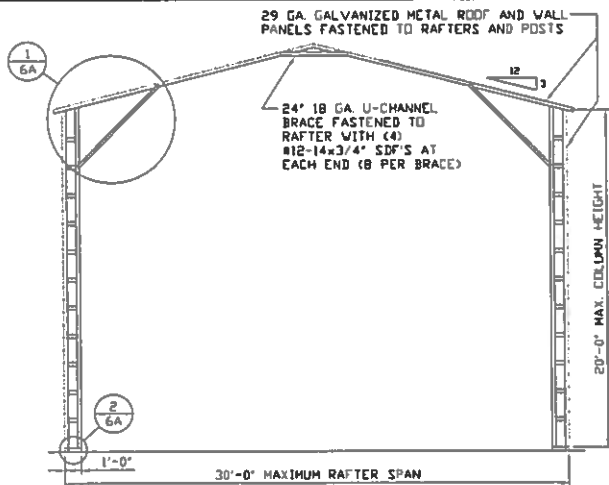
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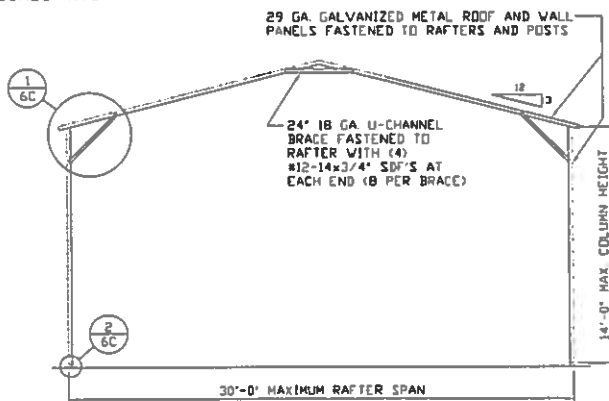
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160225/173005

REV: 4

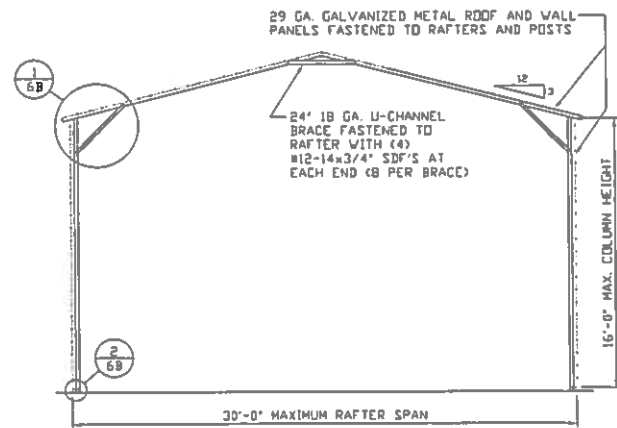
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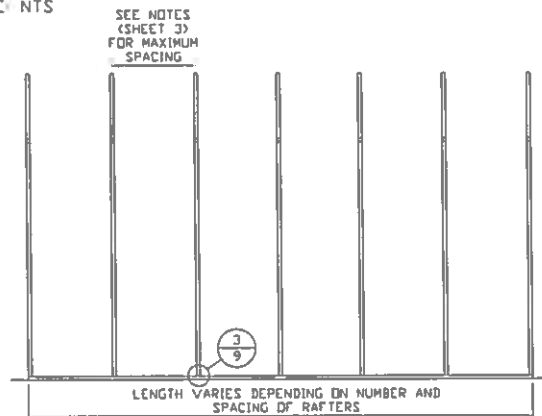
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
SCALE: NTS



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



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



**TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION**  
SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
30'-0"X20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

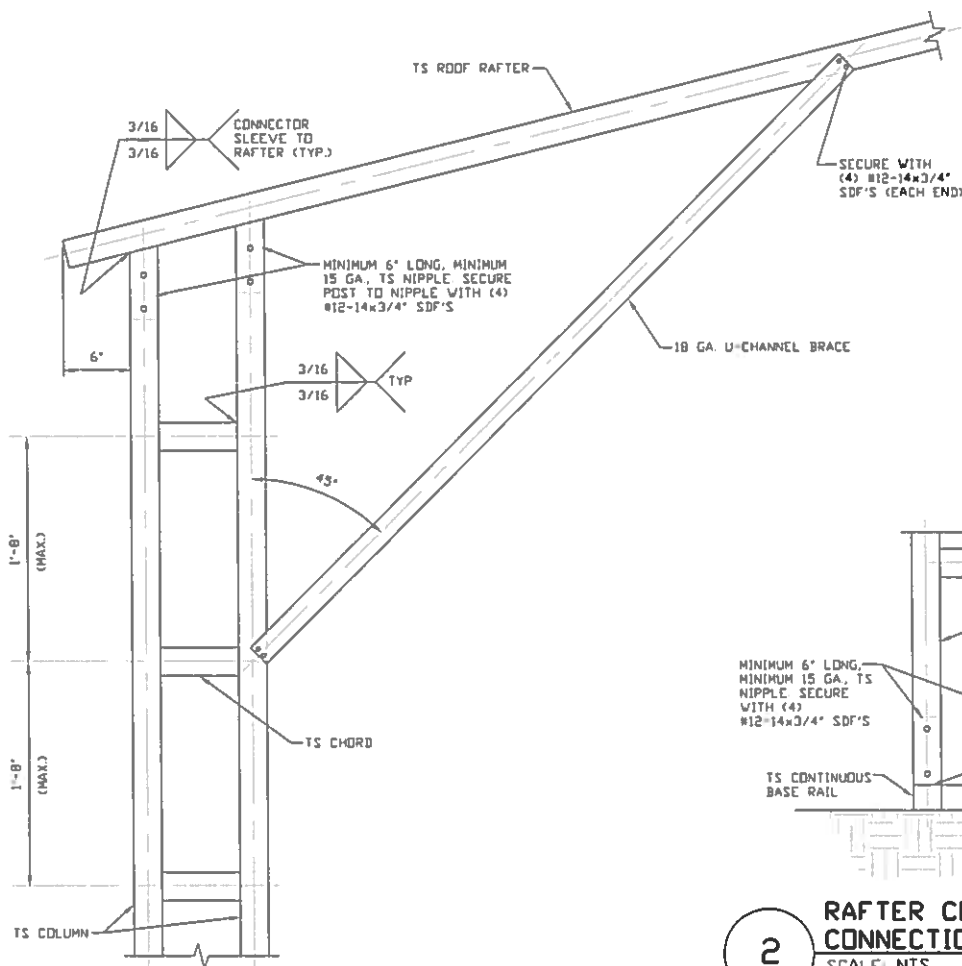
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SCALE: NTS

DWG. NO: SK-3

JOB NO:  
16022S/17300S

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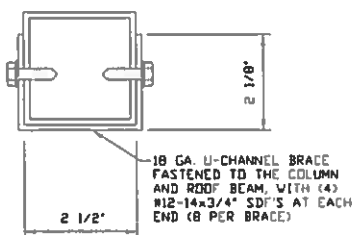
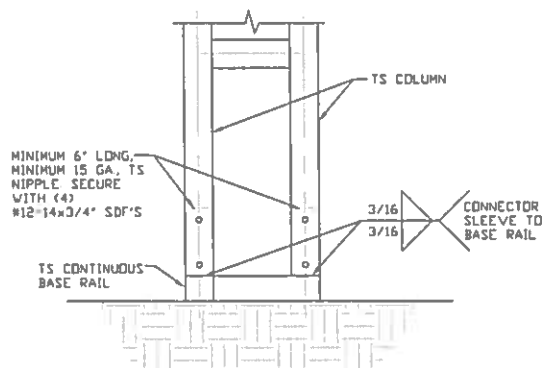
**BOX EAVE RAFTER COLUMN  
CONNECTION DETAIL  
FOR HEIGHTS 16'-0" < TO ≤ 20'-0"**

SCALE: NTS

2

**RAFTER COLUMN/BASE RAIL  
CONNECTION DETAIL**

SCALE: NTS



**BRACE SECTION**

SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 6A

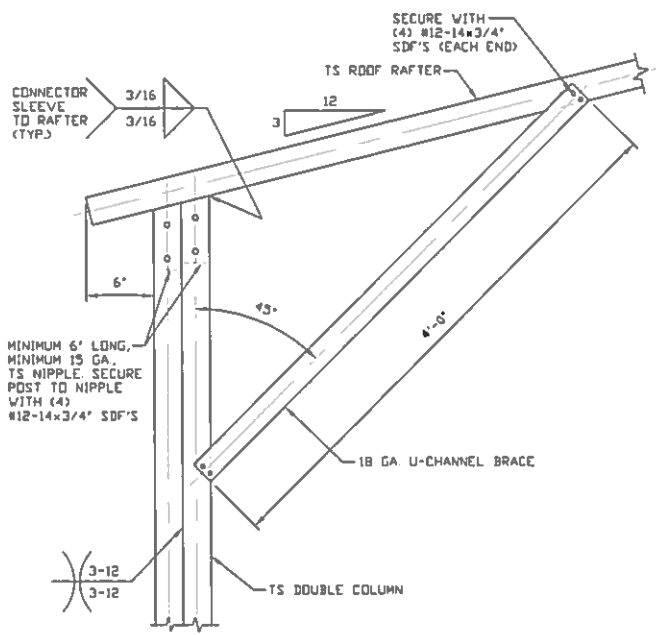
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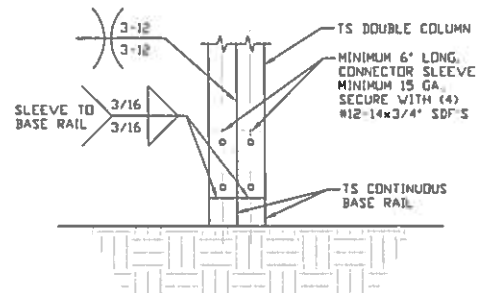
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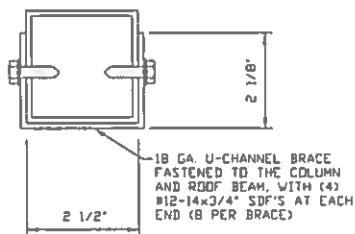
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**1**  
**BOX EAVE RAFTER COLUMN  
 CONNECTION DETAIL  
 FOR HEIGHTS 14'-0" < TO ≤ 16'-0"**  
 SCALE: NTS



**2**  
**RAFTER COLUMN/BASE RAIL  
 CONNECTION DETAIL**  
 SCALE: NTS



**BRACE SECTION**  
 SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
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**SHT. 6B**

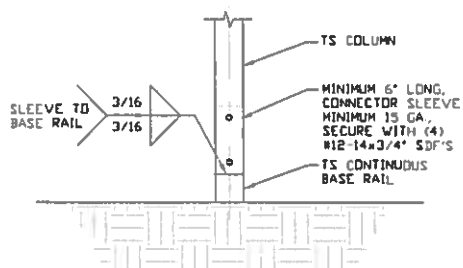
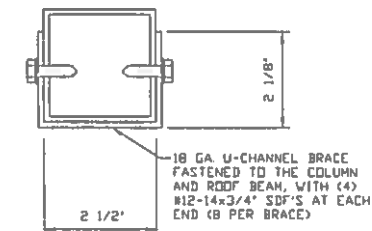
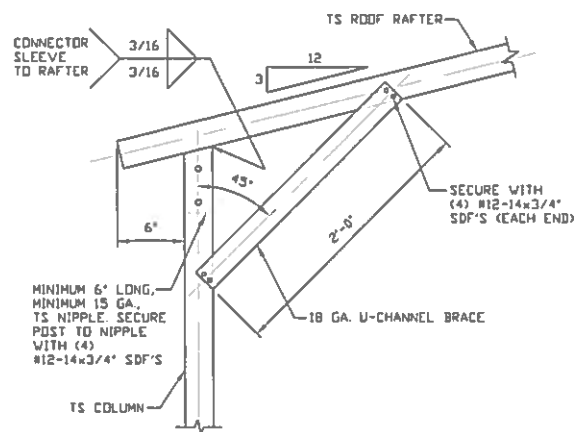
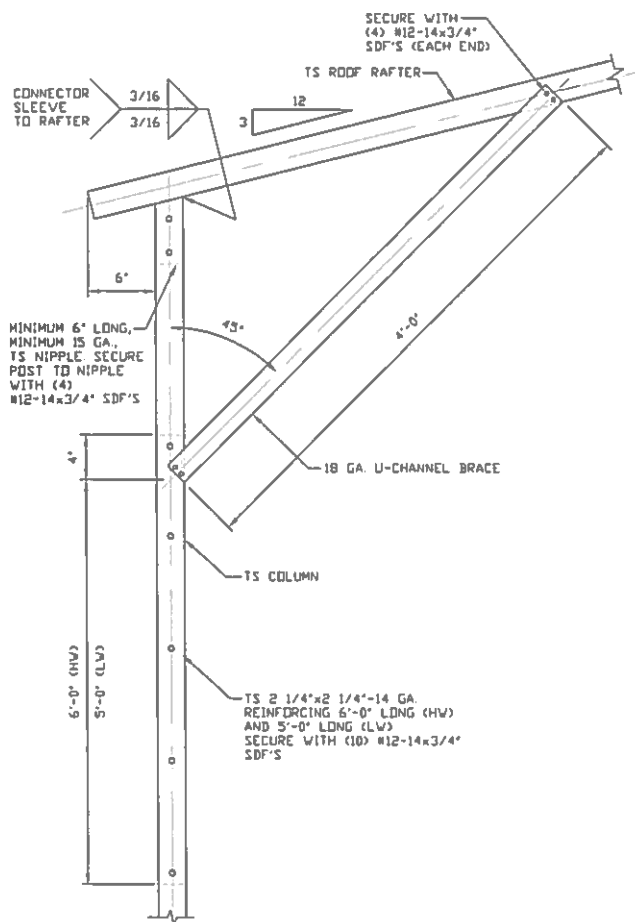
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**DWG. NO: SK-3**

**JOB NO:  
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SHT. 6C

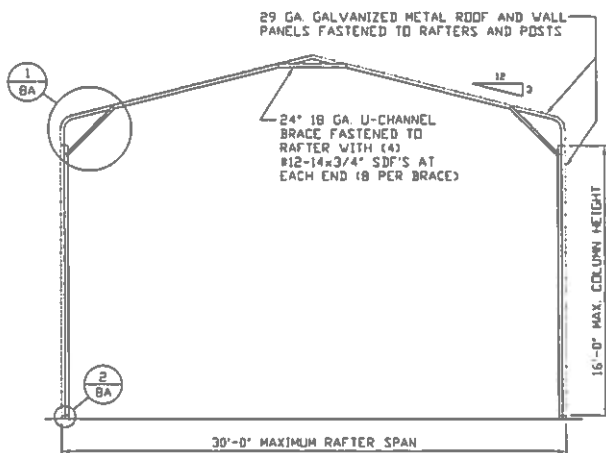
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**JOB NO:**  
**160225/17300\$**

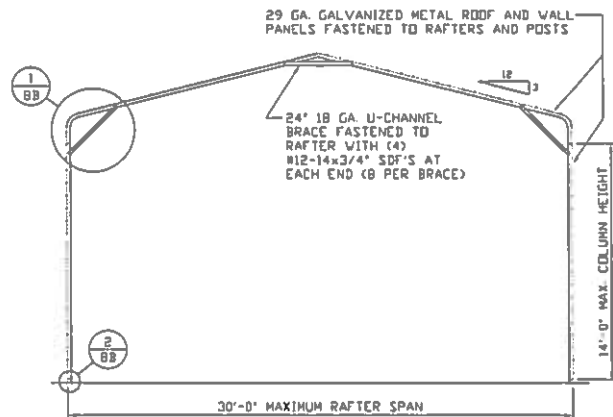
REV. 4

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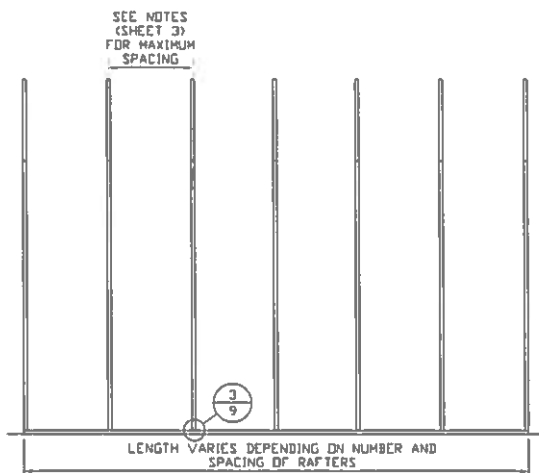
**TYPICAL RAFTER/COLUMN END FRAME SECTION**

SCALE: NTS



**TYPICAL RAFTER/COLUMN END FRAME SECTION**

SCALE: NTS



**TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION**

SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
30'-0" x 20'-0" ENCLOSED BUILDING EXP. B**

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**SHT. 7**

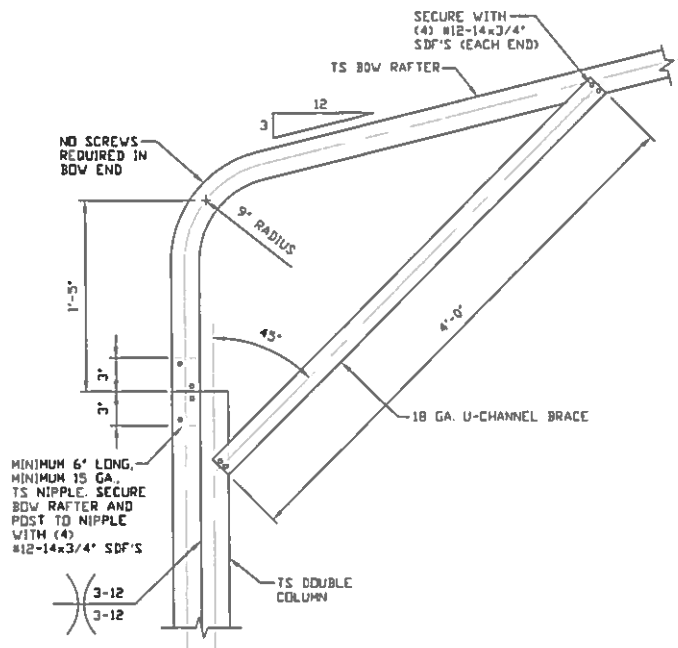
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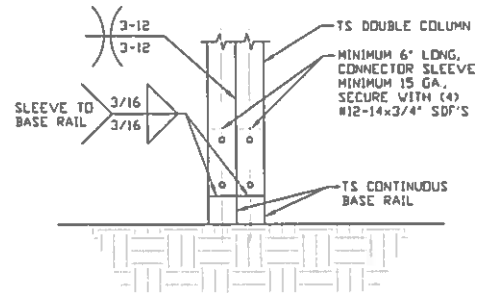
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160225/173005**

**REV: 4**

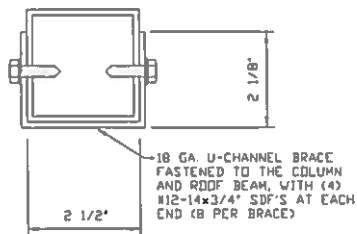
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**1** BOX EAVE RAFTER COLUMN  
CONNECTION DETAIL  
FOR HEIGHTS 14'-0" < TO ≤ 16'-0"  
SCALE: NTS



**2** RAFTER COLUMN/BASE RAIL  
CONNECTION DETAIL  
SCALE: NTS



**BRACE SECTION**  
SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

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**SHT. 8A**

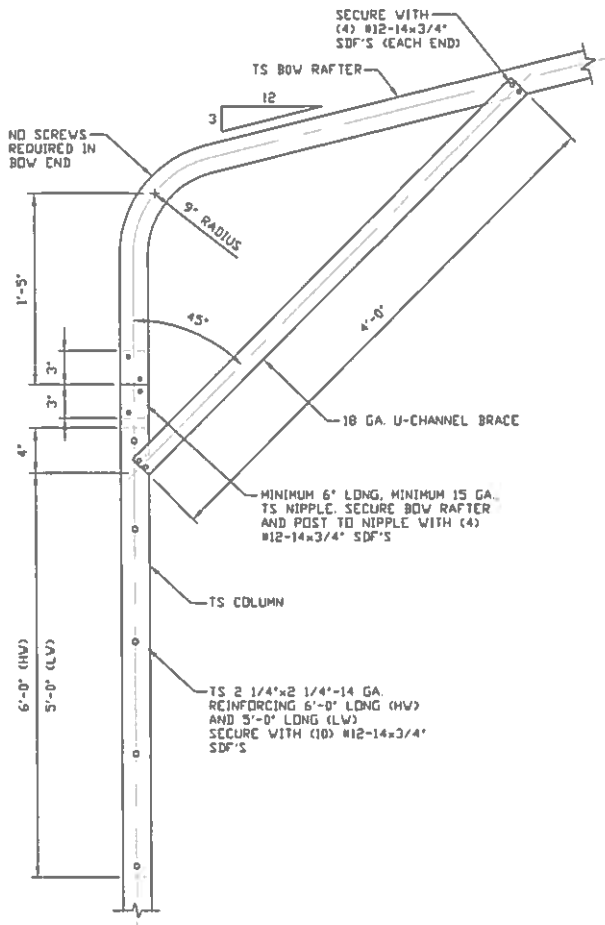
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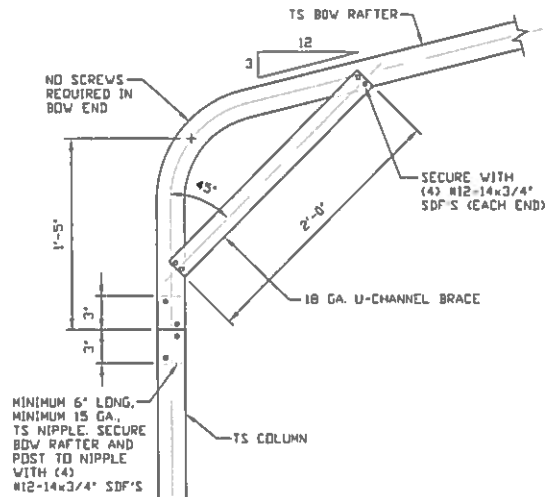
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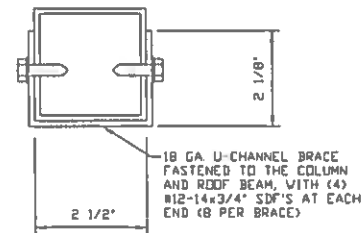
1A

**BOX EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS 10'-0" < TO ≤ 14'-0"**  
SCALE: NTS

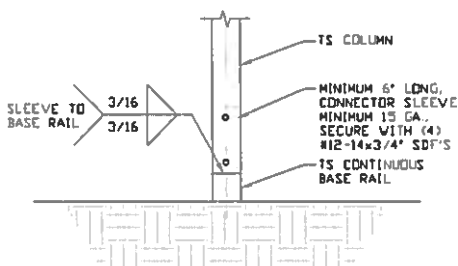


1B

**BOX EAVE RAFTER COLUMN CONNECTION DETAIL FOR HEIGHTS ≤ 10'-0"**  
SCALE: NTS



**BRACE SECTION**  
SCALE: NTS



2

**RAFTER COLUMN/BASE RAIL CONNECTION DETAIL**  
SCALE: NTS

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**TUBULAR BUILDING SYSTEMS  
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SHT. 08

SCALE: NTS

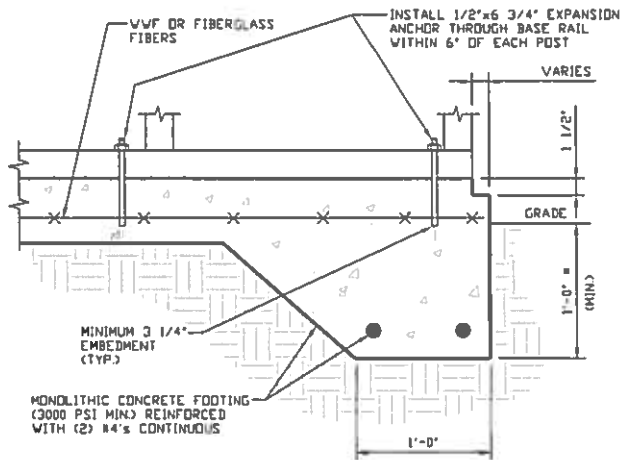
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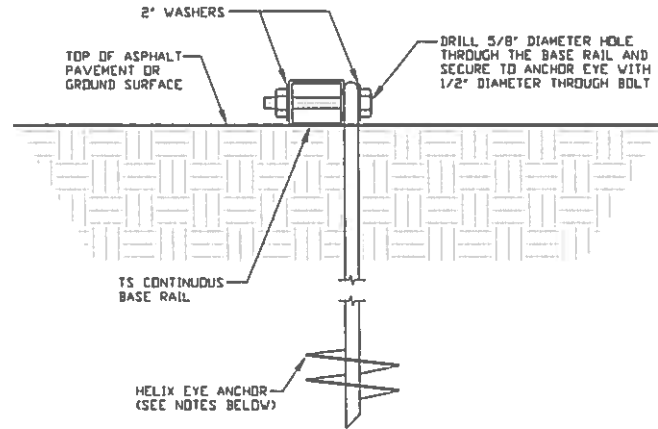
## BASE RAIL ANCHORAGE OPTIONS FOR LOW AND HIGH WIND SPEED



3A

### CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS  
(MINIMUM ANCHOR EDGE DISTANCE IS 4'')  
■ COORDINATE WITH LOCAL CODES/ORD.



3B

### GROUND BASE HELIX ANCHORAGE

SCALE: NTS (CAN BE USED FOR ASPHALT)

## GENERAL NOTES

### 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 INCHES 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 INCHES 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 INCH EMBEDMENT.
2. FOR CORAL USE MINIMUM (2) 4" HELICES WITH MINIMUM 30 INCH EMBEDMENT.
3. FOR MEDIUM DENSE COARSE SANDS, SANDY GRAVELS, VERY STIFF SILTS, AND CLAYS USE MINIMUM (2) 4" HELICES WITH MINIMUM 30 INCH EMBEDMENT.
4. FOR LOOSE TO MEDIUM DENSE SANDS, FIRM TO STIFF CLAYS AND SILTS ALLUVIAL FILL USE MINIMUM (2) 6" HELICES WITH MINIMUM 50 INCH 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 INCH EMBEDMENT.

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

DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: WSM

CLIENT: TBS

TUBULAR BUILDING SYSTEMS  
30'-0" x 20'-0" ENCLOSED BUILDING EXP. B

DATE: 12-18-17

SHT. 9A

SCALE: NTS

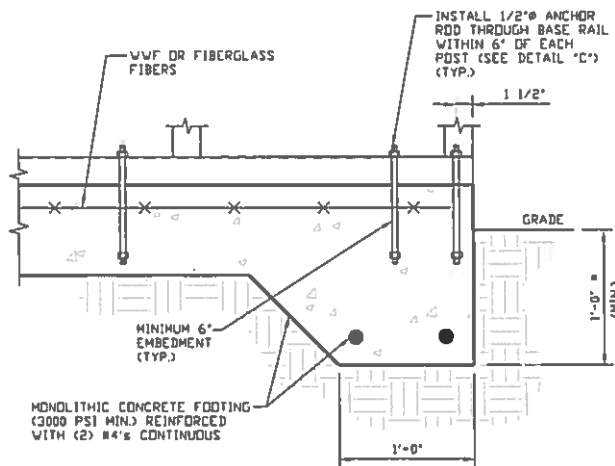
DWG. NO: SK-3

JOB NO:  
16022S/17300S

REV: 4

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## OPTIONAL FOUNDATION ANCHORAGE FOR LOW & HIGH WIND SPEED

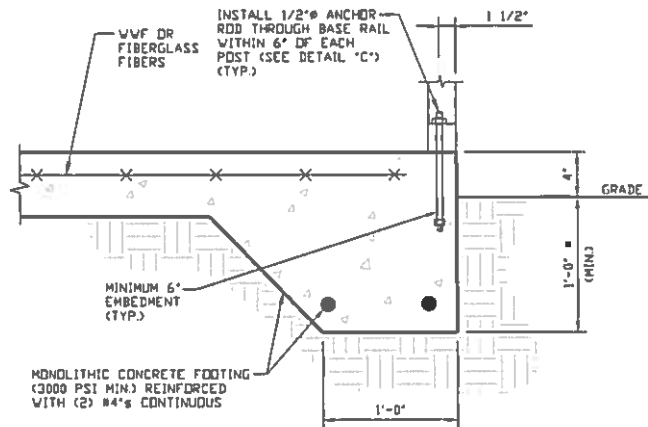


1A

### CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS

(MINIMUM ANCHOR EDGE DISTANCE IS 1 1/2")  
\* COORDINATE WITH LOCAL CODES/ORD.



1B

### CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS

(MINIMUM ANCHOR EDGE DISTANCE IS 1 1/2")  
\* COORDINATE WITH LOCAL CODES/ORD.

## GENERAL NOTES

### CONCRETE:

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

### COVER OVER REINFORCING STEEL:

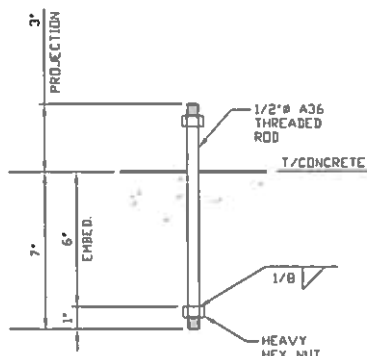
FOR FOUNDATIONS, MINIMUM CONCRETE COVER OVER REINFORCING BARS SHALL BE PER ACI-318  
3 INCHES IN FOUNDATIONS WHERE THE CONCRETE IS CAST AGAINST AND PERMANENTLY IN CONTACT WITH THE EARTH OR EXPOSED TO THE EARTH OR WEATHER, AND 1 1/2 INCHES ELSEWHERE.

### 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.



1C

### ANCHOR ROD THROUGH BASE RAIL DETAIL

SCALE: NTS

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ENGINEERING AND CONSULTING, INC.

DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: WSM

CLIENT: TBS

TUBULAR BUILDING SYSTEMS  
30'-0"X20'-0" ENCLOSED BUILDING EXP. B

DATE: 12-18-17

SHT. 9B

SCALE: NTS

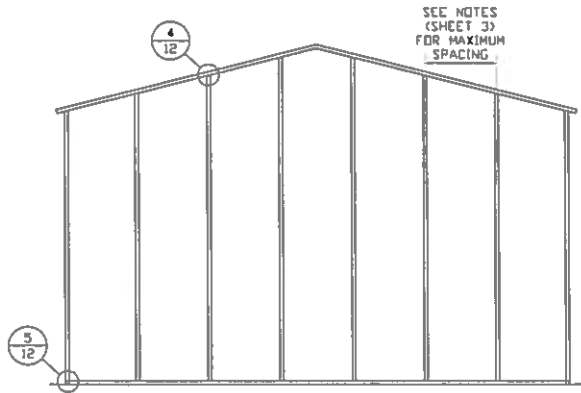
DWG. NO: SK-3

JOB NO:  
16022S/17300S

REV: 4

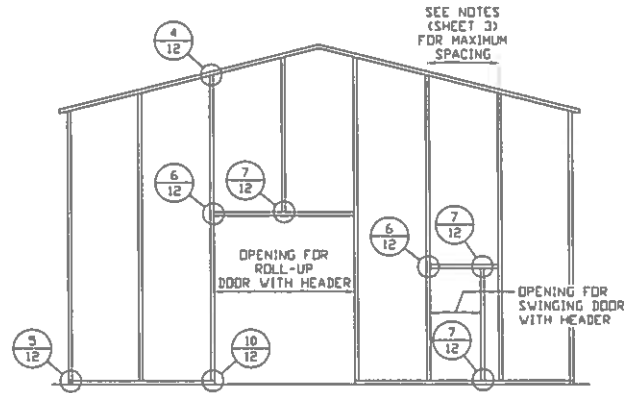
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## BOX EAVE RAFTER END WALL AND SIDE WALL OPENINGS



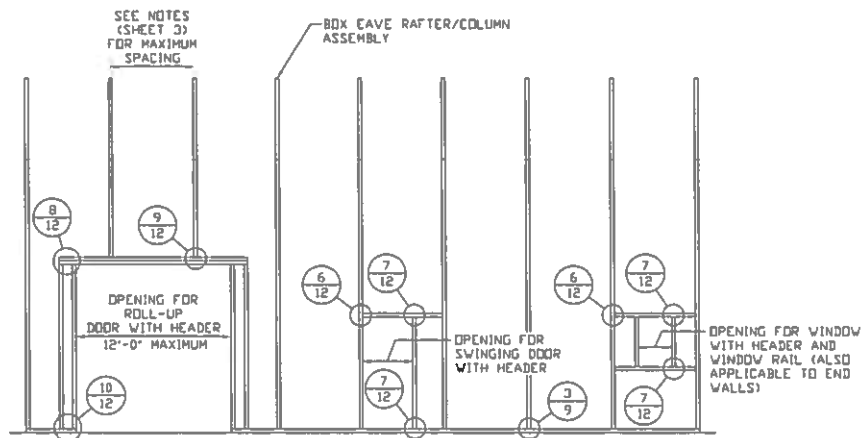
**TYPICAL BOX EAVE RAFTER  
END WALL FRAMING SECTION**

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.**

**DRAWN BY: LT**

**CHECKED BY: PDH**

**PROJECT MGR: WSM**

**CLIENT: TBS**

**TUBULAR BUILDING SYSTEMS  
30'-0" x 20'-0" ENCLOSED BUILDING EXP. B**

**DATE: 12-18-17**

**SHT. 10**

**SCALE: NTS**

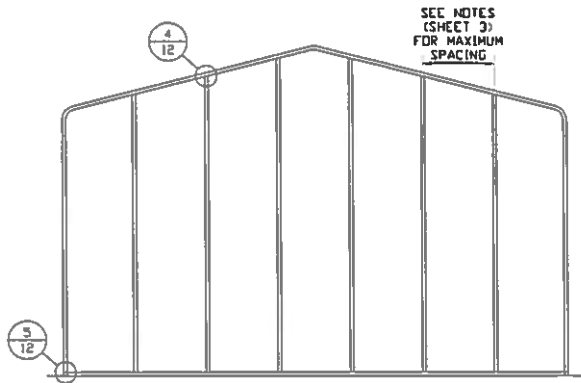
**DWG. NO: SK-3**

**JOB NO:  
16022S/17300S**

**REV: 4**

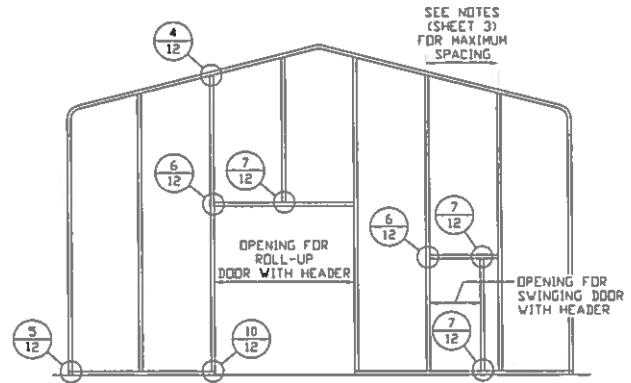
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## BOW RAFTER END WALL AND SIDE WALL OPENINGS



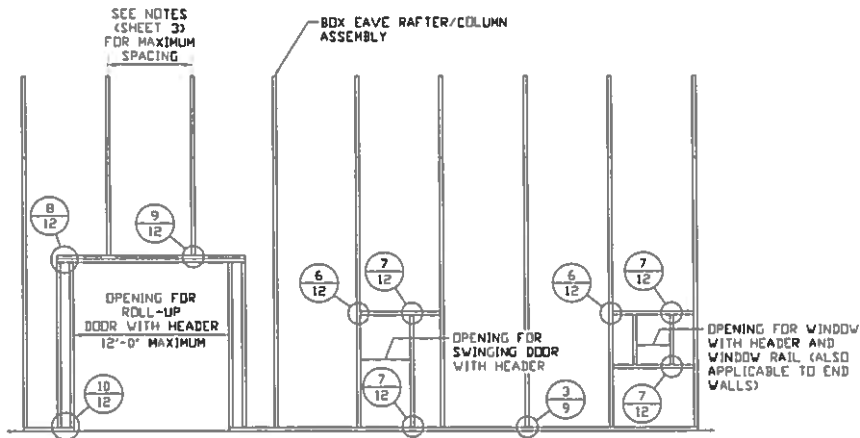
**TYPICAL BOX EAVE RAFTER  
END WALL FRAMING SECTION**

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.**

**DRAWN BY: LT**

**CHECKED BY: PDH**

**PROJECT MGR: WSH**

**CLIENT: TBS**

**TUBULAR BUILDING SYSTEMS  
30'-0" x 20'-0" ENCLOSED BUILDING EXP. B**

**DATE: 12-18-17**

**SHT. 11**

**SCALE: NTS**

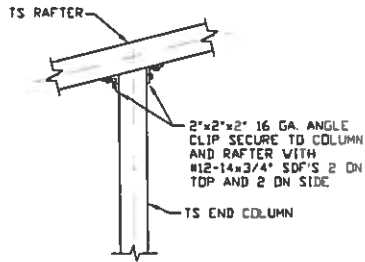
**DWG. NO: SK-3**

**JOB NO:  
16022S/17300S**

**REV: 4**

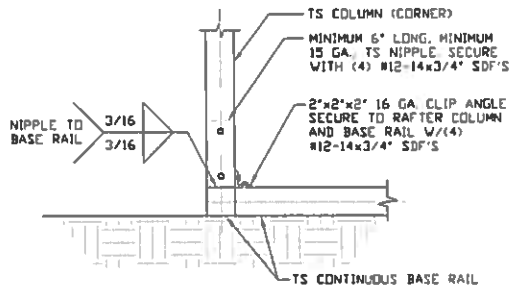
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## BOW AND BOX EAVE RAFTER WALL OPENING DETAILS



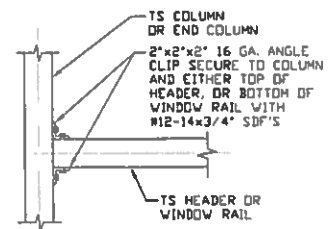
**4** **END COLUMN/RAFTER CONNECTION DETAIL**

SCALE: NTS



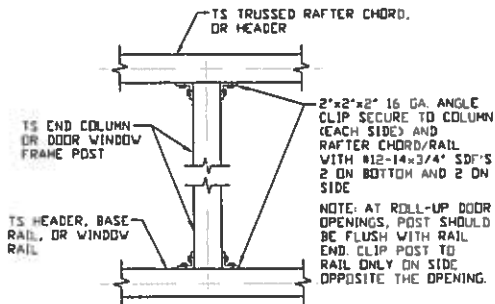
**5** **END COLUMN/BASE RAIL CONNECTION DETAIL**

SCALE: NTS



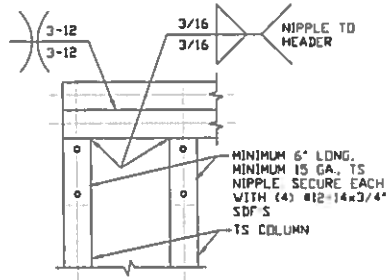
**6** **HEADER OR WINDOW RAIL TO COLUMN CONNECTION DETAIL**

SCALE: NTS



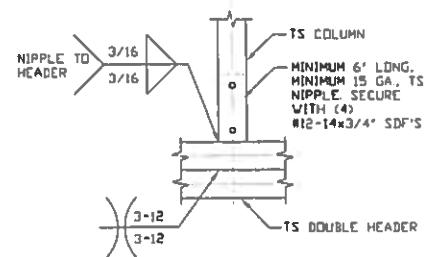
**7** **COLUMN TO HEADER, BASE RAIL, OR WINDOW RAIL CONNECTION DETAIL**

SCALE: NTS



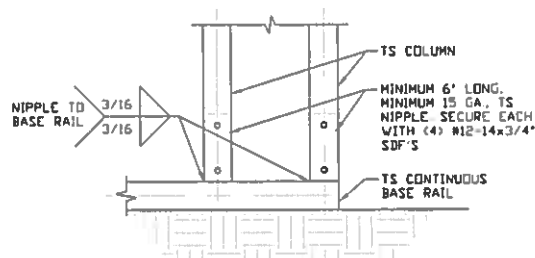
**8** **DOUBLE HEADER/COLUMN CONNECTION DETAIL**

SCALE: NTS



**9** **COLUMN/DOUBLE HEADER CONNECTION DETAIL**

SCALE: NTS



**10** **COLUMN/BASE RAIL CONNECTION DETAIL**

SCALE: NTS

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

DRAWN BY: LT

CHECKED BY: PDM

PROJECT MGR: WSH

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS  
30'-0"X20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 12

SCALE: NTS

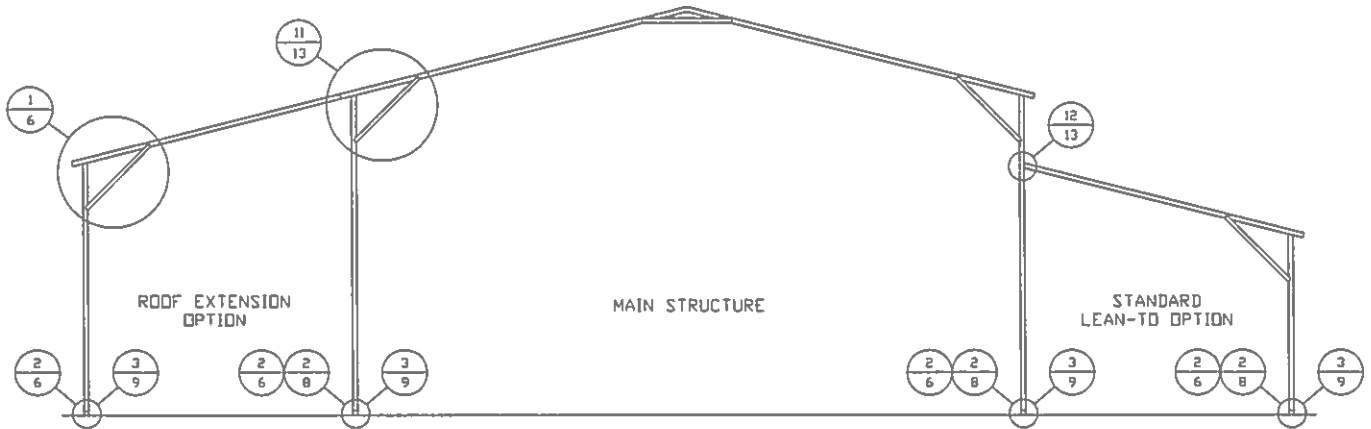
DWG. NO: SK-3

JOB NO:  
16022S/17300S

REV: 4

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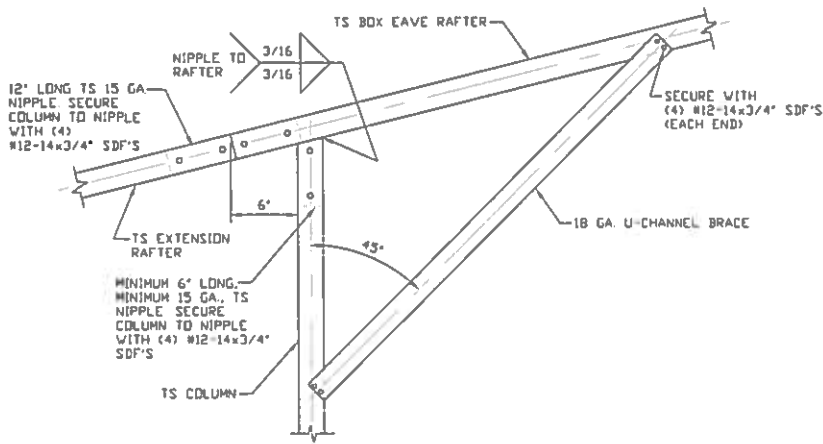
## BOX EAVE RAFTER LEAN-TO OPTIONS



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

SCALE: NTS

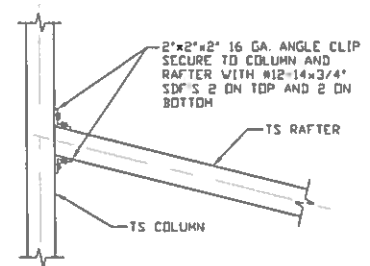
MAXIMUM WIDTH OF SINGLE MEMBER RAFTER LEAN-TO IS 16'-0".



**11A**

**SIDE EXTENSION RAFTER/COLUMN DETAIL**

SCALE: NTS



**12**

**LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL**

SCALE: NTS

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

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CHECKED BY: PDH

PROJECT MGR: WSH

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 13

SCALE: NTS

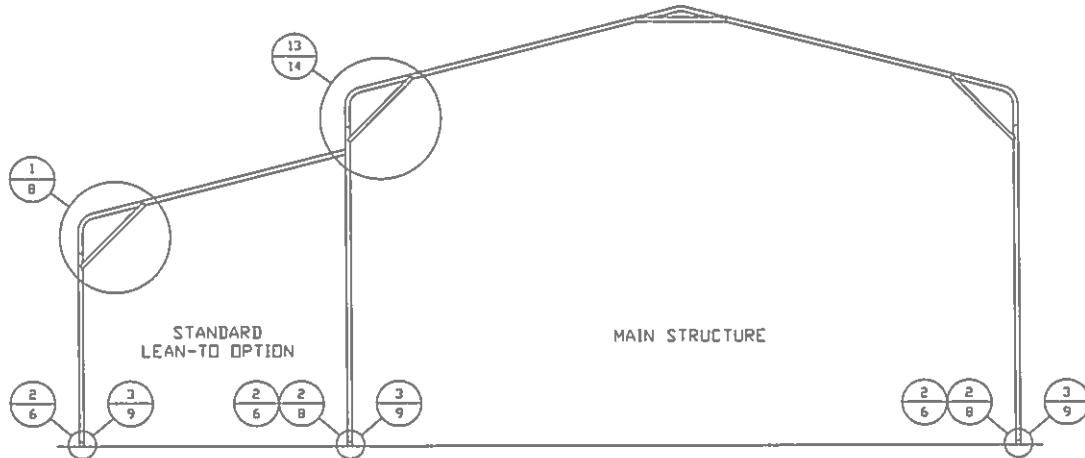
DWG. NO: SK-3

JOB NO:  
16022S/17300S

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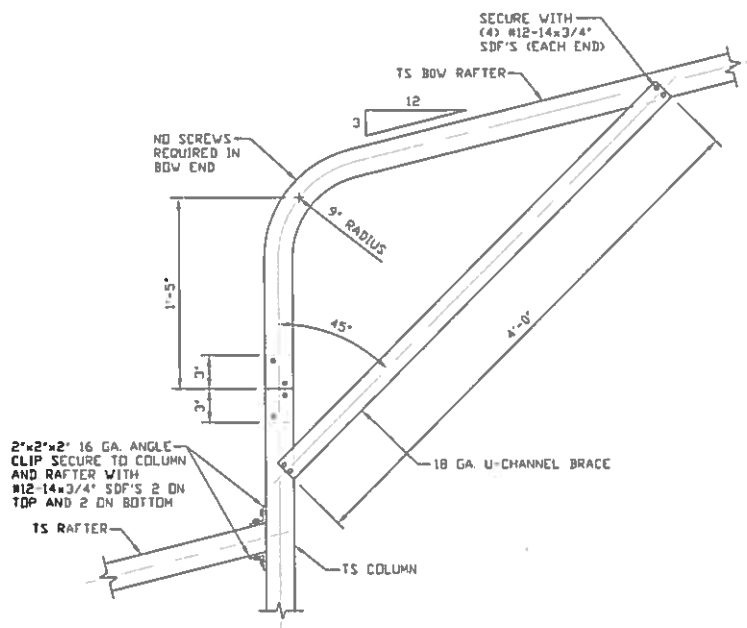
## BOW RAFTER LEAN-TO OPTIONS



**TYPICAL BOW RAFTER LEAN-TO OPTIONS FRAMING SECTION (BOTH OPTIONS SHOWN)**

SCALE: NTS

MAXIMUM WIDTH OF SINGLE MEMBER RAFTER LEAN-TO IS 16'-0"



13

**SIDE EXTENSION RAFTER/COLUMN DETAIL**

SCALE: NTS

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

DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: WSH

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 14

SCALE: NTS

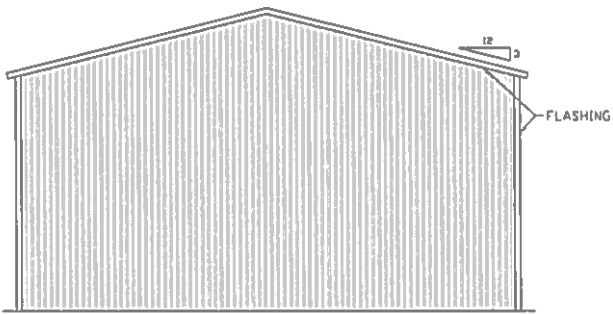
DWG. NO: SK-3

JOB NO:  
16022S/17300S

REV: 4

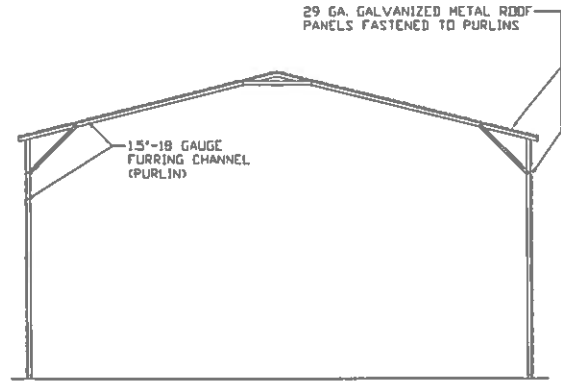
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## BOX EAVE RAFTER VERTICAL ROOF/SIDING OPTION



**TYPICAL END ELEVATION  
VERTICAL ROOF/SIDING OPTION**

SCALE: NTS



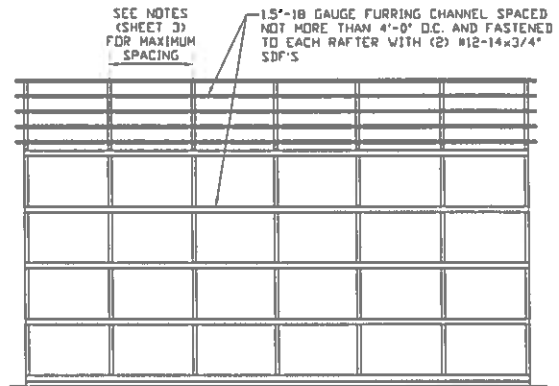
**TYPICAL SECTION VERTICAL  
ROOF/SIDING OPTION**

SCALE: NTS



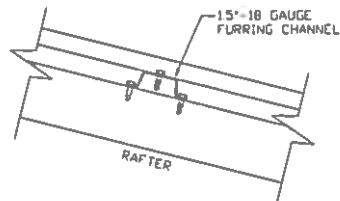
**TYPICAL SIDE ELEVATION  
VERTICAL ROOF/SIDING OPTION**

SCALE: NTS



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

SCALE: NTS



**ROOF PANEL ATTACHMENT**

(ALTERNATE FOR VERTICAL ROOF PANELS)  
SCALE: NTS

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

DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: WSH

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS  
30'-0" x 20'-0" ENCLOSED BUILDING EXP. B**

DATE: 12-18-17

SHT. 15

SCALE: NTS

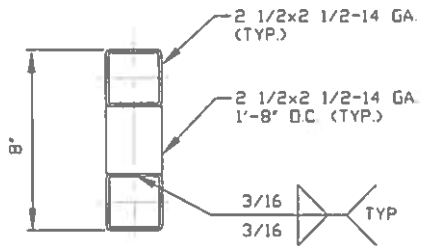
DWG. NO: SK-3

JOB NO:  
16022S/17300S

REV: 4

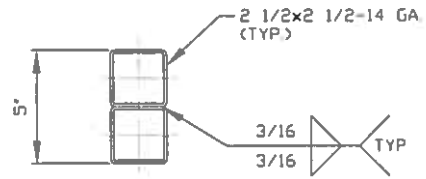
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## OPTIONAL DOOR HEADER



**HEADER DETAIL FOR DOOR  
OPENINGS 12'-0" < LENGTH ≤ 15'-0"**

SCALE: NTS



**HEADER DETAIL FOR DOOR  
OPENINGS LENGTH ≤ 12'-0"**

SCALE: NTS

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

**DRAWN BY: LT**

**CHECKED BY: PDH**

**PROJECT MGR: WSH**

**CLIENT: TBS**

**TUBULAR BUILDING SYSTEMS  
30'-0"x20'-0" ENCLOSED BUILDING EXP. B**

**DATE: 12-18-17**

**SHT. 16**

**SCALE: NTS**

**DWG. NO: SK-3**

**JOB NO:  
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**REV. 4**

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