



STRUCTURAL DESIGN

FULLY OPEN CARPORT 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:

**Tubular Building Systems, LLC
631 SE Industrial Circle
Lake City, Florida 32025**

Prepared by:

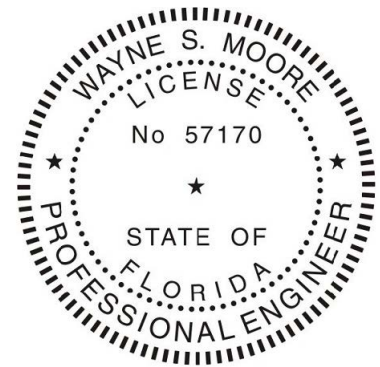
**Moore and Associates Engineering and Consulting, Inc.
1009 East Avenue
North Augusta, SC 29841**

**401 S. Main Street, Suite 200
Mount Airy, NC 27030**



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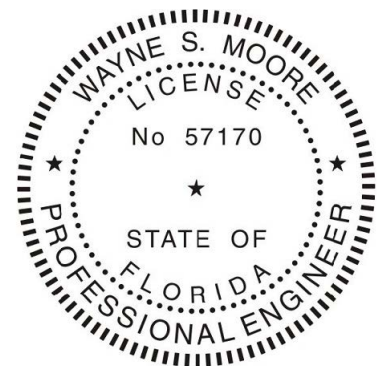
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MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.	DRAWN BY: LT		TUBULAR BUILDING SYSTEMS 30'-0"x20'-0" FULLY OPEN CARPORT EXP. B PE SEAL COVER SHEET	
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	CLIENT: TBS	SHT. 1	DWG. NO: SK-1	REV: 4

DRAWING INDEX

SHEET 1	PE SEAL COVER SHEET
SHEET 2	DRAWING INDEX
SHEET 3	INSTALLATION NOTES AND SPECIFICATIONS
SHEET 4	TYPICAL SIDE AND END ELEVATIONS
SHEET 5	TYPICAL RAFTER COLUMN END AND SIDE FRAMING SECTIONS (BOX EAVE RAFTER)
SHEET 6A	TYPICAL RAFTER COLUMN CONNECTION DETAILS (LACED COLUMN)
SHEET 6B	TYPICAL RAFTER COLUMN CONNECTION DETAILS (DOUBLE COLUMN)
SHEET 6C	TYPICAL RAFTER COLUMN CONNECTION DETAILS (SINGLE COLUMN)
SHEET 7	TYPICAL RAFTER COLUMN END AND SIDE FRAMING SECTIONS (BOW RAFTER)
SHEET 8A	TYPICAL RAFTER COLUMN CONNECTION DETAILS (DOUBLE COLUMN)
SHEET 8B	TYPICAL RAFTER COLUMN CONNECTION DETAILS (SINGLE COLUMN)
SHEET 9A	BASE RAIL ANCHORAGE OPTIONS
SHEET 9B	OPTIONAL FOUNDATION ANCHORAGE
SHEET 10	BOX EAVE RAFTER GABLE END OPTION
SHEET 11	BOW RAFTER GABLE END OPTION
SHEET 12	BOX EAVE RAFTER EXTRA SIDE PANEL OPTION
SHEET 13	BOW RAFTER EXTRA SIDE PANEL OPTION
SHEET 14	BOX EAVE RAFTER VERTICAL ROOF OPTION



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**TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B**

DATE: 12-18-17

SCALE: NTS

SHT. 2

DWG. NO: SK-1

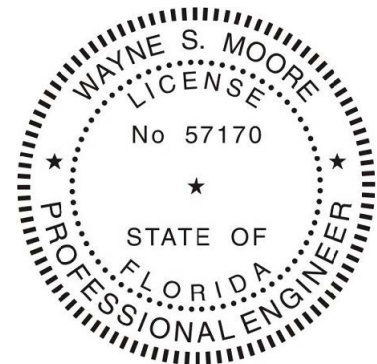
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INSTALLATION NOTES AND SPECIFICATIONS

1. DESIGN IS FOR A MAXIMUM 30'-0" WIDE x 20'-0" EAVE HEIGHT FULLY OPEN CARPORT.
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 = 1.5 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 USE 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_E= 1.0
S_{DS}= 1.522 V= C_SW
S_{DI}= 0.839



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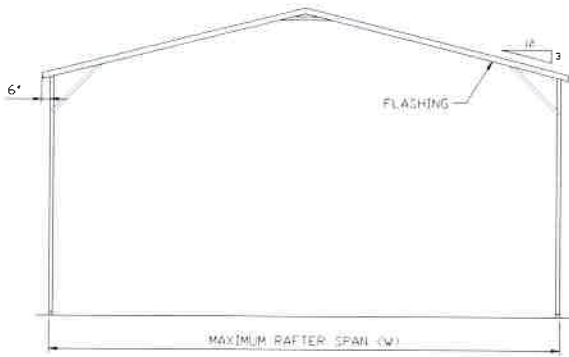
SHT. 3

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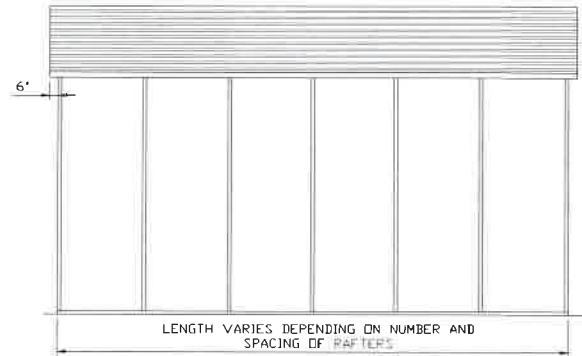
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☐ BOX EAVE FRAME RAFTER ENCLOSED BUILDING



TYPICAL END ELEVATION-HORIZONTAL ROOF

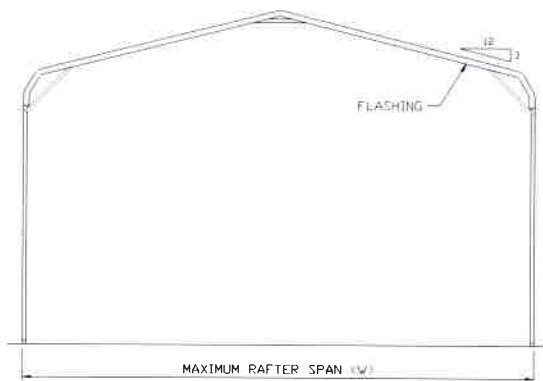
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TYPICAL SIDE ELEVATION-HORIZONTAL ROOF

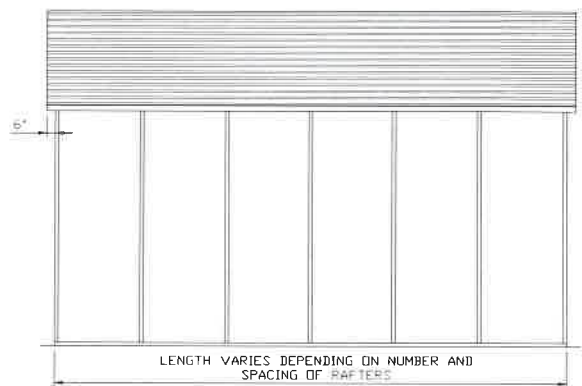
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☐ BOW FRAME RAFTER ENCLOSED BUILDING



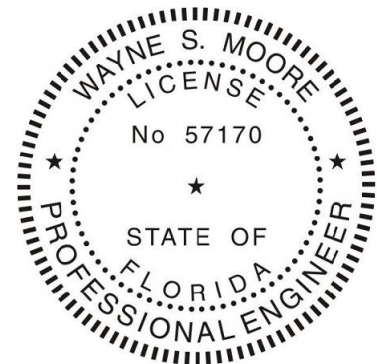
TYPICAL END ELEVATION

SCALE: NTS



TYPICAL SIDE ELEVATION

SCALE: NTS



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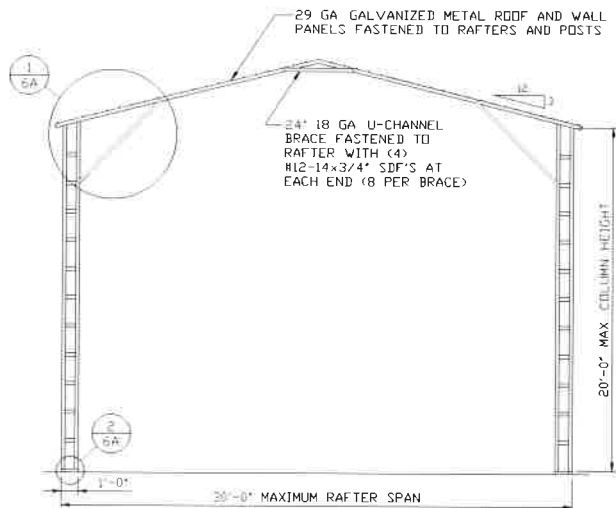
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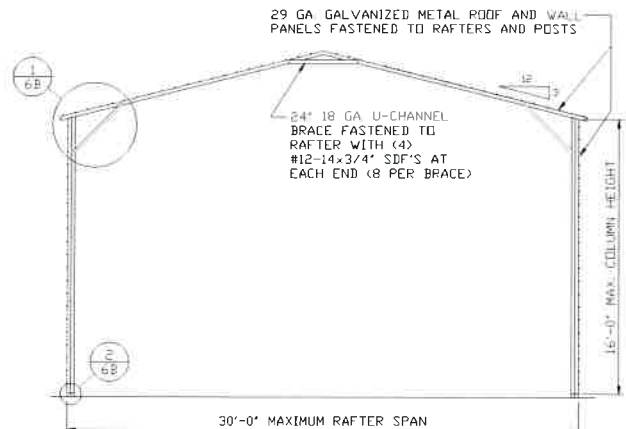
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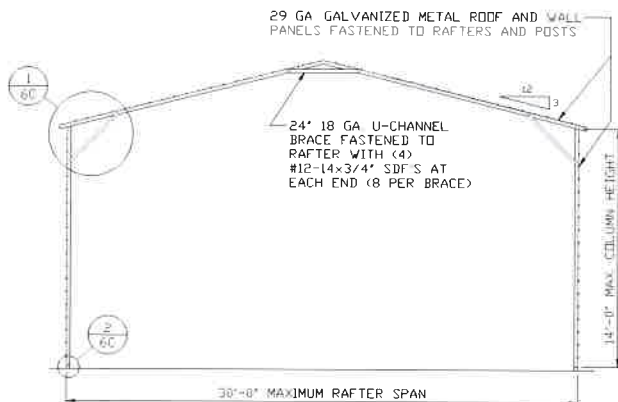
TYPICAL RAFTER/COLUMN END FRAME SECTION

SCALE: NTS



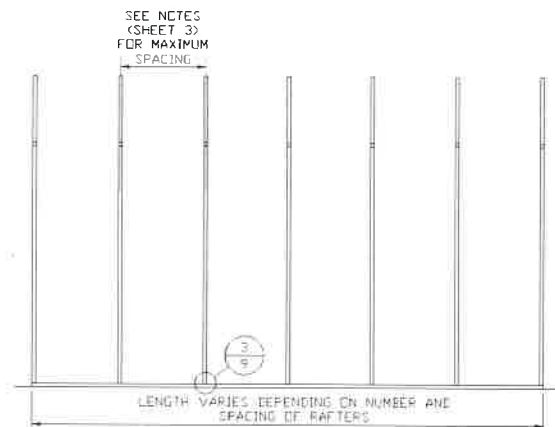
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SCALE: NTS



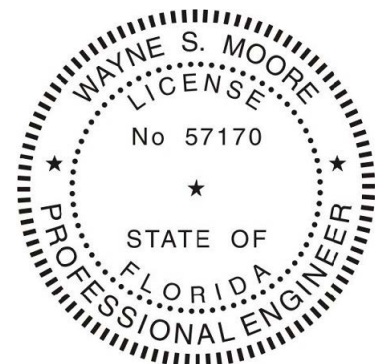
TYPICAL RAFTER/COLUMN END FRAME SECTION

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TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION

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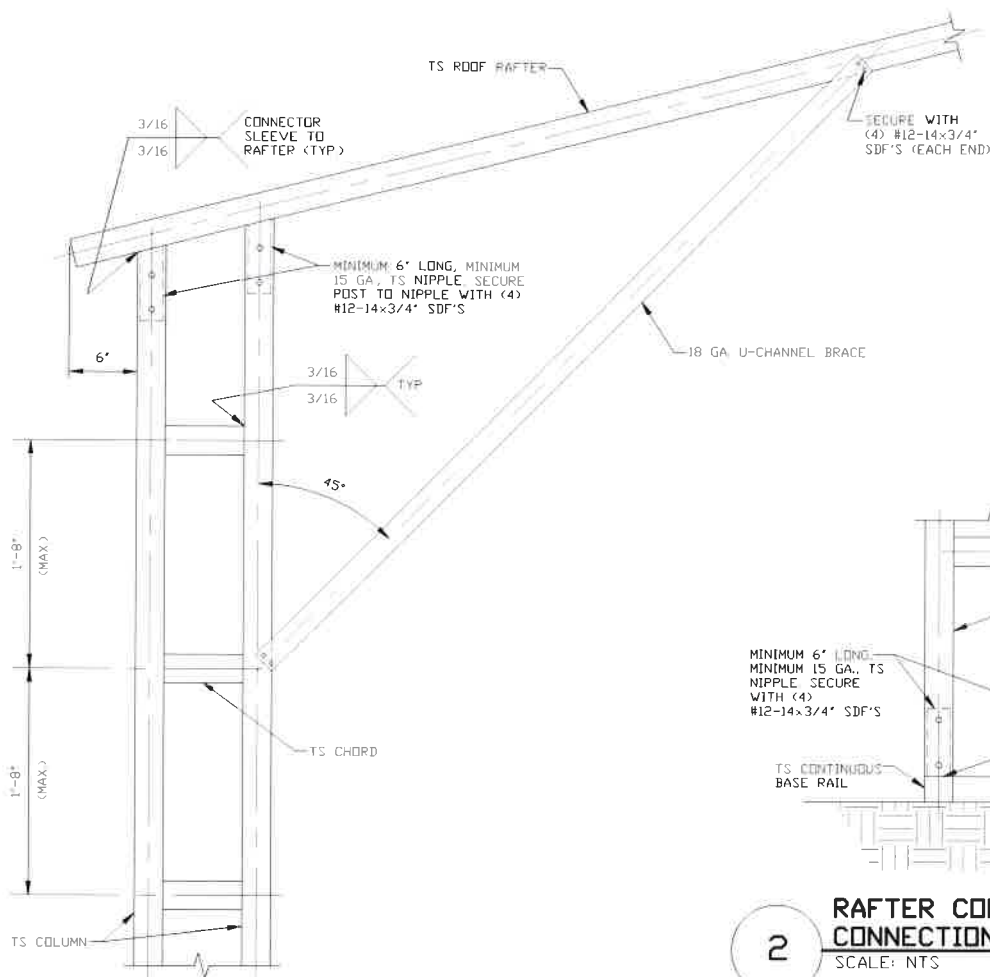
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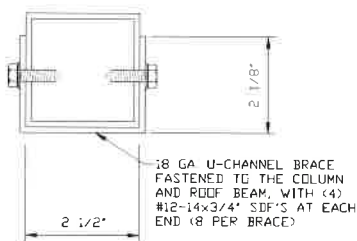
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**BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
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SCALE: NTS



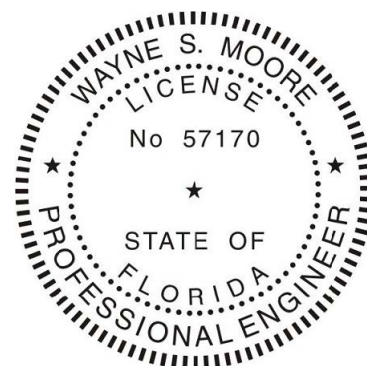
BRACE SECTION

SCALE: NTS

2

**RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL**

SCALE: NTS



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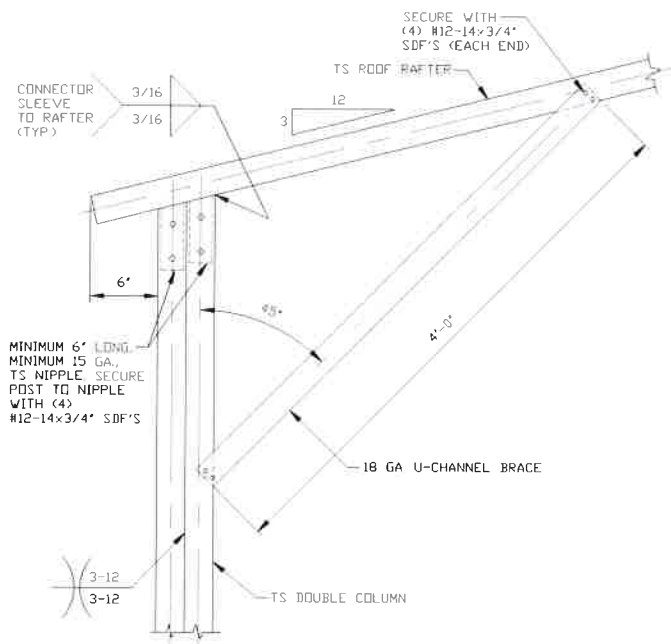
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SHT. 6A

DWG. NO: SK-1

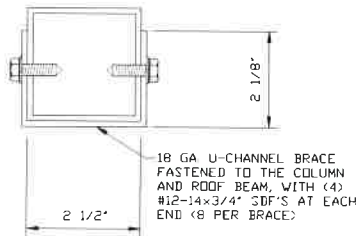
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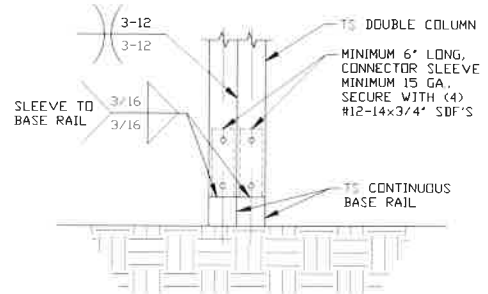
**BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
FOR HEIGHTS 14'-0" < TO ≤ 16'-0"**

SCALE: NTS



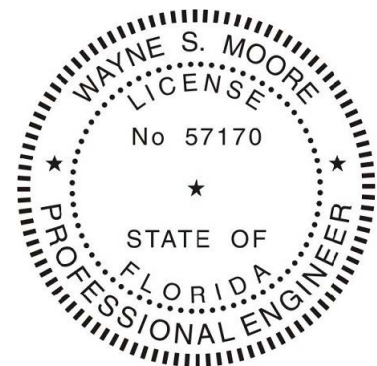
BRACE SECTION

SCALE: NTS



**RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL**

SCALE: NTS



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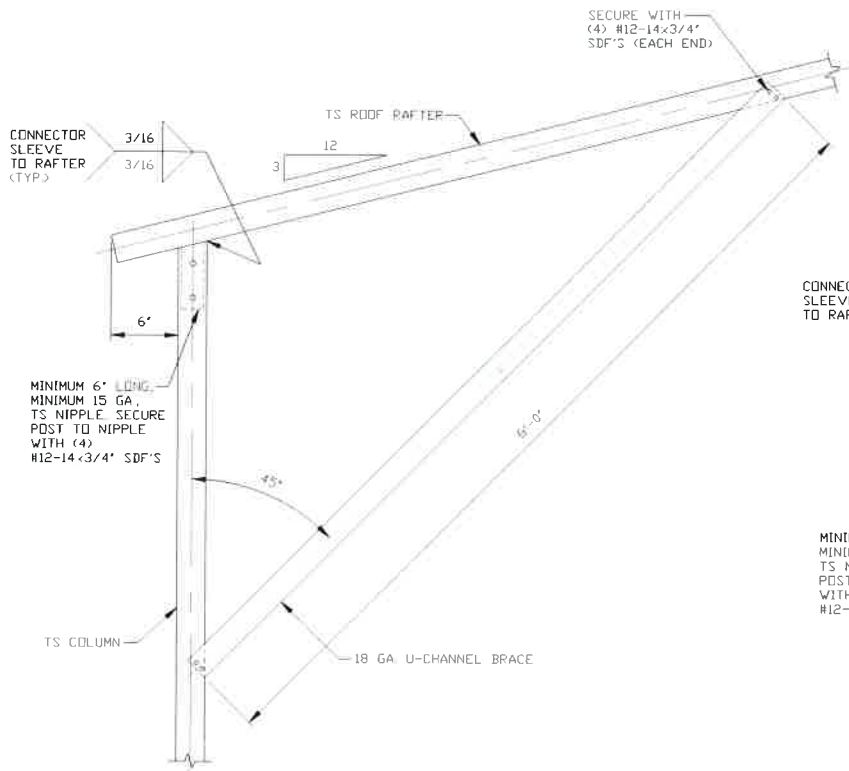
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SHT. 6B

DWG. NO: SK-1

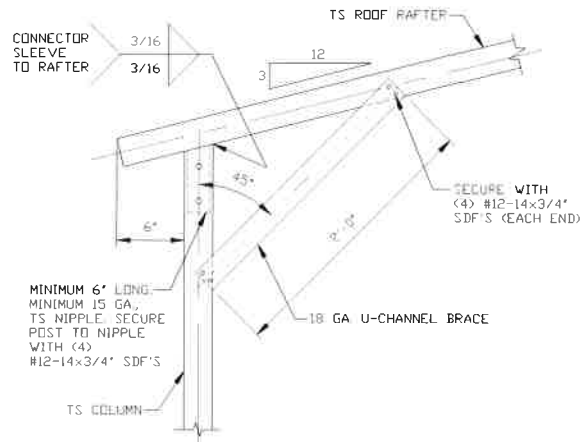
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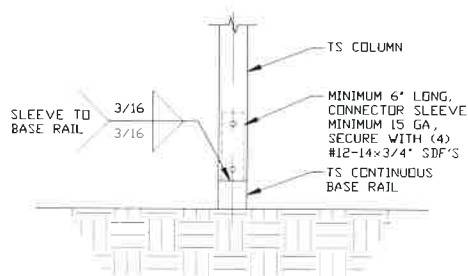
**BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
FOR HEIGHTS 12'-0" < TO <= 14'-0"**
SCALE: NTS

1A



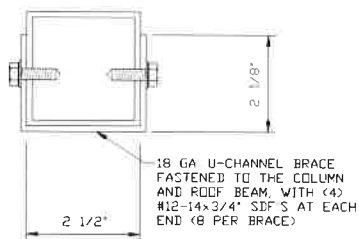
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CONNECTION DETAIL
FOR HEIGHTS <= 12'-0"**
SCALE: NTS

1B

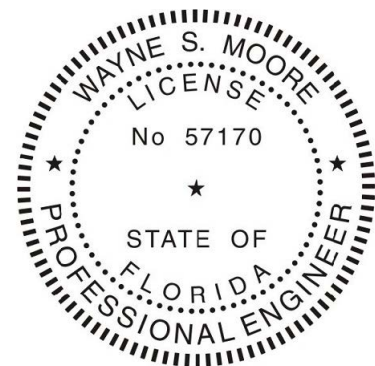


**2 RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL**
SCALE: NTS

2



BRACE SECTION
SCALE: NTS



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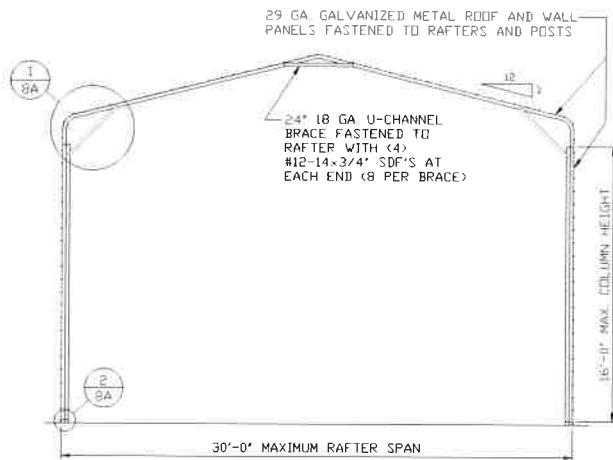
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SHT. 6C

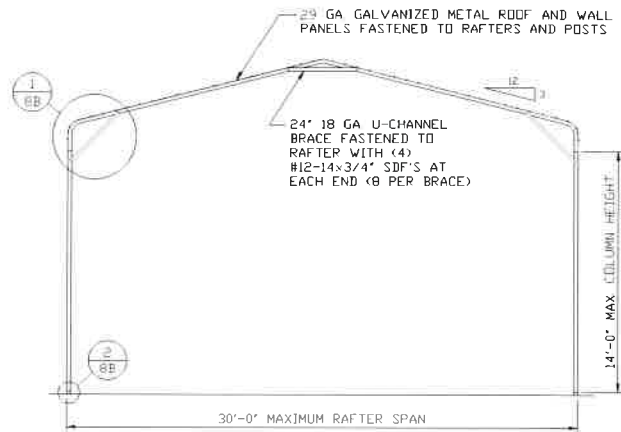
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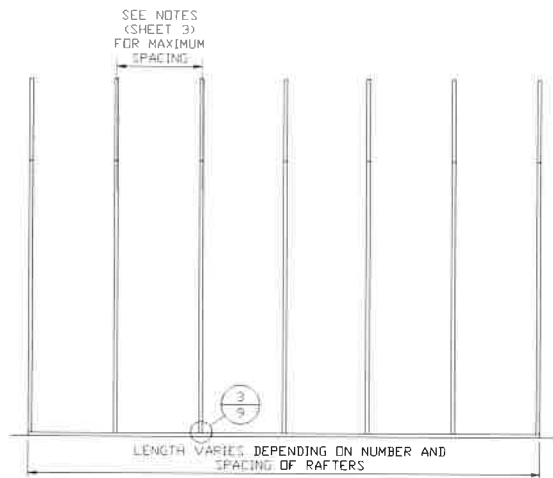
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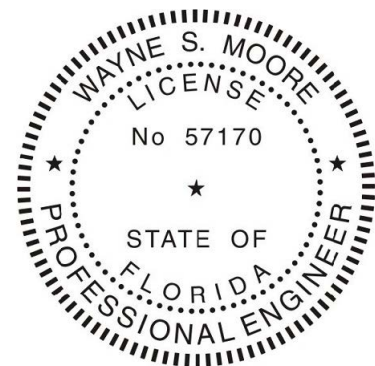
TYPICAL RAFTER/COLUMN END FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN END FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION
SCALE: NTS



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SHT. 7

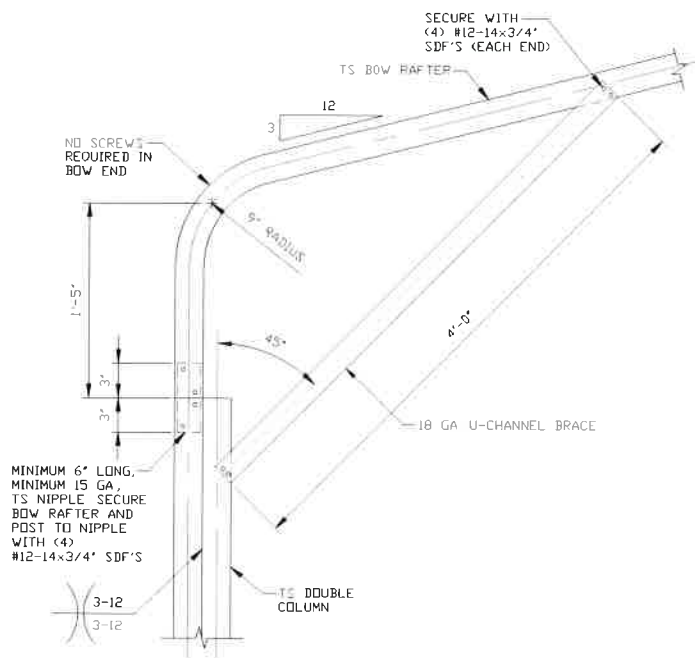
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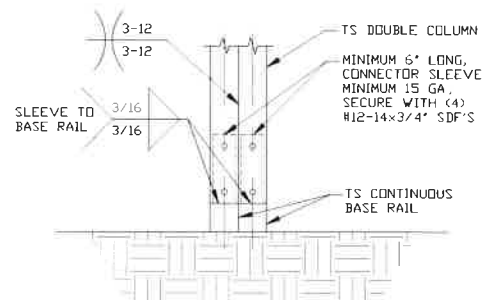
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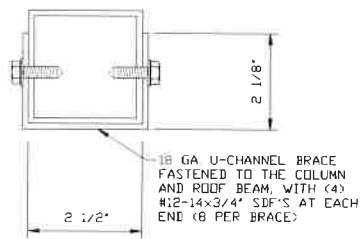
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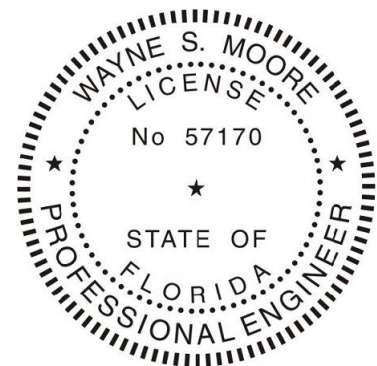
1 BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
FOR HEIGHTS 14'-0" < TO ≤ 16'-0"
SCALE: NTS



2 RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL
SCALE: NTS



BRACE SECTION
SCALE: NTS



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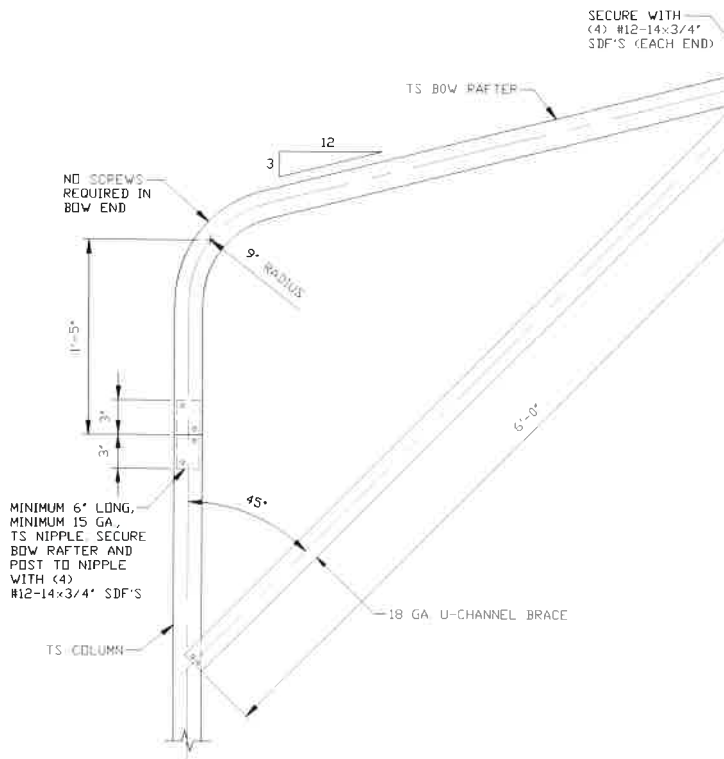
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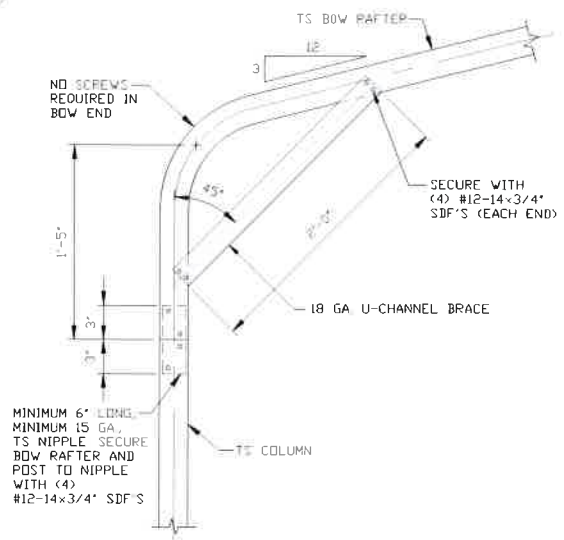
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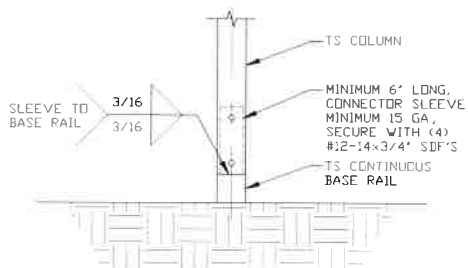
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**BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
FOR HEIGHTS 12'-0" < TD ≤ 14'-0"**
SCALE: NTS



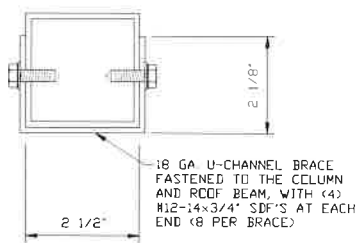
1B

**BOX EAVE RAFTER COLUMN
CONNECTION DETAIL
FOR HEIGHTS ≤ 12'-0"**
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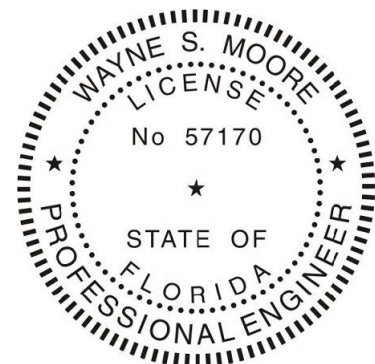


2

**RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL**
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BRACE SECTION
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SHT. 08

SCALE: NTS

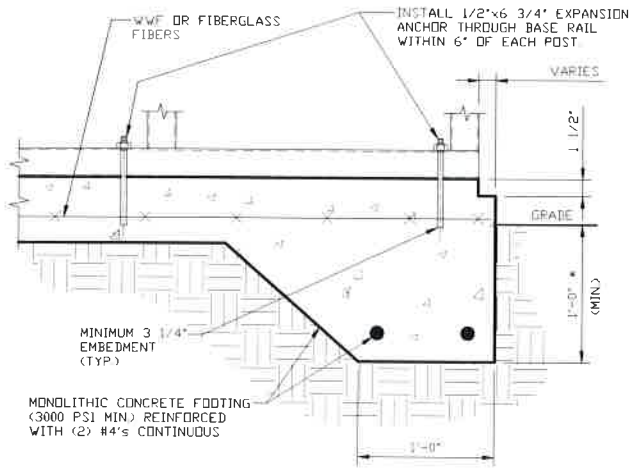
DWG. NO: SK-1

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

REV: 4

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BASE RAIL ANCHORAGE OPTIONS FOR LOW AND HIGH WIND SPEED



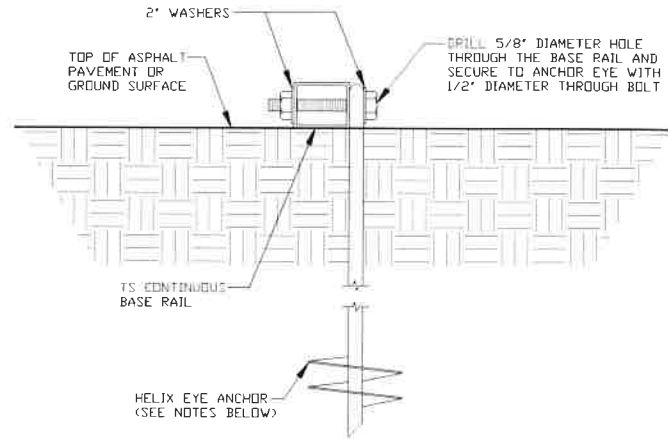
3A

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:

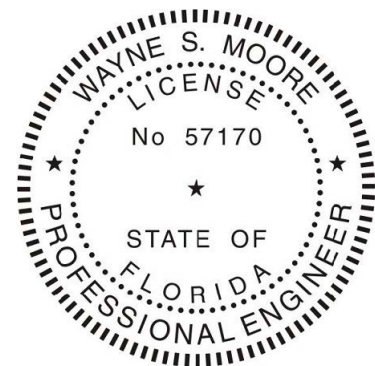
THE TURNDOWN REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. THE SLAB REINFORCEMENT SHALL BE WELDED WIRE FABRIC MEETING ASTM A185 OR FIBERGLASS FIBER REINFORCEMENT.

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 LOSE TO MEDIUM DENSE SANDS, FIRM TO STIFFER CLAYS AND SILTS, ALLUVIAL FILL USE MINIMUM (2) 8" HELICES WITH MINIMUM 60 INCH EMBEDMENT.



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MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING, INC.

DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: VSM

CLIENT: TBS

TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B

DATE: 12-18-17

SCALE: NTS

JOB NO:
16022S/17300S

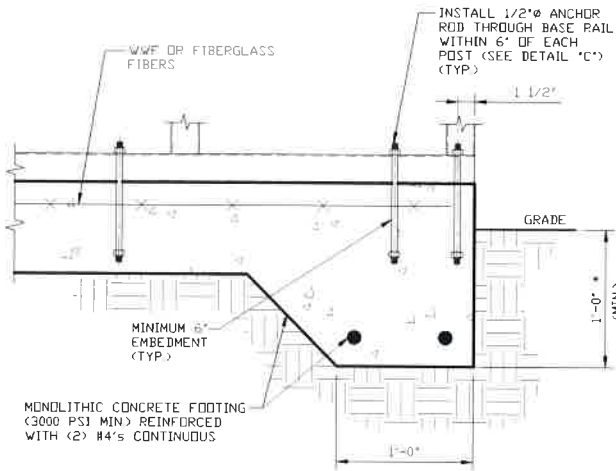
SHT. 9A

DWG. NO: SK-1

REV: 4

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OPTIONAL FOUNDATION ANCHORAGE FOR LOW & HIGH WIND SPEED

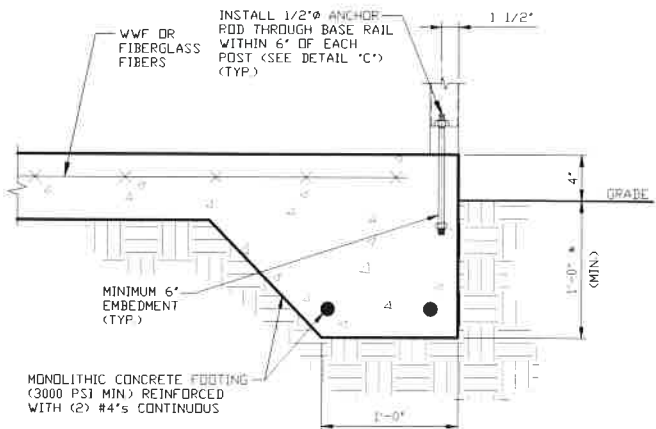


3A

CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS

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



3B

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:

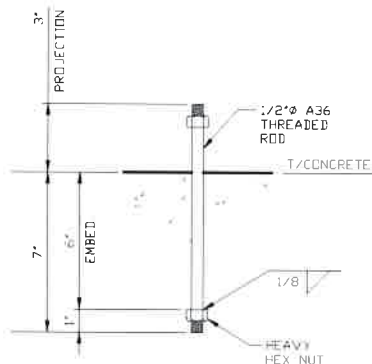
3 INCHES IN FOUNDATIONS WHERE THE CONCRETE IS CAST AGAINST AND PERMANENTLY IN CONTACT WITH THE EARTH OR EXPOSED TO THE EARTH OR WEATHER, AND 1 1/2 INCHES ELSEWHERE.

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:

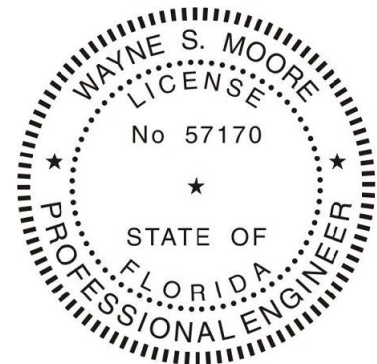
1. REINFORCEMENT IS BENT COLD.
2. THE DIAMETER OF THE BEND, MEASURED ON THE INSIDE OF THE BAR, IS NOT LESS THAN SIX-BAR DIAMETERS.
3. REINFORCEMENT PARTIALLY EMBEDDED IN CONCRETE SHALL NOT BE FIELD BENT.



3C

ANCHOR ROD THROUGH BASE RAIL DETAIL

SCALE: NTS



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CHECKED BY: PDH

PROJECT MGR: VSM

CLIENT: TBS

TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B

DATE: 12-18-17

SHT. 9B

SCALE: NTS

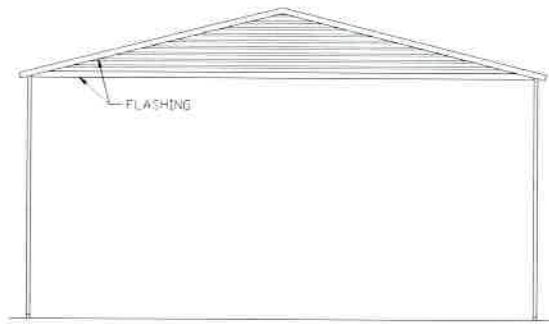
DWG. NO: SK-1

JOB NO:
16022S/17300S

REV: 4

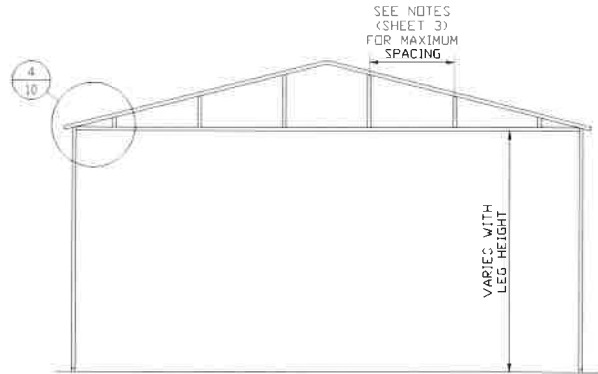
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BOX EAVE RAFTER GABLE END OPTION



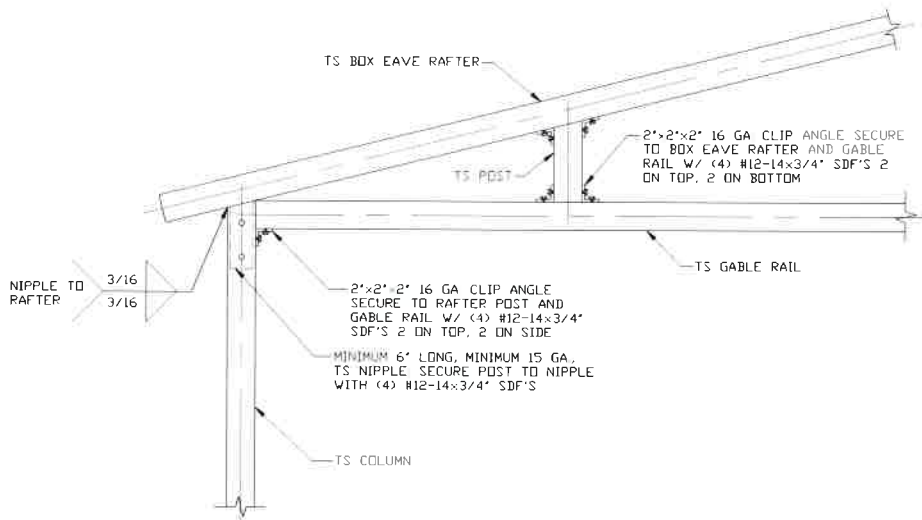
**TYPICAL BOX EAVE RAFTER
END WALL FRAMING SECTION**

SCALE: NTS



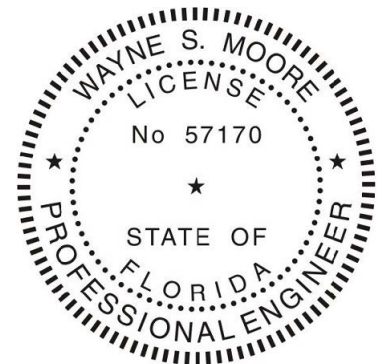
**TYPICAL BOX EAVE RAFTER END
WALL OPENINGS FRAMING SECTION**

SCALE: NTS



**BOX EAVE RAFTER GABLE RAIL TO
RAFTER POST CONNECTION DETAIL**

SCALE: NTS



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PROJECT MGR: WSM

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B**

DATE: 12-18-17

SCALE: NTS

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

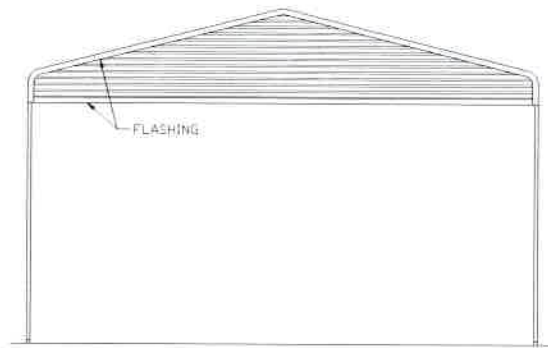
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DWG. NO: SK-1

REV: 4

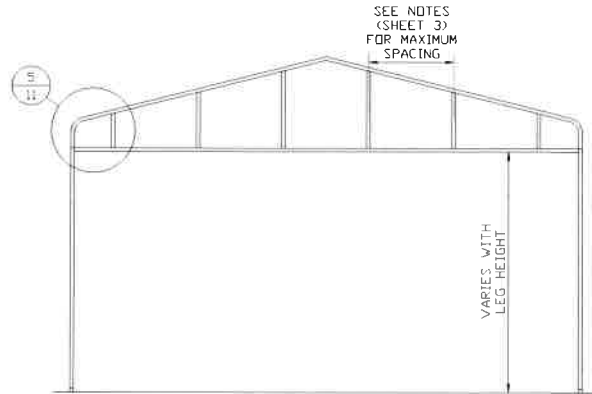
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BOW RAFTER GABLE END OPTION



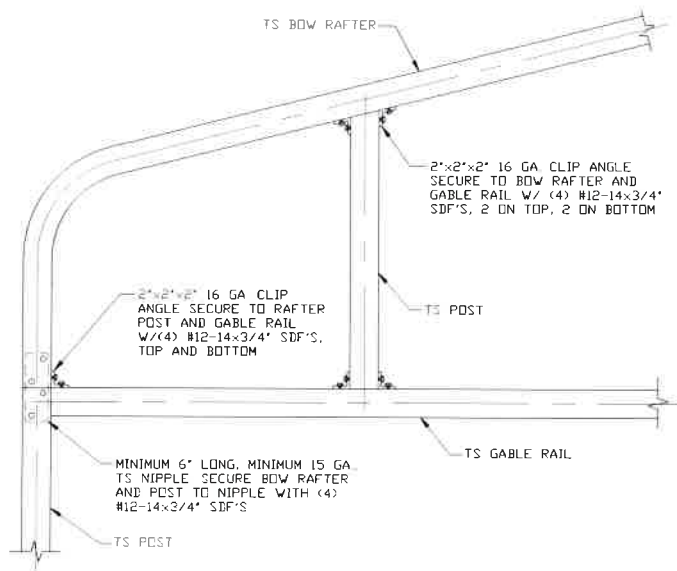
**TYPICAL BOX EAVE RAFTER
END WALL FRAMING SECTION**

SCALE: NTS



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

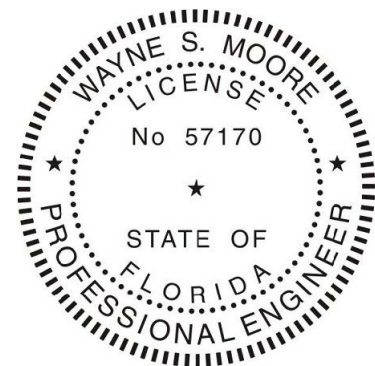
SCALE: NTS



5

**BOW RAFTER GABLE RAIL TO
RAFTER/POST CONNECTION DETAIL**

SCALE: NTS



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PROJECT MGR: WSM

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B**

DATE: 12-18-17

SCALE: NTS

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

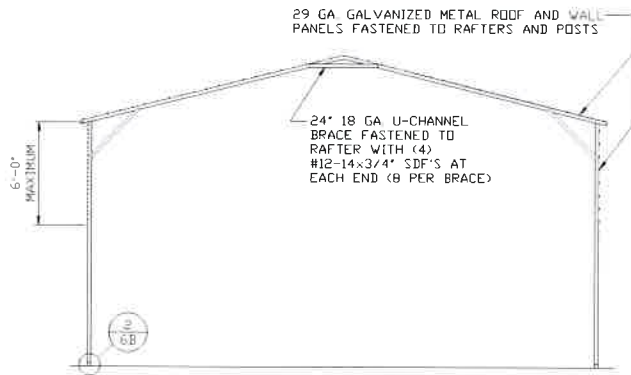
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DWG. NO: SK-1

REV: 4

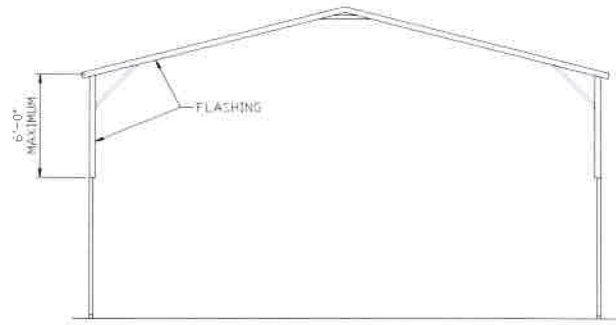
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BOX EAVE RAFTER EXTRA SIDE PANEL OPTION



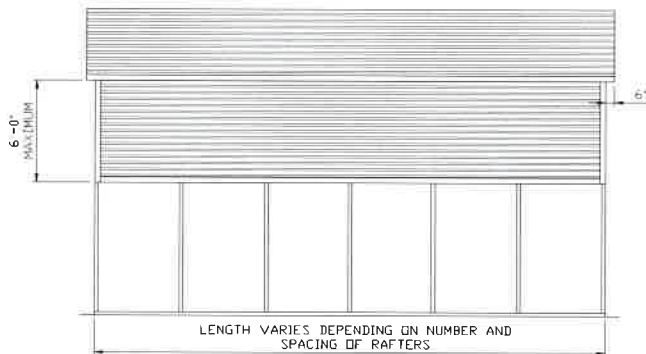
**TYPICAL RAFTER/POST FRAME
SECTION EXTRA SIDE PANELS**

SCALE: NTS



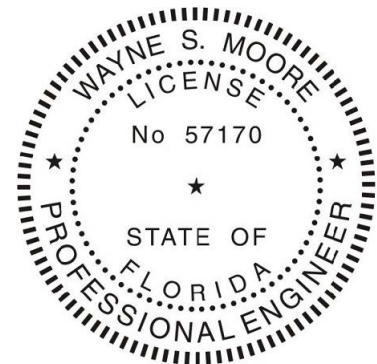
**TYPICAL END ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS



**TYPICAL SIDE ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS



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TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B

DATE: 12-18-17

SHT. 12

SCALE: NTS

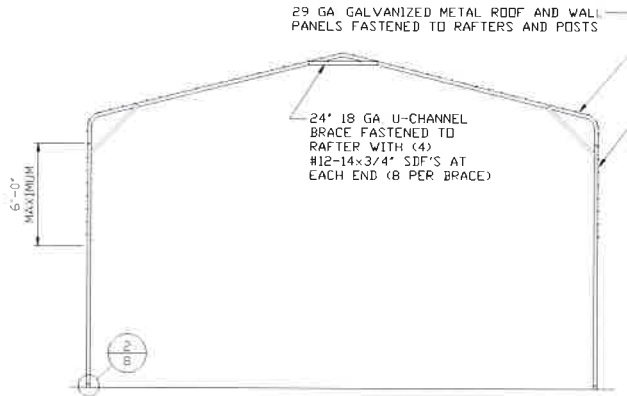
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**JOB NO:
16022S/17300S**

REV: 4

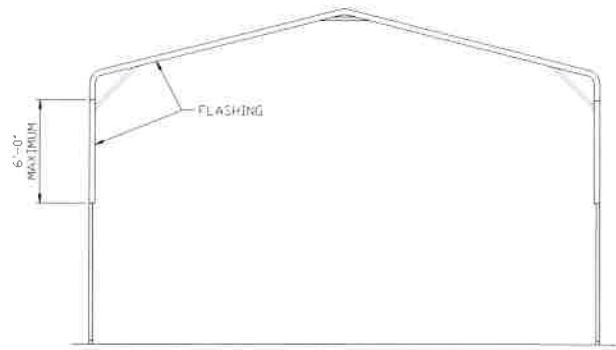
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BOW RAFTER EXTRA SIDE PANEL OPTION



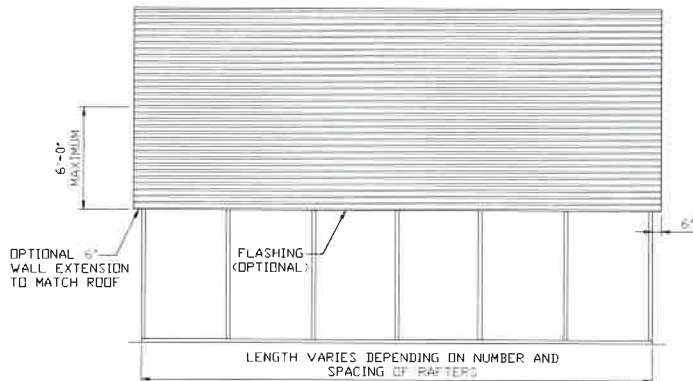
**TYPICAL RAFTER/POST FRAME
SECTION EXTRA SIDE PANELS**

SCALE: NTS



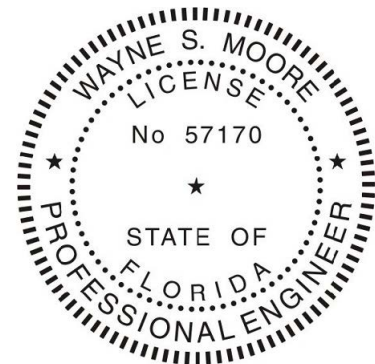
**TYPICAL END ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS



**TYPICAL SIDE ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS



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PROJECT MGR: WSM

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B**

DATE: 12-18-17

SCALE: NTS

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

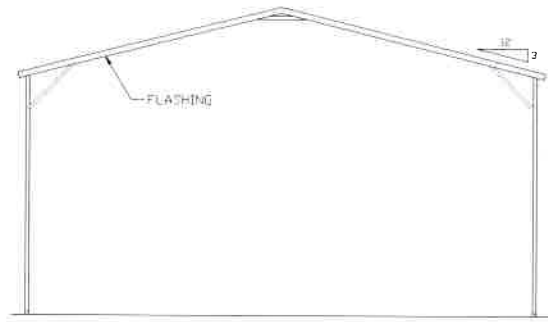
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DWG. NO: SK-1

REV: 4

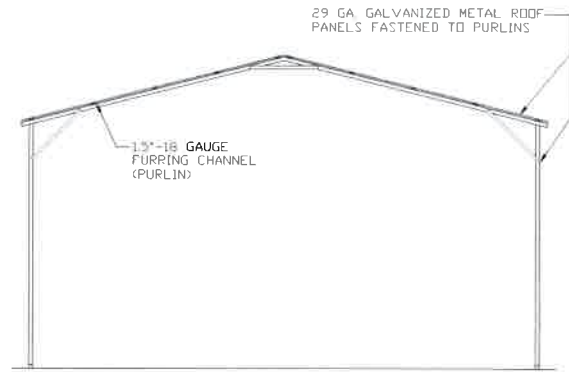
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BOX EAVE RAFTER VERTICAL ROOF OPTION



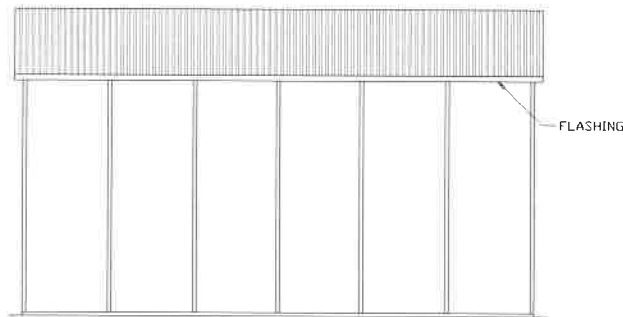
**TYPICAL END ELEVATION
VERTICAL ROOF/SIDING OPTION**

SCALE: NTS



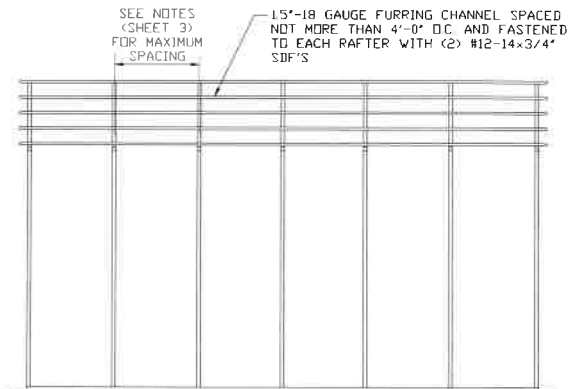
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ROOF/SIDING OPTION**

SCALE: NTS



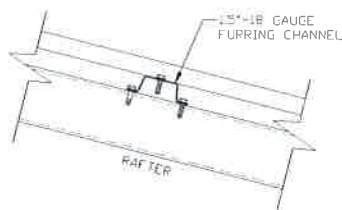
**TYPICAL SIDE ELEVATION
VERTICAL ROOF/SIDING OPTION**

SCALE: NTS



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

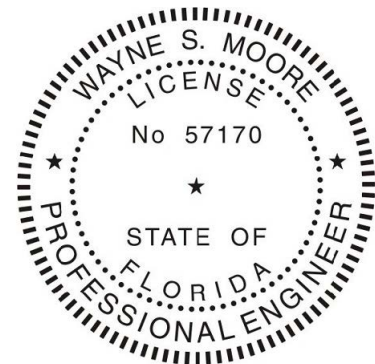
SCALE: NTS



ROOF PANEL ATTACHMENT

(ALTERNATE FOR VERTICAL ROOF PANELS)

SCALE: NTS



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PROJECT MGR: WSM

CLIENT: TBS

**TUBULAR BUILDING SYSTEMS
30'-0"x20'-0" FULLY OPEN CARPORT EXP. B**

DATE: 12-18-17

SCALE: NTS

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

SHT. 14

DWG. NO: SK-1

REV: 4

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