



## STRUCTURAL DESIGN

## ENCLOSED BUILDING

**MAXIMUM 30'- 0" WIDE X 14'- 0" HEIGHT-  
BOX EAVE FRAME AND BOW FRAME**

5 November 2018

Revision 6

M&A Project No. 17062S/17174S/17254S/18033S/18113S/18246S

Prepared for:

Newmart Builders  
1000 Cycle Lane  
South Hill, VA 23970

Prepared by:

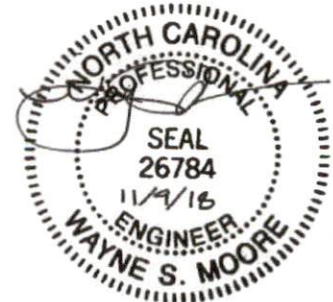
Moore and Associates Engineering and Consulting, Inc.

1009 East Avenue  
North Augusta, SC 29841

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



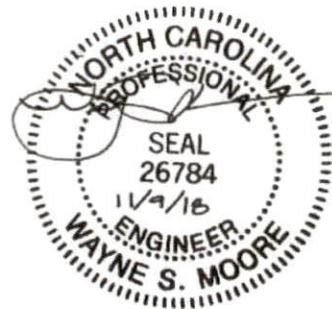
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# DRAWING INDEX

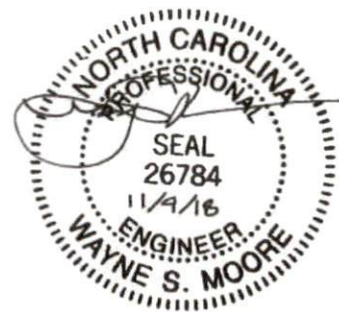
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<b>MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.</b>	DRAWN BY: LT	NEWMART BUILDERS, INC. 1000 CYCLE LANE SOUTH HILL, VA 23970 30'-0" x 14'-0" ENCLOSED STRUCTURE		
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	CLIENT: NEWMART BUILDERS	SHT. 2	DWG. NO: SK-3	REV: 6

## INSTALLATION NOTES AND SPECIFICATIONS

- 1 DESIGN IS FOR MAXIMUM 30'-0" WIDE x 14'-0" EAVE HEIGHT ENCLOSED STRUCTURES
- 2 DESIGN WAS DONE IN ACCORDANCE WITH THE 2018 NORTH CAROLINA BUILDING CODE, 2006 INTERNATIONAL BUILDING CODE (IBC), 2009 IBC, 2012 IBC AND 2015 IBC.
- 3 DESIGN LOADS ARE AS FOLLOWS:
  - A) DEAD LOAD = 15 PSF
  - B) LIVE LOAD = 12 PSF
  - C) GROUND SNOW LOAD = 30 PSF ( $W \leq 24'-0"$ )  
 = 35 PSF ( $18'-0" < W \leq 30'-0"$ )  
 = 45 PSF @ 4'-0" O.C. MAX. RAFTER/COLUMN AND END COLUMN SPACING ( $24'-0" < W \leq 30'-0"$ )  
 @ 5'-0" O.C. MAX. RAFTER/COLUMN AND END COLUMN SPACING ( $W \leq 24'-0"$ )
- 4 LOW ULTIMATE WIND SPEED (LW) 105 TO 130 MPH (NOMINAL WIND SPEED 81 TO 101 MPH); MAXIMUM RAFTER/POST AND END COLUMN SPACING = 50 FEET (UNLESS NOTED OTHERWISE).
- 5 END WALL COLUMNS (POST) ARE SIMILAR TO SIDE WALL POSTS UNLESS NOTED OTHERWISE
- 6 RISK CATEGORY I
- 7 WIND EXPOSURE CATEGORY B
- 8 SPECIFICATIONS APPLICABLE TO 29 GAUGE METAL PANELS FASTENED DIRECTLY TO 2"x3"-14 GAUGE TUBE STEEL (TS) FRAMING MEMBERS FOR ( $24'-0" < W \leq 30'-0"$  AND  $W \leq 24'-0"$  WITH EAVE HEIGHT  $12'-0" < TO \leq 14'-0"$ ) 2 1/4"x2 1/4"-14 GAUGE TUBE STEEL (TS) FOR ( $W \leq 24'-0"$ ) (UNLESS NOTED OTHERWISE).
9. AVERAGE FASTENER SPACING ON-CENTERS ALONG RAFTERS OR HAT CHANNELS AND COLUMNS (INTERIOR OR END) = 10" O.C. (MAX)
- 10 FASTENERS CONSIST OF 1/4"x3/4" 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 CONSIST OF #4 REBAR W/ WELDED NUT/FORMED HEAD x 30" LONG IN SUITABLE SOIL CONDITIONS OPTIONAL ANCHORAGE MAY BE USED IN SUITABLE SOILS AND MUST BE USED IN UNSUITABLE SOILS AS NOTED.
- 13 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> = 2.039 V = C<sub>s</sub>W  
 S<sub>01</sub> = 1.258



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NEW MART BUILDERS, INC.

1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0"x14'-0" ENCLOSED STRUCTURE

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**CLIENT:** NEW MART BUILDERS

**DATE:** 11-5-18

**SHT:** 3A

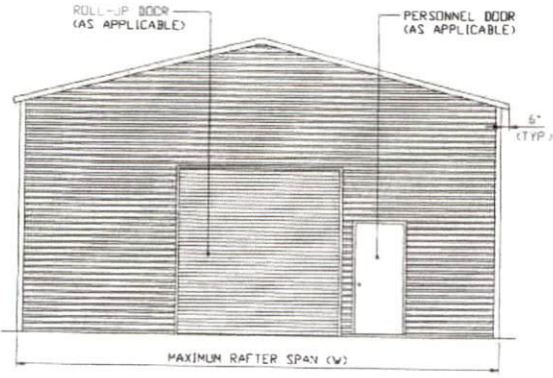
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**DWG. NO:** SK-3

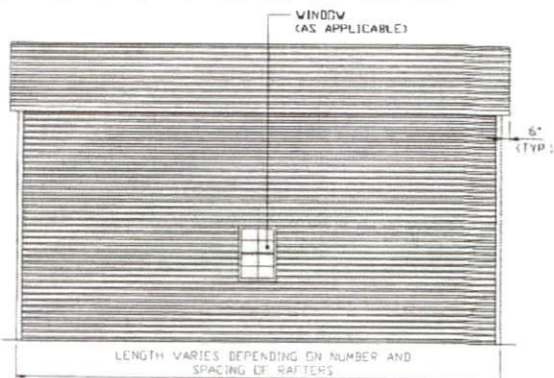
**JOB NO:** 18033S/18113S/18246S

**REV:** 6

**BOX EAVE FRAME RAFTER STRUCTURE (Sheets 4, 5A, 5B, 8, 9, 11, 12, 13, 15 AND 16)**

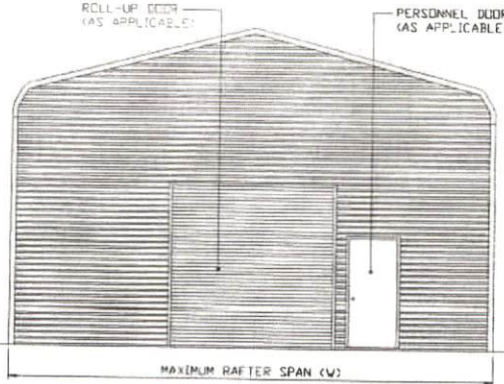


**TYPICAL END ELEVATION**  
SCALE: NTS

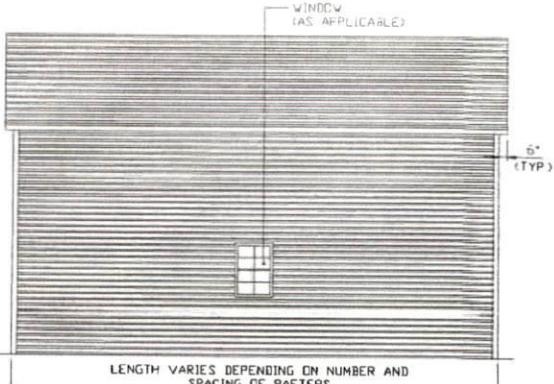


**TYPICAL SIDE ELEVATION**  
SCALE: NTS

**BOW FRAME RAFTER STRUCTURE (Sheets 6, 7A, 7B, 8, 10, 11, 12, 14 AND 16)**



**TYPICAL END ELEVATION**  
SCALE: NTS



**TYPICAL SIDE ELEVATION**  
SCALE: NTS



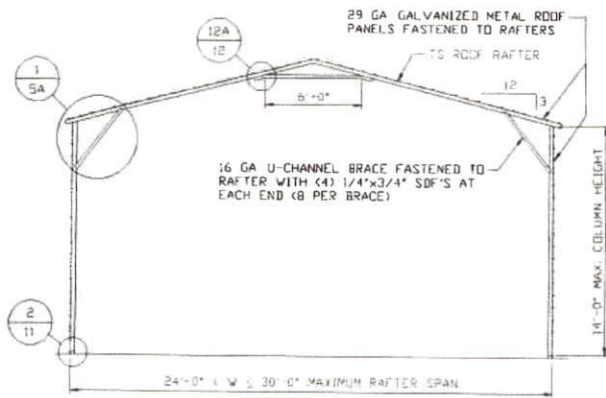
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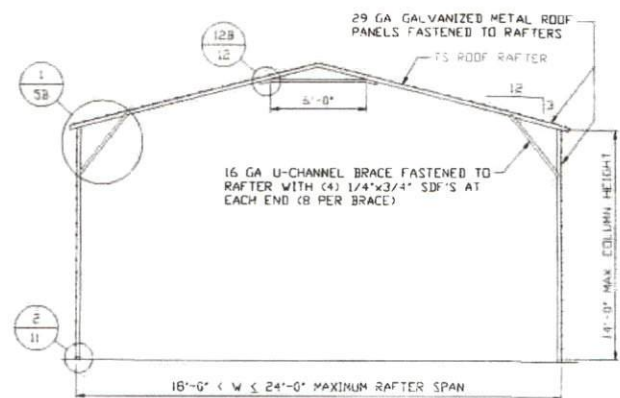
**NEWMART BUILDERS, INC.**  
1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

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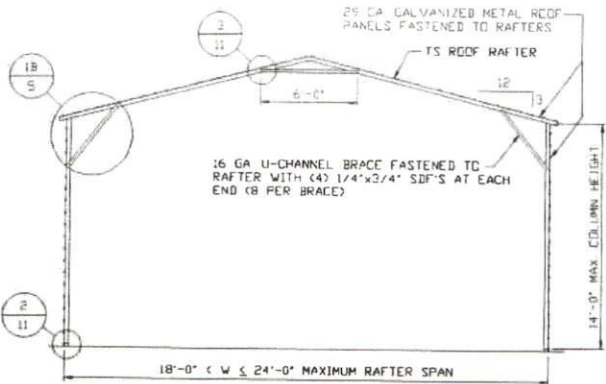
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<b>CLIENT: NEWMART BUILDERS</b>	<b>SHT. 3B</b>	<b>DWG. NO: SK-3</b>	<b>REV: 6</b>



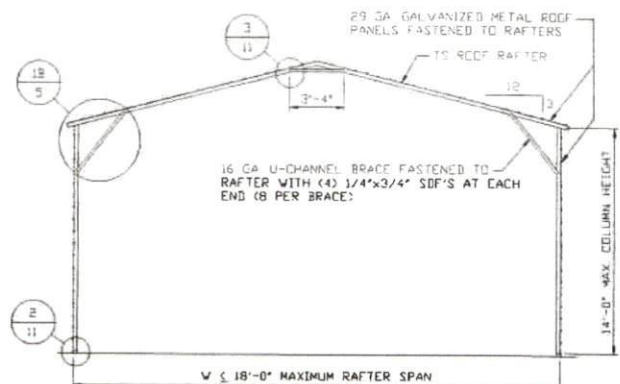
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
SCALE: NTS



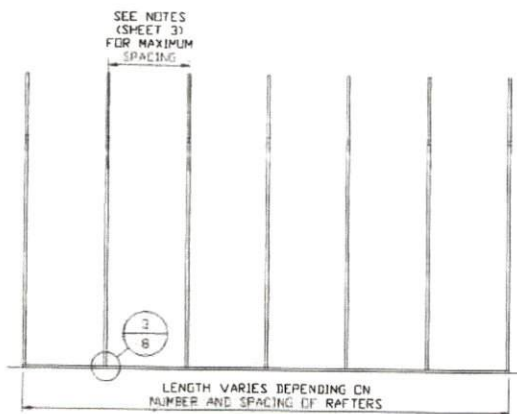
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
SCALE: NTS



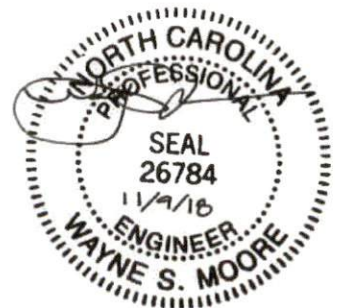
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
SCALE: NTS



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



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



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1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

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SHT. 4

SCALE: NTS

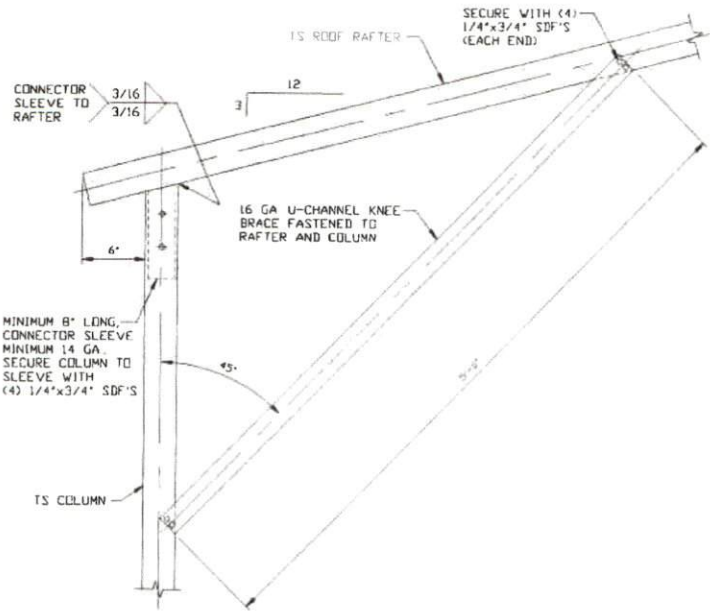
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JOB NO: 18033S/18113S/18246S

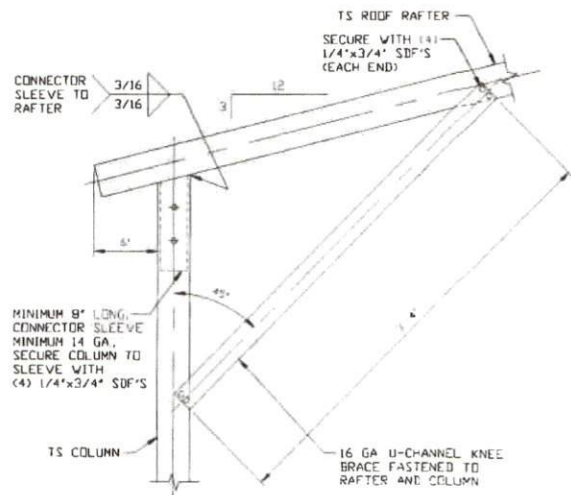
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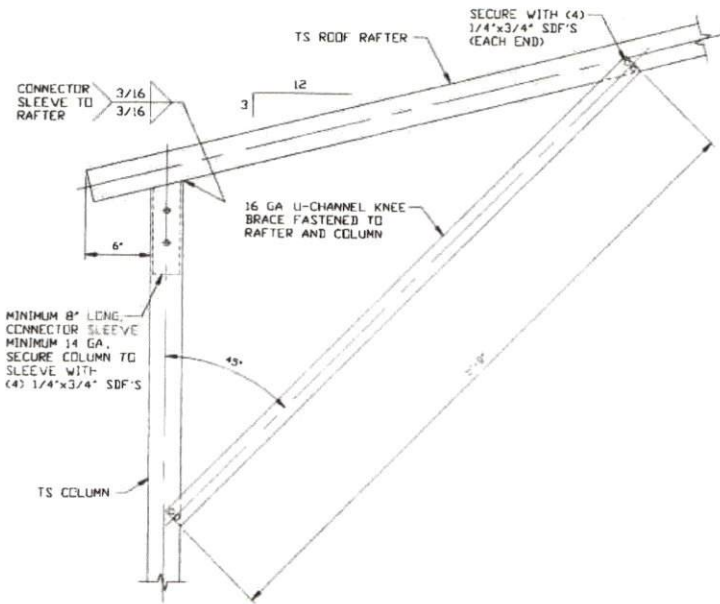
**24'-0" < W ≤ 30'-0" MAXIMUM RAFTER SPAN**



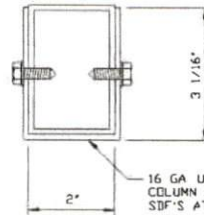
**1A**  
**BOX EAVE RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 12'-0" < TO ≤ 14'-0" @ 3'-6" O.C.  
 SCALE: NTS



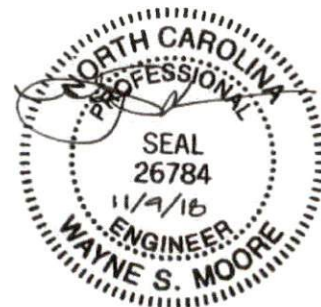
**1C**  
**BOX EAVE RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS ≤ 10'-0"  
 SCALE: NTS



**1B**  
**BOX EAVE RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 10'-0" < TO ≤ 12'-0"  
 SCALE: NTS



**BRACE SECTION**  
 SCALE: NTS



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 30'-0" x 14'-0" ENCLOSED STRUCTURE

DATE: 11-5-18

SHT. 5A

SCALE: NTS

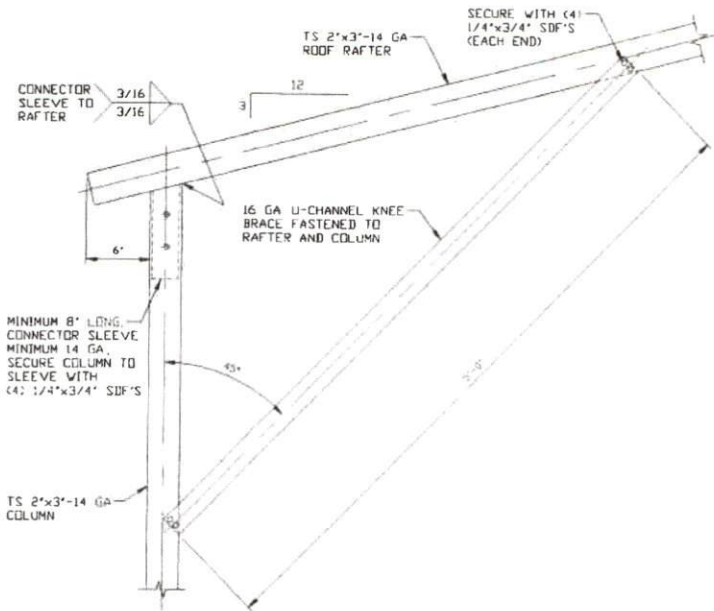
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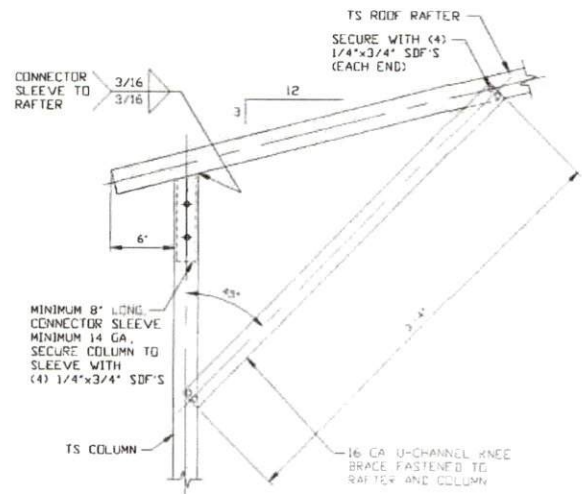
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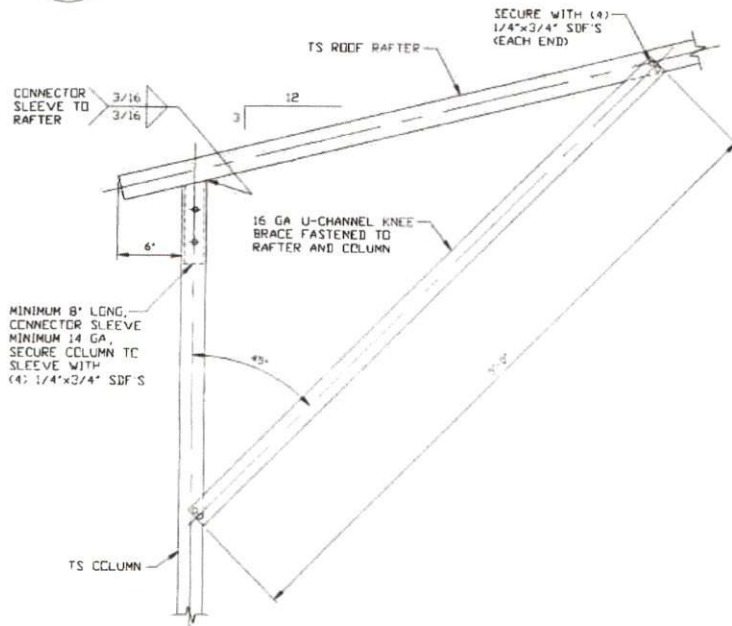
**W ≤ 24'-0" MAXIMUM RAFTER SPAN**



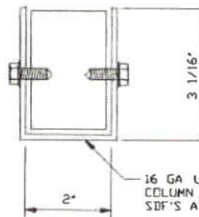
**1A** BOX EAVE RAFTER COLUMN CONNECTION DETAIL  
HEIGHTS 12'-0" < TO ≤ 14'-0" @ 4'-0" O.C.  
SCALE: NTS



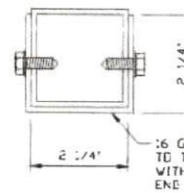
**1C** BOX EAVE RAFTER COLUMN CONNECTION DETAIL  
HEIGHTS ≤ 10'-0"  
SCALE: NTS



**1B** BOX EAVE RAFTER COLUMN CONNECTION DETAIL  
HEIGHTS 10'-0" < TO ≤ 12'-0" @ 4'-0" O.C.  
SCALE: NTS



**BRACE SECTION**  
SCALE: NTS



**BRACE SECTION**  
SCALE: NTS



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SHT. 5B

SCALE: NTS

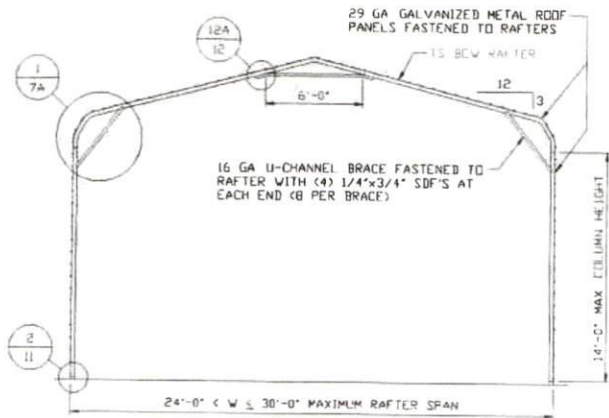
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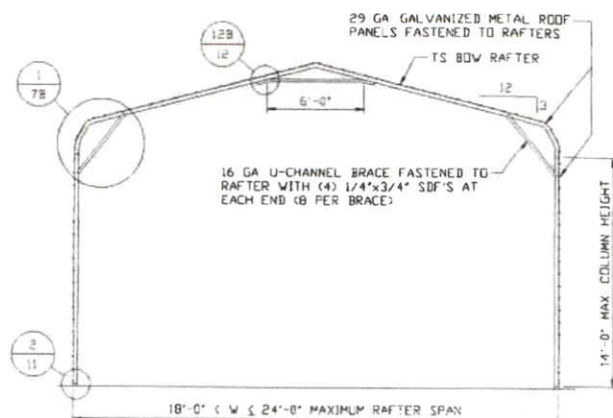
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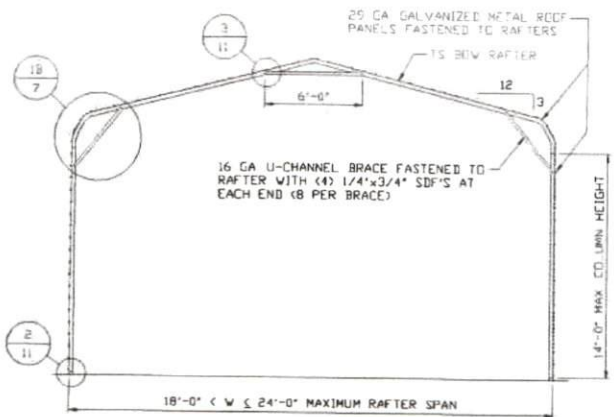




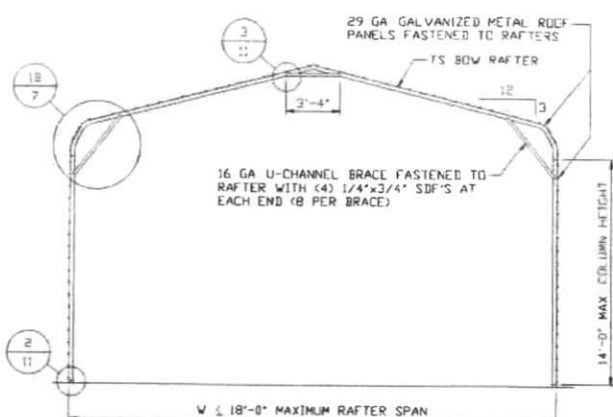
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
 SCALE: NTS



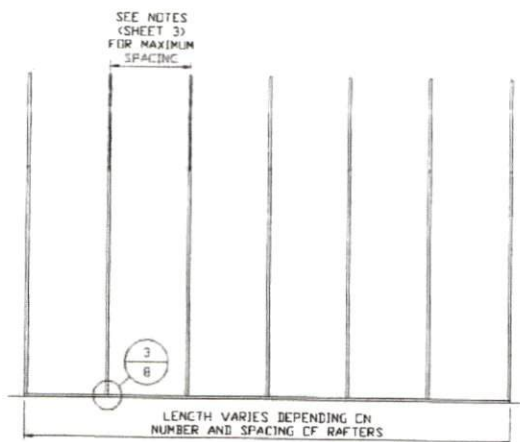
**TYPICAL RAFTER/COLUMN END FRAME SECTION**  
 SCALE: NTS



**TYPICAL RAFTER/COLUMN 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. 6

SCALE: NTS

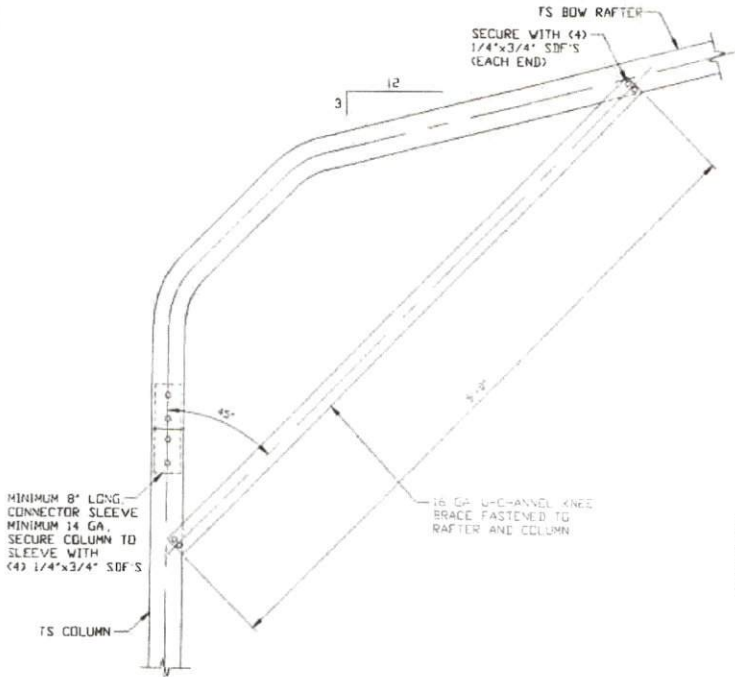
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 18033S/18113S/18246S

REV: 6

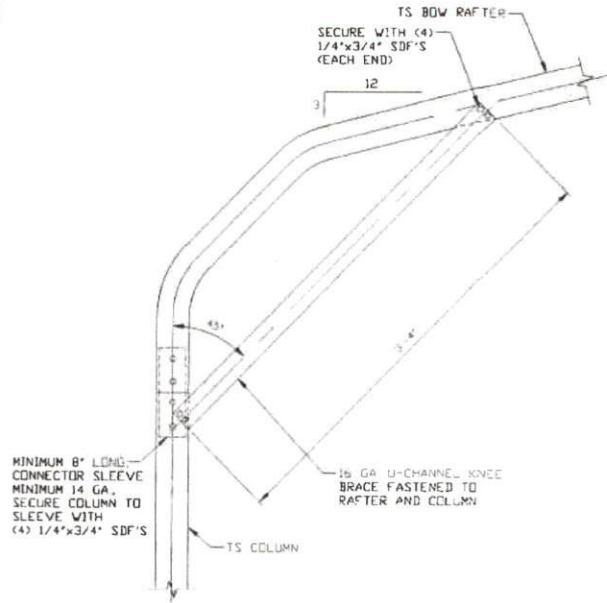
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**24'-0" < W ≤ 30'-0" MAXIMUM RAFTER SPAN**



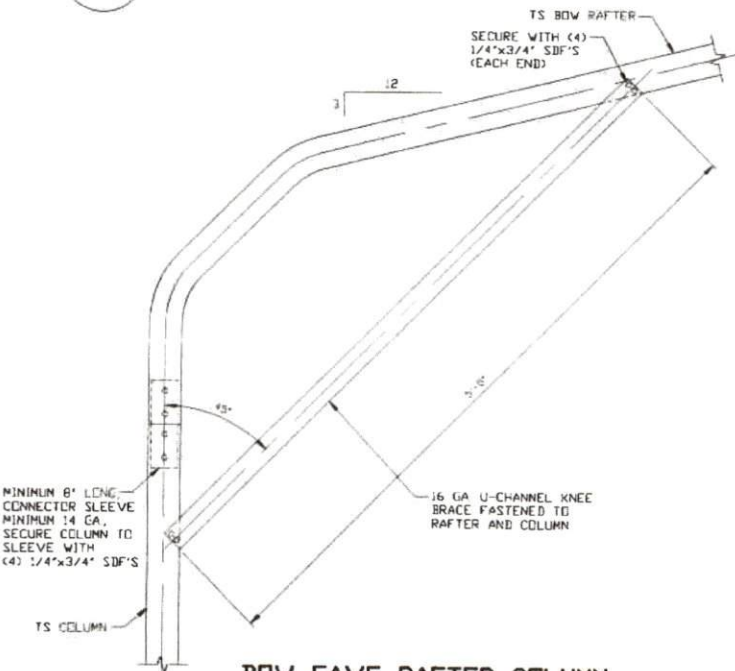
1A

**BOW RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 12'-0" < TO ≤ 14'-0" @ 3'-6" O.C.  
 SCALE: NTS



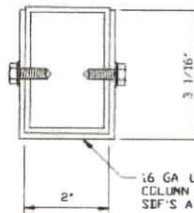
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**BOW RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS < 10'-0"  
 SCALE: NTS

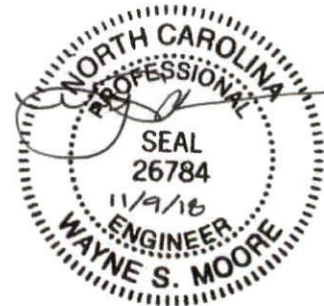


1B

**BOW EAVE RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 10'-0" < TO ≤ 12'-0"  
 SCALE: NTS



**BRACE SECTION**  
 SCALE: NTS



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CLIENT: NEWMART BUILDERS

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SHT. 7A

SCALE: NTS

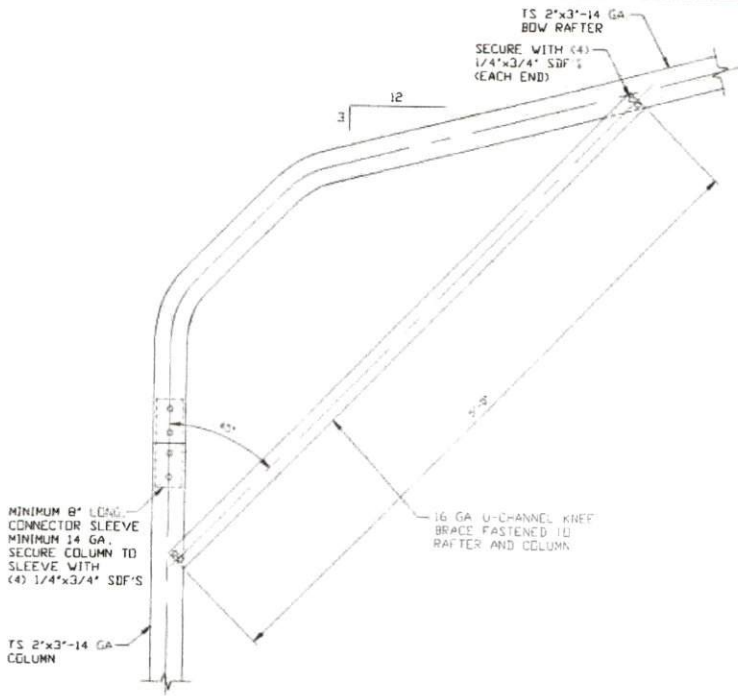
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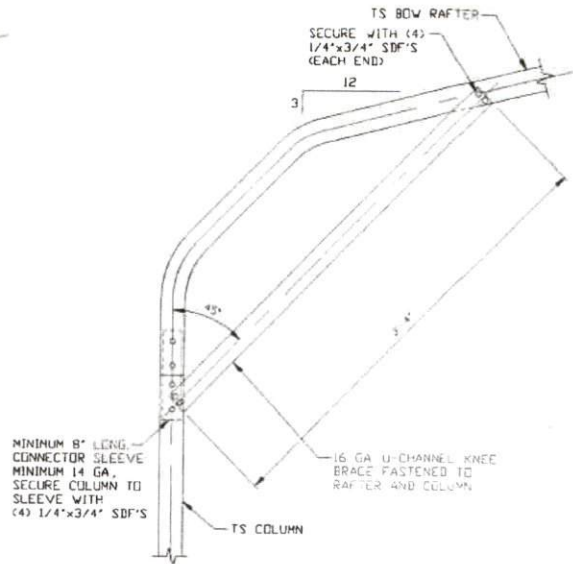
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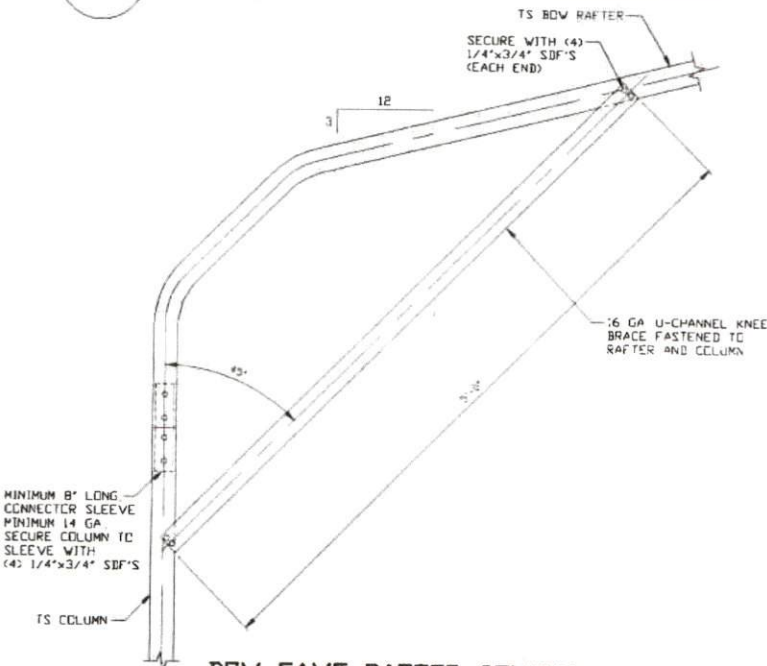
**W ≤ 24'-0" MAXIMUM RAFTER SPAN**



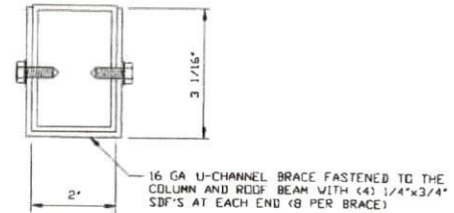
**1A**  
**BOW RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 12'-0" < TO < 14'-0" @ 4'-0" O.C.  
 SCALE: NTS



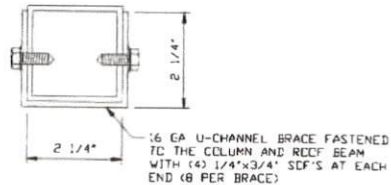
**1C**  
**BOW RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS ≤ 10'-0"  
 SCALE: NTS



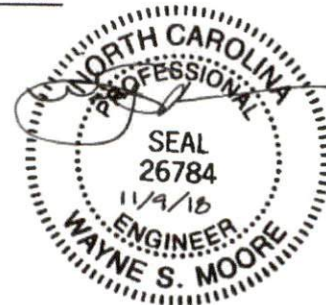
**1B**  
**BOW EAVE RAFTER COLUMN CONNECTION DETAIL**  
 HEIGHTS 10'-0" < TO < 12'-0" @ 4'-0" O.C.  
 SCALE: NTS



**BRACE SECTION**  
 SCALE: NTS



**BRACE SECTION**  
 SCALE: NTS



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

**DRAWN BY: LT**

**CHECKED BY: PDH**

**PROJECT MGR: WSH**

**CLIENT: NEWMART BUILDERS**

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 1000 CYCLE LANE  
 SOUTH HILL, VA 23970  
 30'-0"x14'-0" ENCLOSED STRUCTURE

**DATE: 11-5-18**

**SHT. 7B**

**SCALE: NTS**

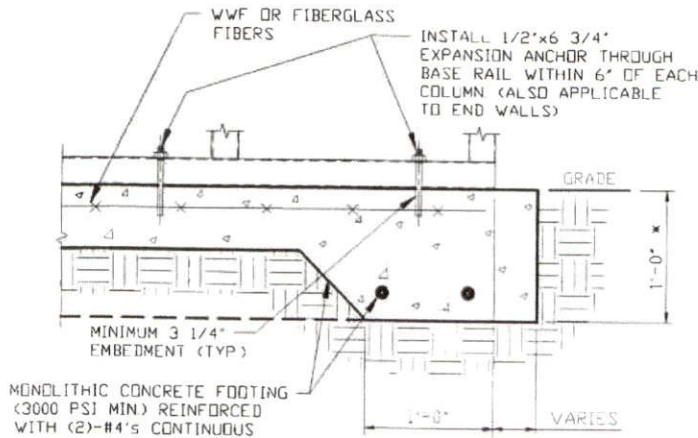
**DWG. NO: SK-3**

**JOB NO: 18033S/18113S/18246S**

**REV. 6**

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## BASE RAIL ANCHORAGE OPTIONS FOR LOW WIND SPEEDS



### 3A CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS  
NOTE: MIN 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:

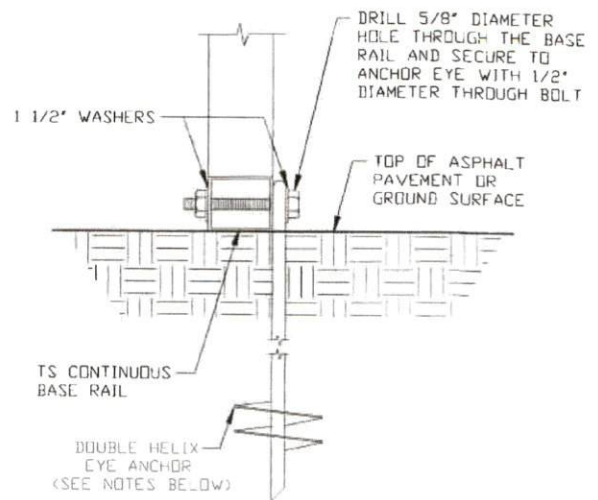
THE TURNDOWN REINFORCING STEEL SHALL BE ASTM A615 GRADE 60 THE SLAB REINFORCEMENT SHALL BE WELDED WIRE FABRIC MEETING ASTM A185 OR FIBERGLASS FIBER REINFORCEMENT.

#### 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

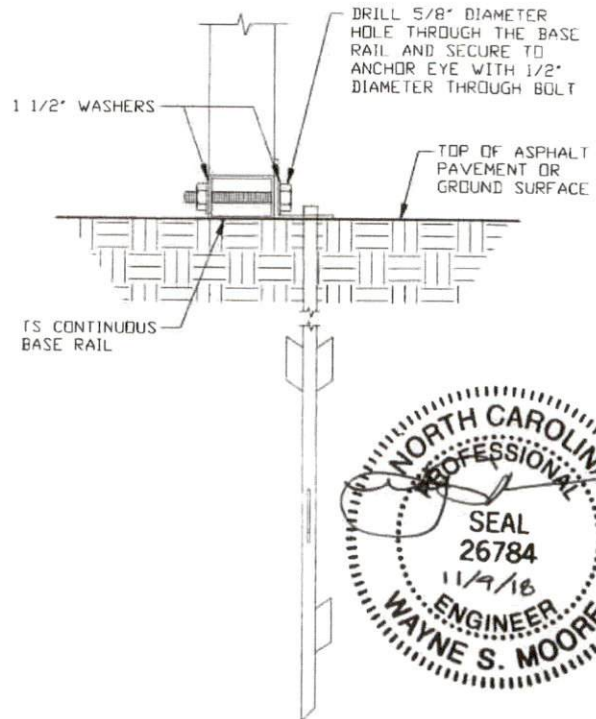
#### HELIX ANCHOR NOTES:

- 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



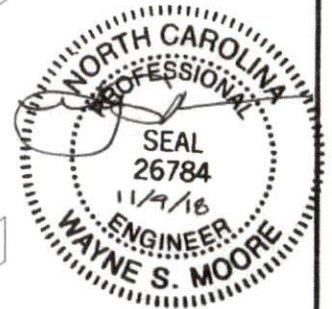
### 3B GROUND BASE HELIX ANCHORAGE

SCALE: NTS (CAN BE USED FOR ASPHALT)



### 3C ASPHALT BASE ANCHORAGE

SCALE: NTS



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CHECKED BY: PDH

PROJECT MGR: VSM

CLIENT: NEWMART BUILDERS

NEWMART BUILDERS, INC.  
1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

DATE: 11-5-18

SHT. 8

SCALE: NTS

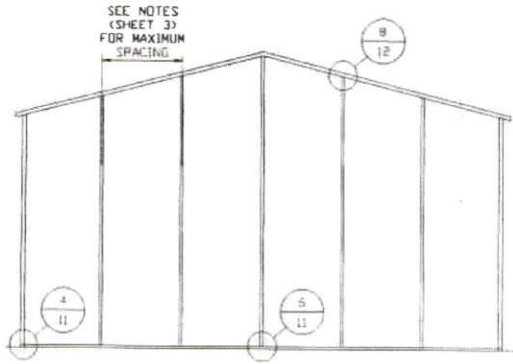
DWG. NO: SK-3

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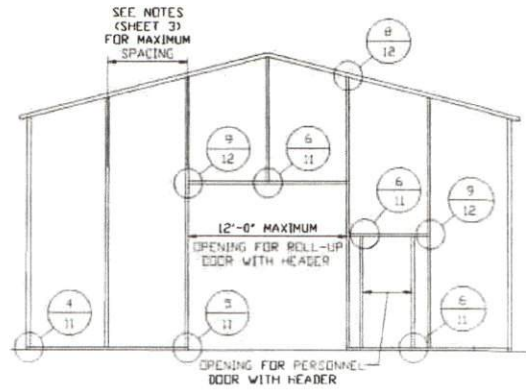
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# BOX EAVE RAFTER END WALL AND SIDE WALL OPENINGS



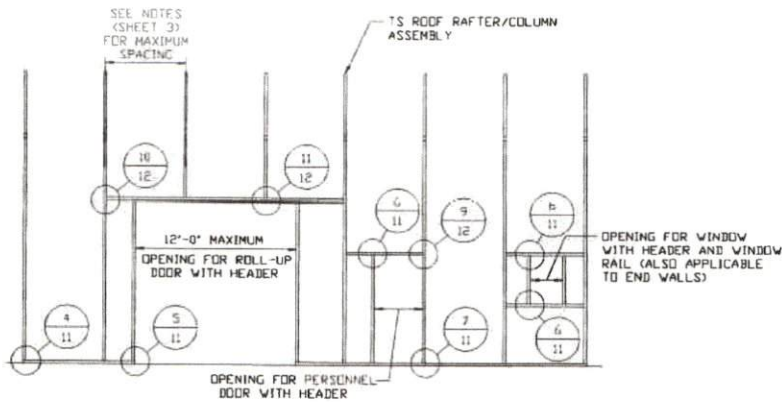
**TYPICAL BOX EAVE RAFTER  
END WALL FRAMING SECTION**

SCALE: NTS



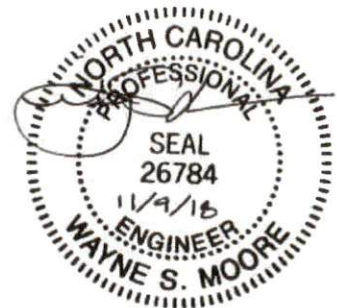
**TYPICAL BOX EAVE RAFTER END  
WALL OPENING FRAMING SECTION**

SCALE: NTS



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

SCALE: NTS



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30'-0" x 14'-0" ENCLOSED STRUCTURE**

**DATE: 11-5-18**

**SHT. 9**

**SCALE: NTS**

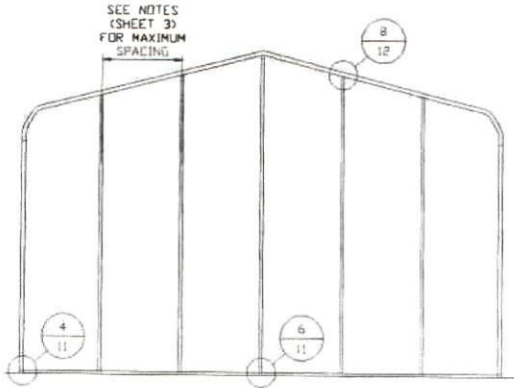
**DWG. NO: SK-3**

**JOB NO:  
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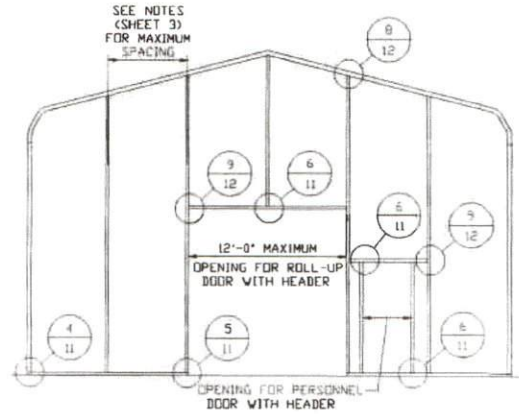
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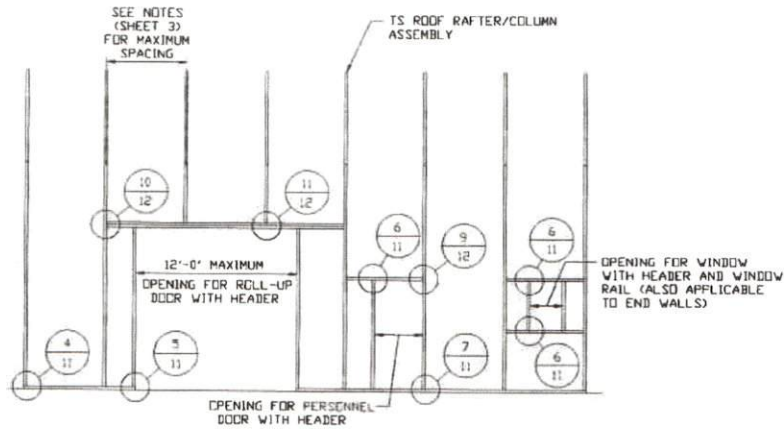
# BOW EAVE RAFTER END WALL AND SIDE WALL OPENINGS



**TYPICAL BOW EAVE RAFTER  
END WALL FRAMING SECTION**  
SCALE: NTS



**TYPICAL BOW EAVE RAFTER END  
WALL OPENING FRAMING SECTION**  
SCALE: NTS



**TYPICAL BOW EAVE RAFTER SIDE  
WALL OPENINGS FRAMING SECTION**  
SCALE: NTS



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**PROJECT MGR: VSM**

**CLIENT: NEWMART  
BUILDERS**

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1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

**DATE: 11-5-18**

**SCALE: NTS**

**DWG. NO: SK-3**

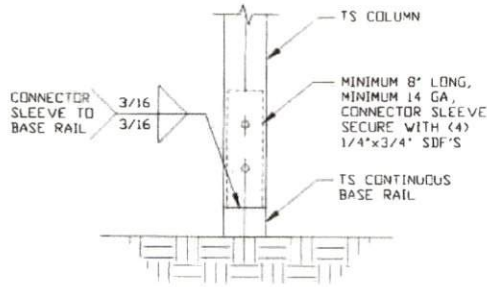
**JOB NO:  
18033S/18113S/18246S**

**SHT. 10**

**REV: 6**

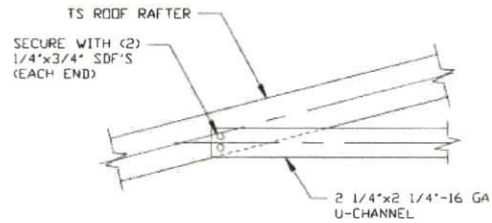
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# BOX AND BOW EAVE RAFTER WALL OPENING DETAILS



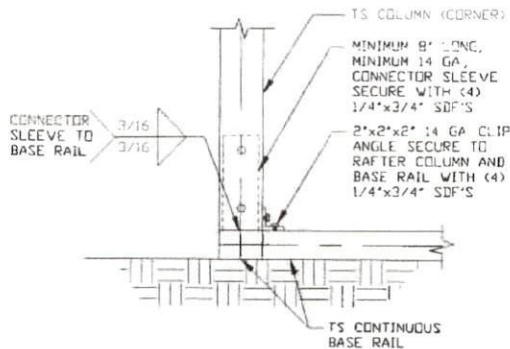
**2** RAFTER COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



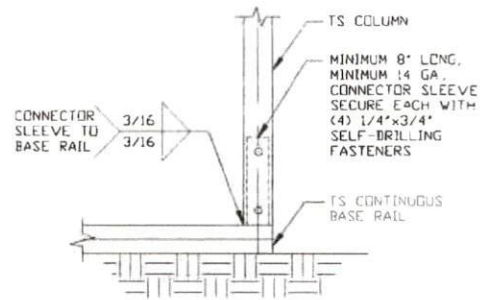
**3** 3'-4' ROOF RAFTER TIE CONNECTION DETAIL

SCALE: NTS



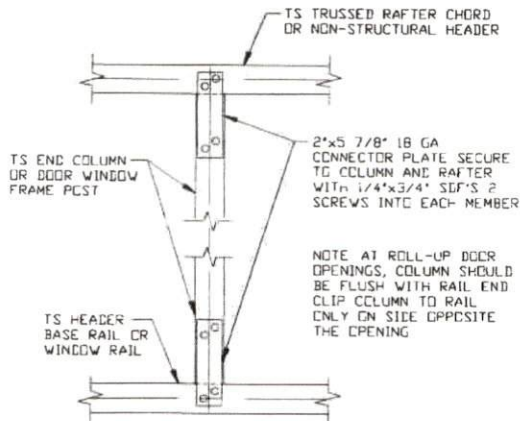
**4** END COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



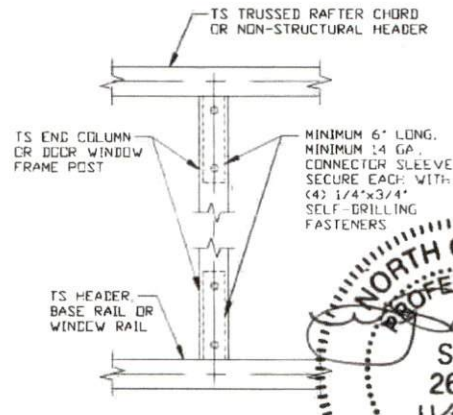
**5** COLUMN/BASE RAIL CONNECTION DETAIL

SCALE: NTS



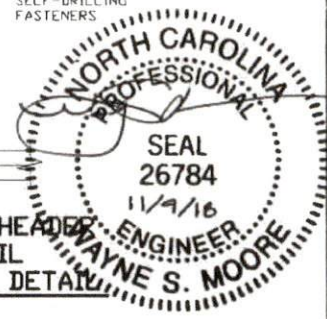
**6** COLUMN TO WINDOW RAIL CONNECTION DETAIL

SCALE: NTS



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

SCALE: NTS



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**CHECKED BY:** PDH

**PROJECT MGR:** WSM

**CLIENT:** NEWMART BUILDERS

**NEWMART BUILDERS, INC.**  
1000 CYCLE LANE  
SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

**DATE:** 11-5-18

**SHT.** 11

**SCALE:** NTS

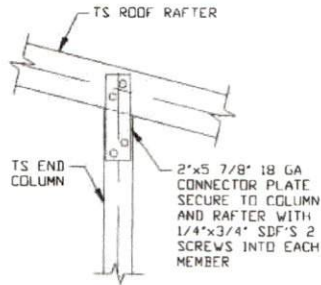
**DWG. NO:** SK-3

**JOB NO:** 18033S/18113S/18246S

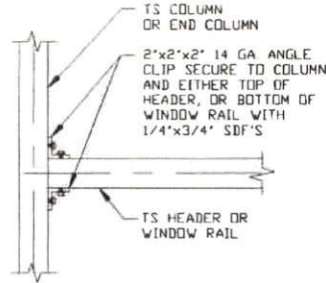
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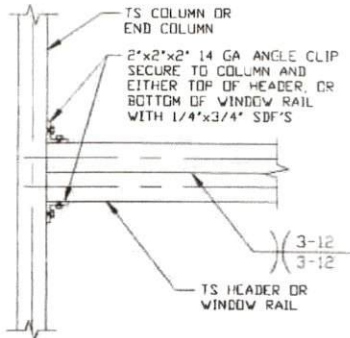
## BOX AND BOW EAVE RAFTER WALL OPENING DETAILS



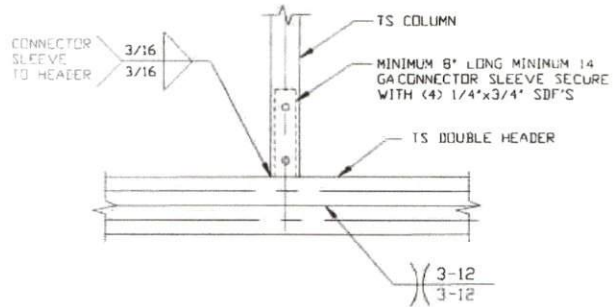
**8** RAFTER TO CHORD CONNECTION DETAIL  
SCALE: NTS



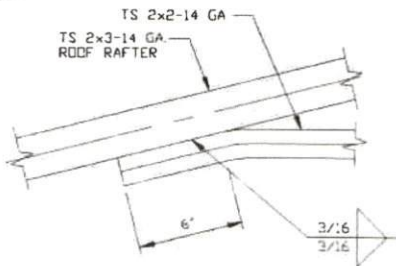
**9** COLUMN OR WINDOW RAIL TO POST CONNECTION DETAIL  
SCALE: NTS



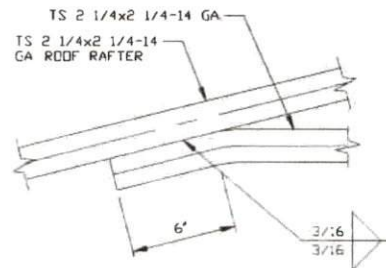
**10** DOUBLE HEADER TO COLUMN CONNECTION DETAIL  
SCALE: NTS



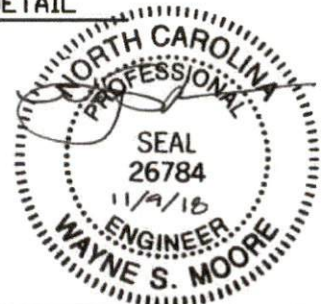
**11** COLUMN/DOUBLE HEADER CONNECTION DETAIL  
SCALE: NTS



**12A** 6'-0" ROOF RAFTER TIE CONNECTION DETAIL  
SCALE: NTS



**12B** 6'-0" ROOF RAFTER TIE CONNECTION DETAIL  
SCALE: NTS



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DRAWN BY: LT

CHECKED BY: PDH

PROJECT MGR: WSM

CLIENT: NEWMART BUILDERS

NEWMART BUILDERS, INC.

1000 CYCLE LANE  
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30'-0" x 14'-0" ENCLOSED STRUCTURE

DATE: 11-5-18

SHT. 12

SCALE: NTS

DWG. NO: SK-3

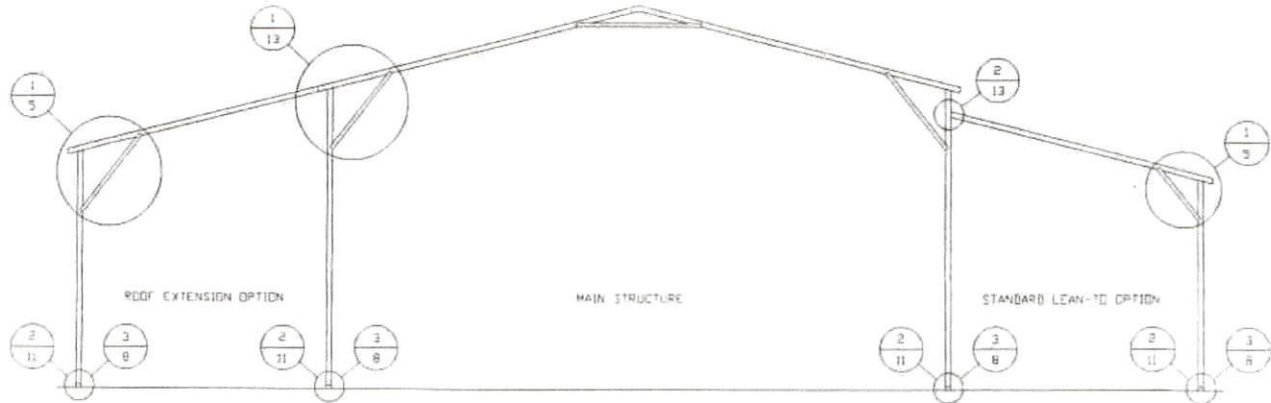
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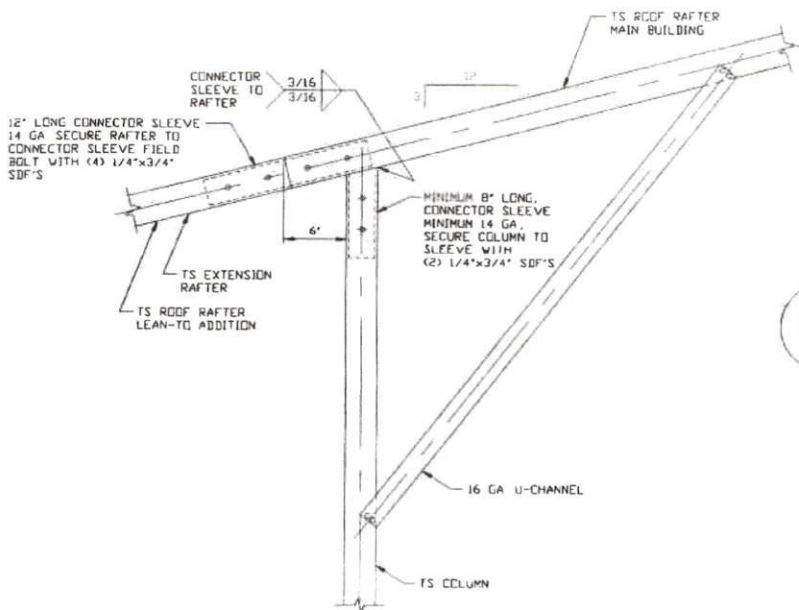


# BOX EAVE RAFTER LEAN-TO OPTIONS

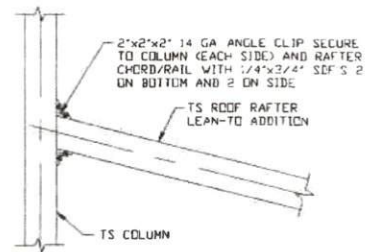


**TYPICAL BOX EAVE RAFTER LEAN-TO OPTIONS FRAMING SECTION (BOTH OPTIONS SHOWN)**

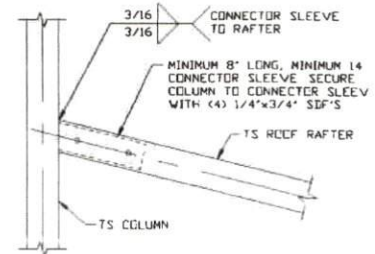
SCALE: NTS  
 MAXIMUM WIDTH OF STANDARD LEAN-TO IS 12'-0"



**1 SIDE EXTENSION RAFTER/COLUMN DETAIL**  
 SCALE: NTS



**2A LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL**  
 SCALE: NTS



**2B LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL**  
 SCALE: NTS



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**NEWMART BUILDERS, INC.**  
 1000 CYCLE LANE  
 SOUTH HILL, VA 23970  
 30'-0" x 14'-0" ENCLOSED STRUCTURE

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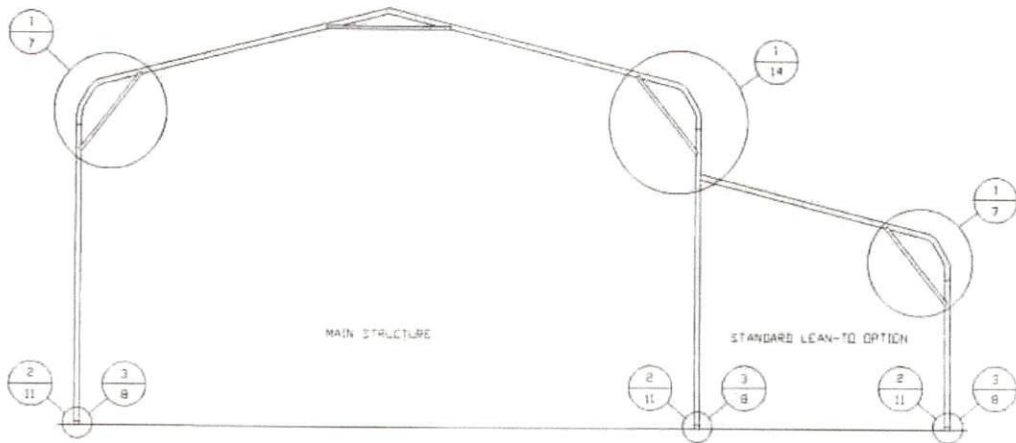
**PROJECT MGR: WSM**  
**CLIENT: NEWMART BUILDERS**

**DATE: 11-5-18**  
**SHT. 13**

**SCALE: NTS**  
**DWG. NO: SK-3**

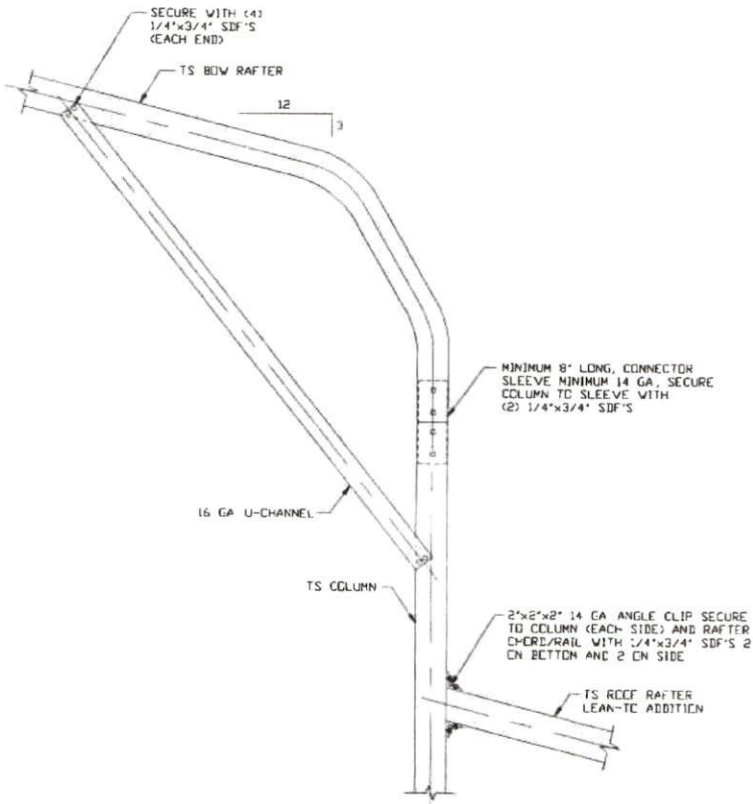
**JOB NO: 18033S/18113S/18246S**  
**REV: 6**

# BOW RAFTER LEAN-TO OPTIONS



## TYPICAL BOW RAFTER LEAN-TO OPTION FRAMING SECTION

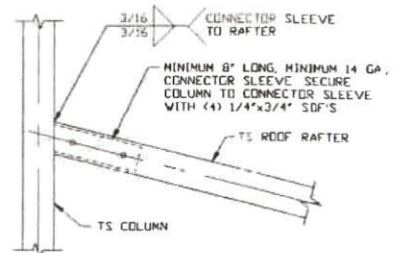
SCALE: NTS  
 MAXIMUM WIDTH OF STANDARD LEAN-TO IS 12'-0"



### LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL

SCALE: NTS

1A



### LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL

SCALE: NTS

1B



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30'-0" x 14'-0" ENCLOSED STRUCTURE

DATE: 11-5-18

SHT. 14

SCALE: NTS

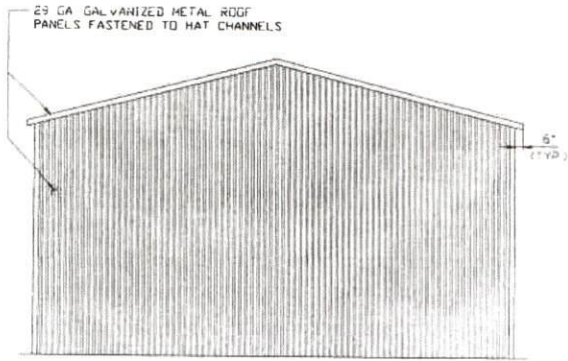
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JOB NO: 18033S/18113S/18246S

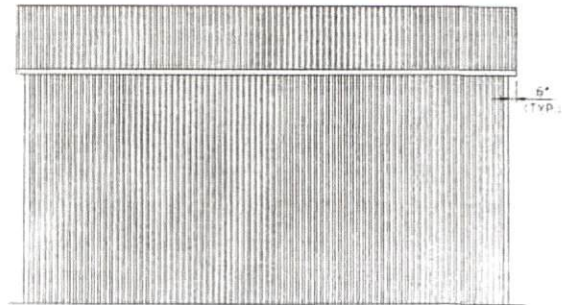
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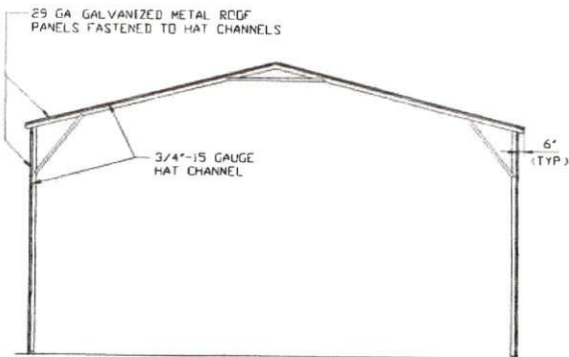
## BOX EAVE RAFTER VERTICAL ROOF/SIDING OPTION



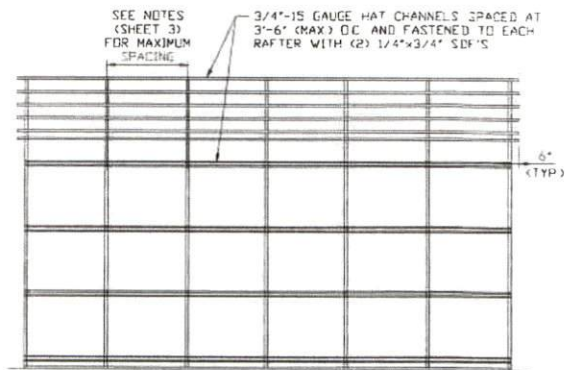
**TYPICAL END ELEVATION  
VERTICAL ROOF/SIDING**  
SCALE: NTS



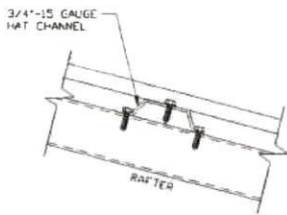
**TYPICAL SIDE ELEVATION  
VERTICAL ROOF/SIDING OPTION**  
SCALE: NTS



**TYPICAL SECTION  
VERTICAL ROOF/SIDING OPTION**  
SCALE: NTS



**TYPICAL FRAMING SECTION  
VERTICAL ROOF/SIDING OPTION**  
SCALE: NTS



**PANEL ATTACHMENT**  
(ALTERNATE FOR VERTICAL ROOF PANELS)  
SCALE: NTS



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**PROJECT MGR: WSM**

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SOUTH HILL, VA 23970  
30'-0" x 14'-0" ENCLOSED STRUCTURE

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**SHT. 15**

**SCALE: NTS**

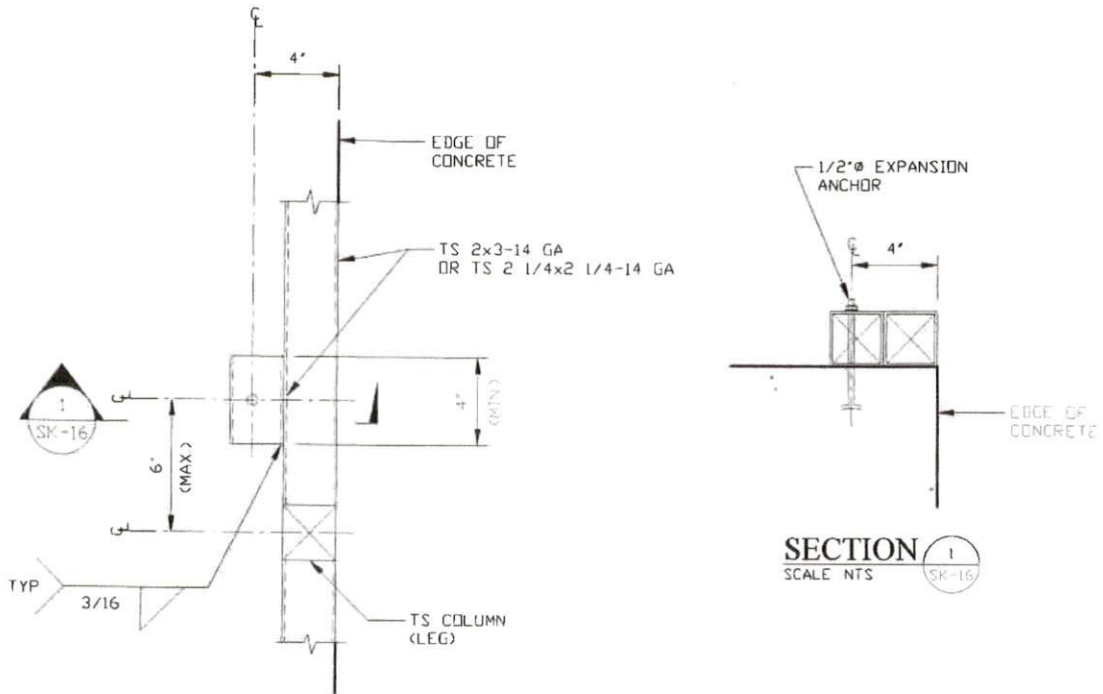
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## ADDITIONAL BASE RAIL ANCHORAGE OPTION



**TYPICAL ANCHOR DETAIL WHEN BASE RAIL IS NEAR EDGE OF CONCRETE**

SCALE: NTS

**SECTION 1**  
SCALE NTS



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**PROJECT MGR: WSM**

**CLIENT: NEWMART BUILDERS**

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1000 CYCLE LANE  
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30'-0" x 14'-0" ENCLOSED STRUCTURE

**DATE: 11-5-18**

**SHT. 16**

**SCALE: NTS**

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