



STRUCTURAL DESIGN

FULLY OPEN (CARPORT) BUILDING

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

3 April 2019

Revision 5

M&A Project No. 17232S/18070S/18094S/19050S

Prepared for:

Steel Building Garages

1804 River Street

Wilkesboro, NC 28697

Prepared by:

Moore and Associates Engineering and Consulting, Inc.

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**MOORE AND ASSOCIATES
ENGINEERING AND CONSULTING**

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ENGINEERING AND CONSULTING, INC.**

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

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CLIENT: ES	SHT: 1	DWG. NO: SK-1	REV: 5

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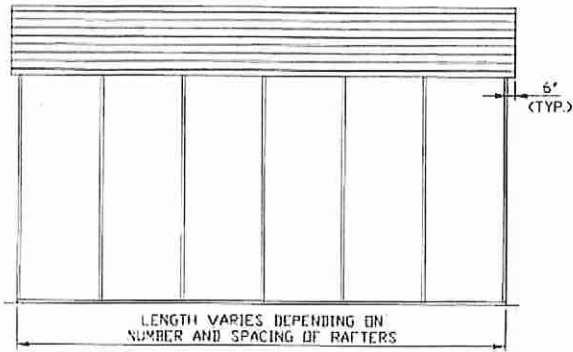
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MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.	DRAWN BY: AT	STEEL BUILDING GARAGES 1804 RIVER STREET WILKESBORO, NC 28697 30'x16' FULLY OPEN BUILDING		
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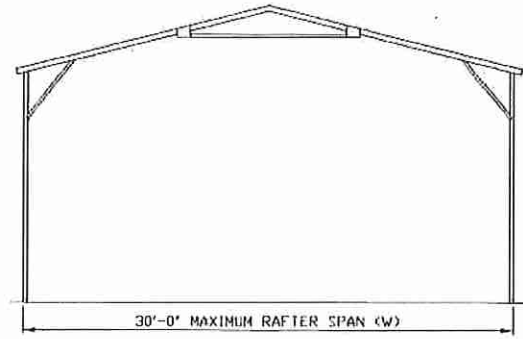
INSTALLATION NOTES AND SPECIFICATIONS

1. DESIGN IS FOR MAXIMUM 30'-0" WIDE x 16'-0" EAVE HEIGHT OPEN CARPORT 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 = 1.5 PSF
 - B) LIVE LOAD = 12 PSF
 - C) GROUND SNOW LOAD = 35 PSF (MAXIMUM 45 PSF AT 4'-0" O.C. RAFTER/POST SPACING)
= 30 PSF WITH U-CHANNEL PEAK BRACE (W ≤ 24'-0").
(UNBALANCED SNOW LOADS DUE TO DRIFTING HAVE NOT BEEN EVALUATED.)
4. 3-SECOND GUST ULTIMATE WIND SPEED (V_{ULT}) 105 TO 150 MPH (NOMINAL WIND SPEED 81 TO 116 MPH).
5. MAXIMUM RAFTER/POST AND END POST SPACING = 5.0 FEET (UNLESS NOTED OTHERWISE).
6. END WALL COLUMNS/POSTS ARE EQUIVALENT TO SIDE WALL COLUMNS/POSTS IN SIZE AND SPACING UNLESS NOTED OTHERWISE.
7. RISK CATEGORY I.
- B. WIND EXPOSURE CATEGORY B.
9. SPECIFICATIONS APPLICABLE TO 29 GAUGE METAL PANELS FASTENED DIRECTLY TO 2' x 3' - 14 GAUGE TUBE STEEL (TS) FRAMING MEMBERS (UNLESS NOTED OTHERWISE).
10. AVERAGE FASTENER SPACING ON-CENTERS ALONG RAFTERS OR HAT CHANNELS, AND COLUMNS (INTERIOR OR END) = 10' O.C. (MAX.)
11. FASTENERS CONSIST OF #12-14x3/4" SELF-DRILLING FASTENER (SDF), USE CONTROL SEAL WASHER WITH EXTERIOR FASTENERS. SPECIFICATIONS APPLICABLE ONLY FOR MEAN ROOF HEIGHT OF 20 FEET OR LESS, AND ROOF SLOPES OF 14' (3:12 PITCH) OR LESS SPACING REQUIREMENTS FOR OTHER ROOF HEIGHTS AND/OR SLOPES MAY VARY.
12. ANCHORS SHALL BE INSTALLED THROUGH BASE RAIL WITHIN 6" OF EACH RAFTER COLUMN ALONG SIDES.
13. STANDARD GROUND ANCHORS (SOIL NAILS) CONSIST OF #4 REBAR W/ WELDED NUT x 30" LONG IN SUITABLE SOIL CONDITIONS MAY BE USED FOR WIND SPEEDS ≤ 145 MPH. OPTIONAL ANCHORAGE MAY BE USED IN SUITABLE SOILS AND MUST BE USED IN UNSUITABLE SOILS AND WIND SPEEDS > 145 MPH.
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}= 2.039 V= C_sW
S_{D1}= 1.258
15. APPLY LAP SEALANT TO METAL ROOF PANELS FOR 1:12 ROOF SLOPES.

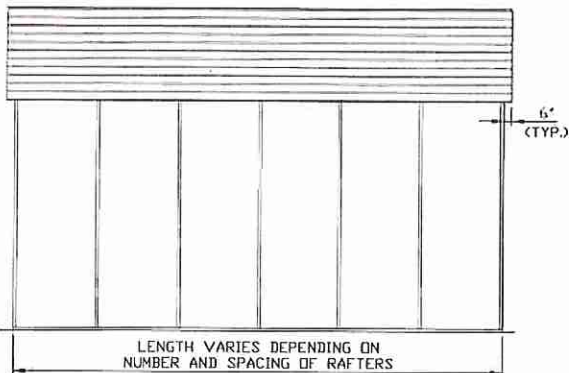
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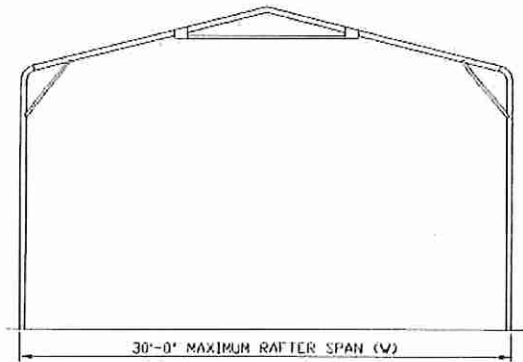
TYPICAL SIDE ELEVATION
SCALE: NTS



TYPICAL END ELEVATION
SCALE: NTS



TYPICAL SIDE ELEVATION
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TYPICAL END ELEVATION
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SHT. 3A

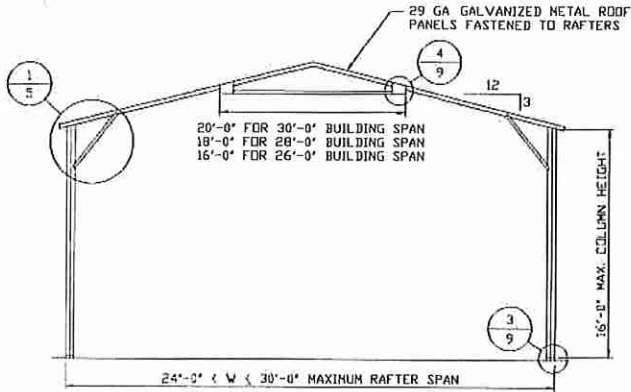
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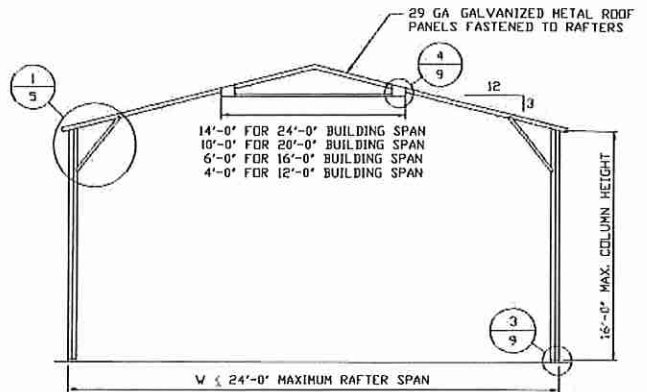
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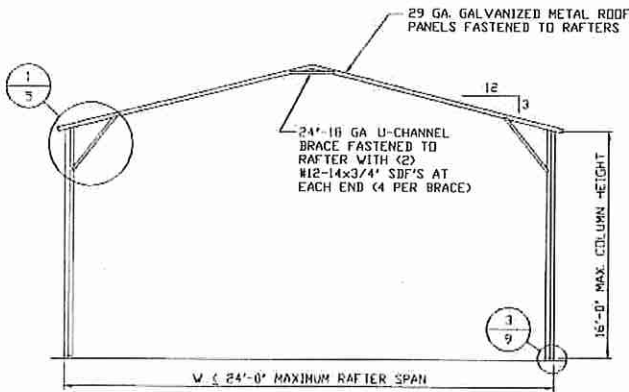
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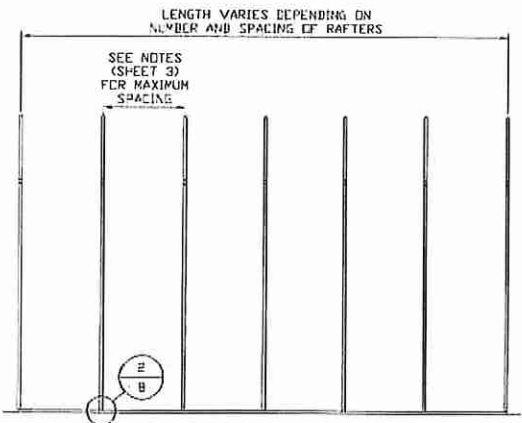
TYPICAL RAFTER/COLUMN END FRAME SECTION
SCALE: NTS



TYPICAL RAFTER/COLUMN END FRAME SECTION
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TYPICAL RAFTER/COLUMN END FRAME SECTION
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TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION
SCALE: NTS

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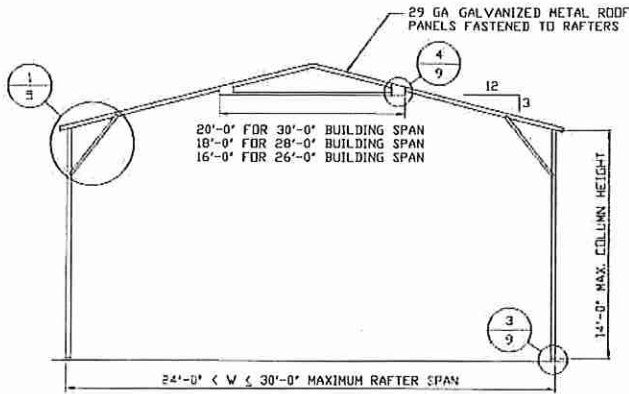
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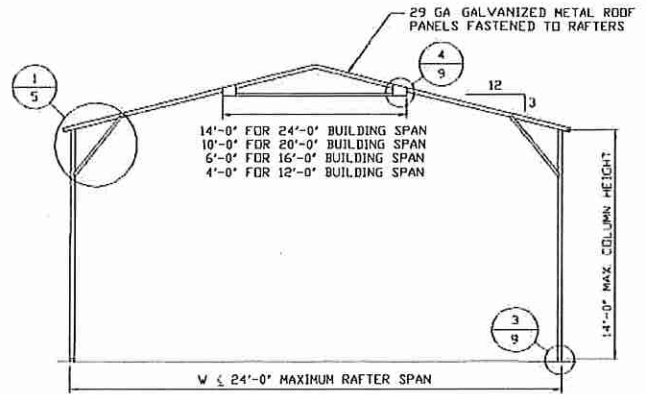
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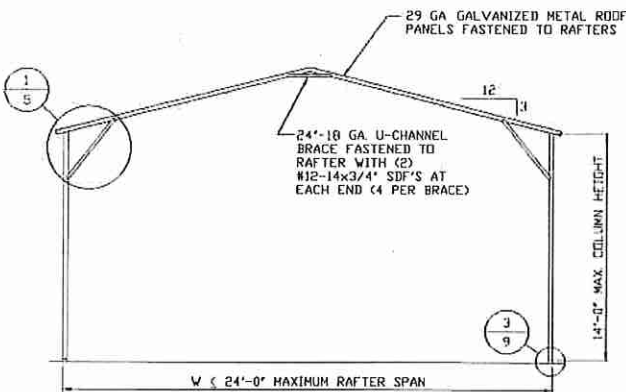
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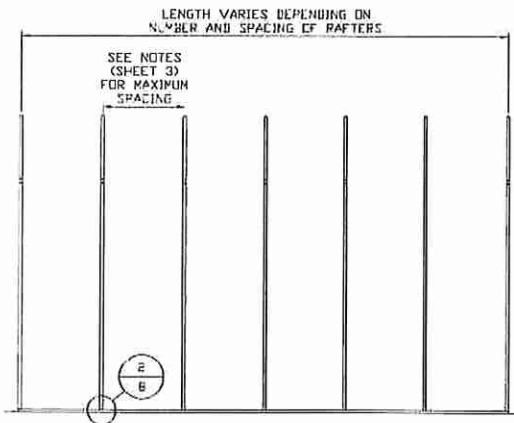
TYPICAL RAFTER/COLUMN END FRAME SECTION
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TYPICAL RAFTER/COLUMN END FRAME SECTION
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TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION
SCALE: NTS

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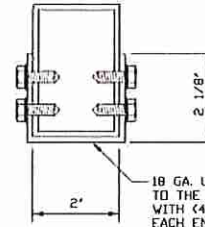
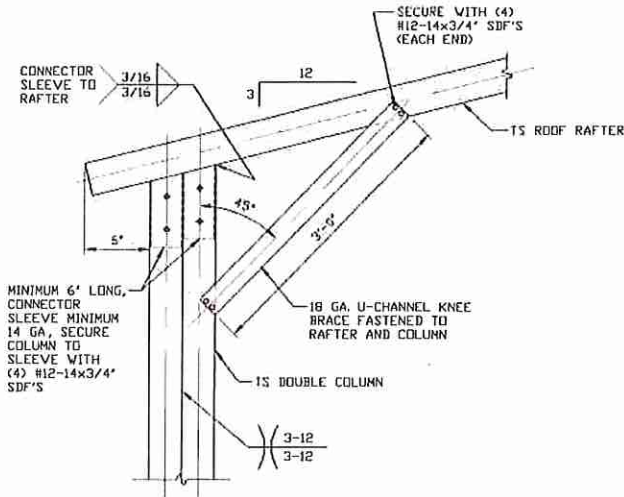
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COLUMN CONNECTION DETAILS

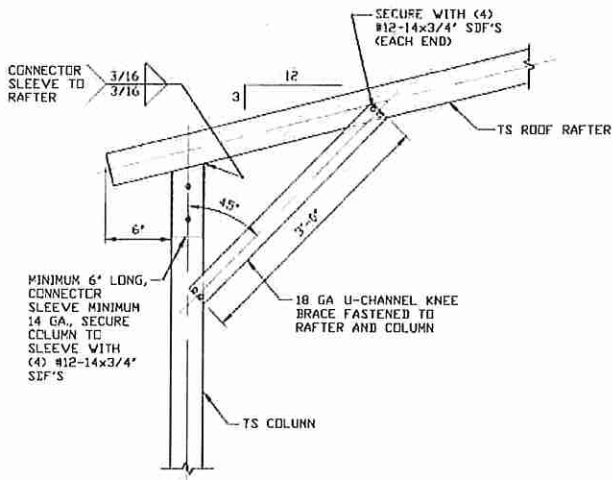


BRACE SECTION
SCALE: NTS

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

1A

SCALE: NTS
NOTE: 2'-0" KNEE BRACE MAY BE USED FOR BUILDING WIDTHS ≤ 26'-0"



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

1B

SCALE: NTS
NOTE: 2'-0" KNEE BRACE MAY BE USED FOR BUILDING WIDTHS ≤ 26'-0"

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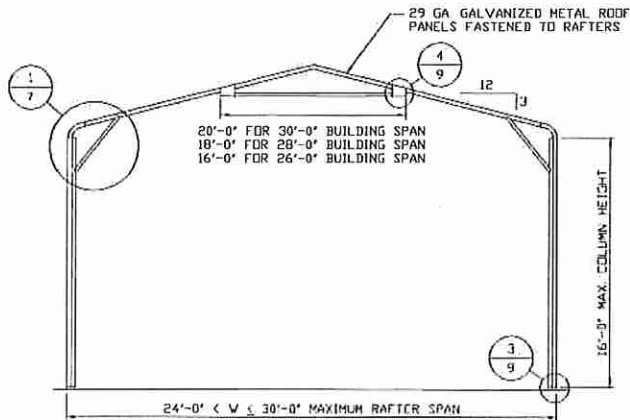
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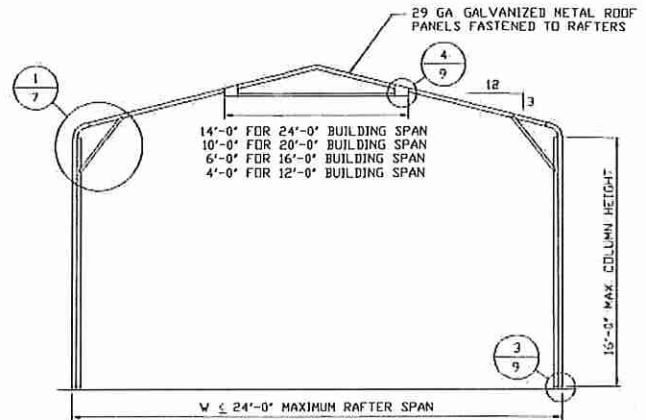
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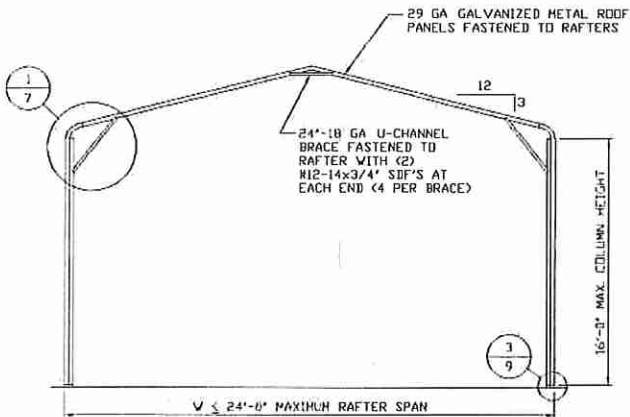
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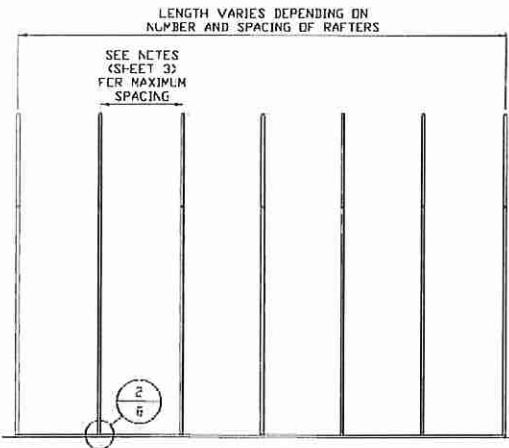
TYPICAL RAFTER/COLUMN END FRAME SECTION
SCALE: NTS



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TYPICAL RAFTER/COLUMN END FRAME SECTION
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TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION
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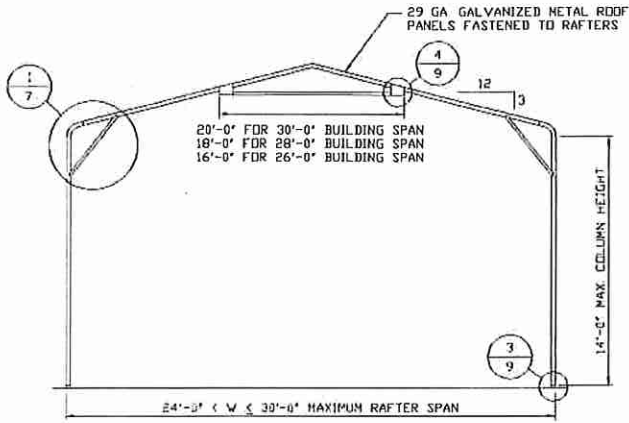
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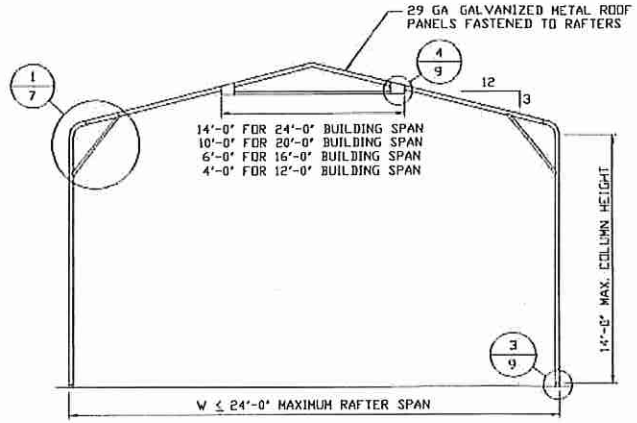
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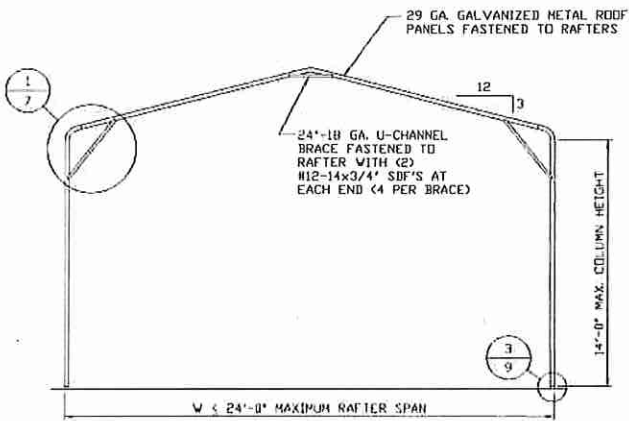
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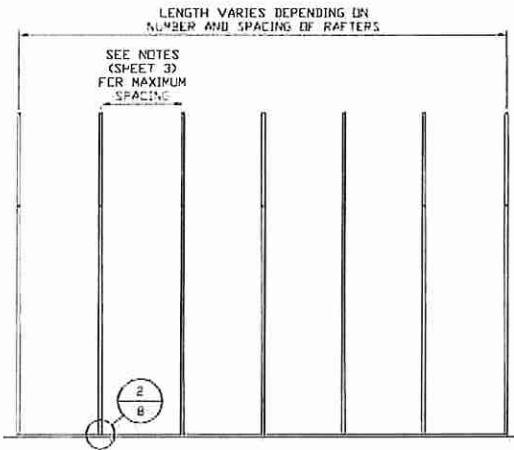
TYPICAL RAFTER/COLUMN END FRAME SECTION
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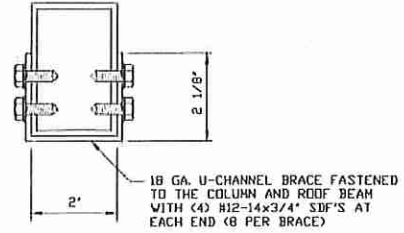
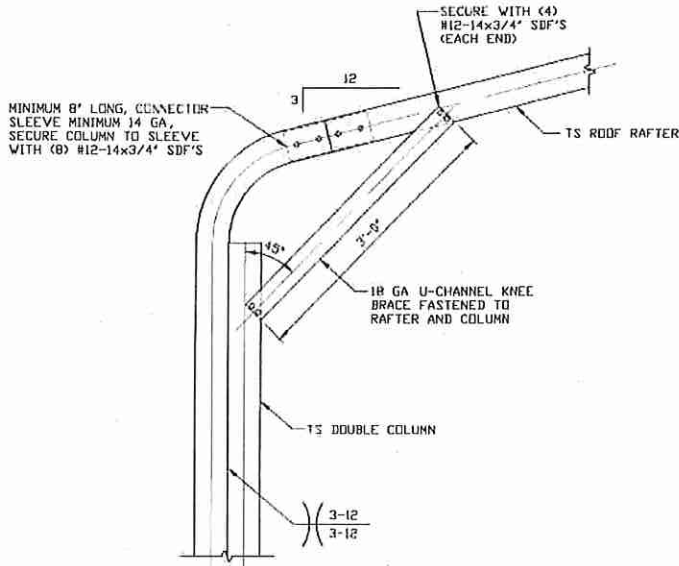


TYPICAL RAFTER/COLUMN SIDE FRAMING SECTION
SCALE: NTS

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COLUMN CONNECTION DETAILS



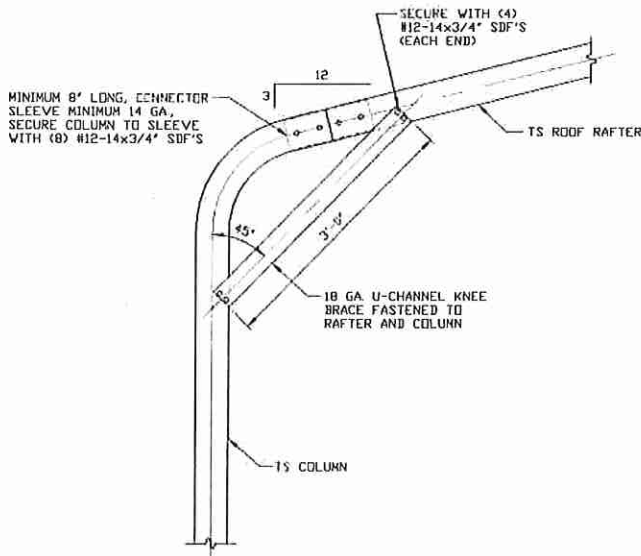
BRACE SECTION
SCALE: NTS

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

1A

SCALE: NTS

NOTE: 2'-0" KNEE BRACE MAY BE USED FOR BUILDING WIDTHS <= 26'-0"



**BOW EAVE RAFTER COLUMN
CONNECTION DETAIL FOR
HEIGHTS <= 14'-0"**

1B

SCALE: NTS

NOTE: 2'-0" KNEE BRACE MAY BE USED FOR BUILDING WIDTHS <= 26'-0"

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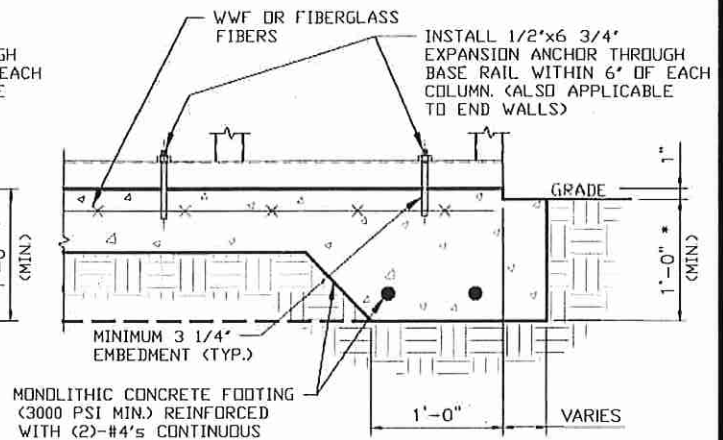
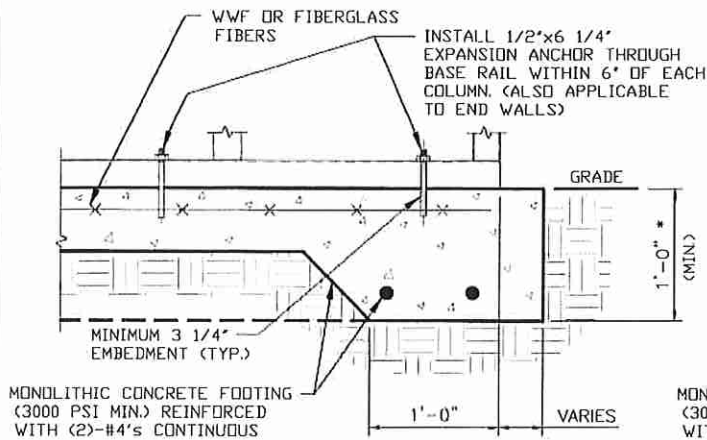
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BASE RAIL ANCHORAGE OPTIONS



2A

CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE

SCALE: NTS
NOTE: MIN. ANCHOR EDGE DISTANCE IS 4"
* COORDINATE WITH LOCAL CODES/ORDINANCES.

2B

CONCRETE MONOLITHIC SLAB BASE RAIL ANCHORAGE WITH NOTCH

SCALE: NTS
NOTE: MIN. ANCHOR EDGE DISTANCE IS 4"
* COORDINATE WITH LOCAL CODES/ORDINANCES.

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

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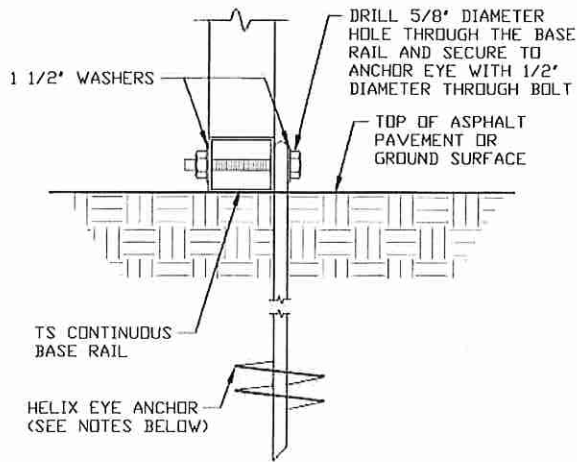
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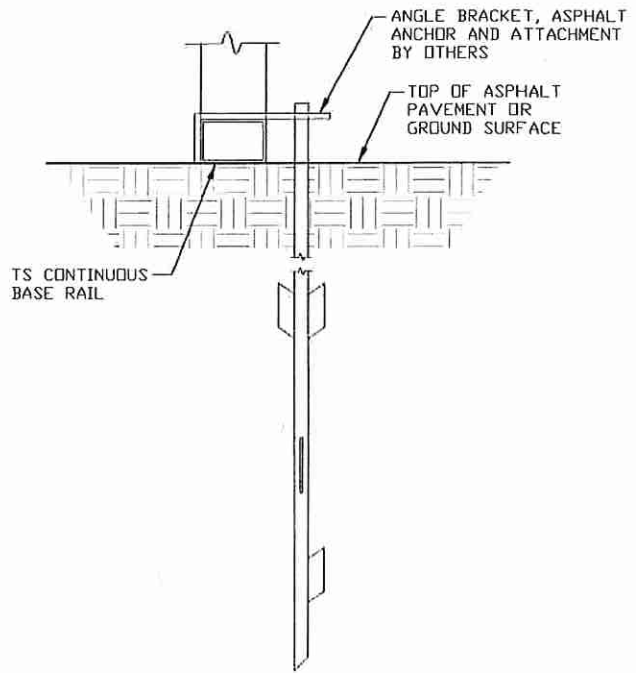
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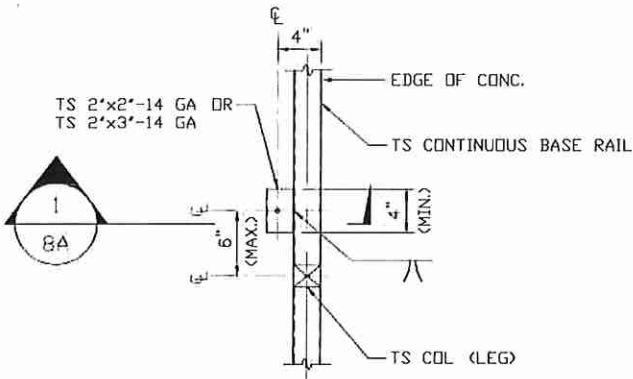
BASE RAIL ANCHORAGE OPTIONS



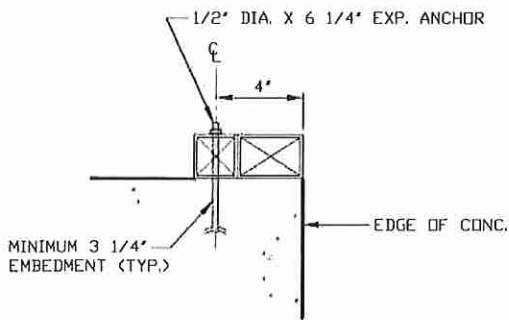
2C GROUND BASE HELIX ANCHORAGE
SCALE: NTS (CAN BE USED FOR ASPHALT)



2D ASPHALT BASE ANCHORAGE
SCALE: NTS



1 TYPICAL ANCHOR DETAIL WHEN BASE RAIL IS NEAR EDGE OF CONCRETE
SCALE: NTS



1 SECTION
SCALE: NTS

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CLIENT: ES

STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

JOB NO: 17232S/19070S/
18094S/19050S

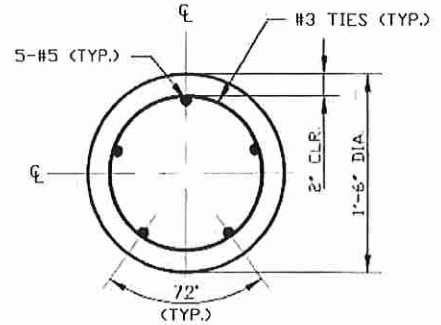
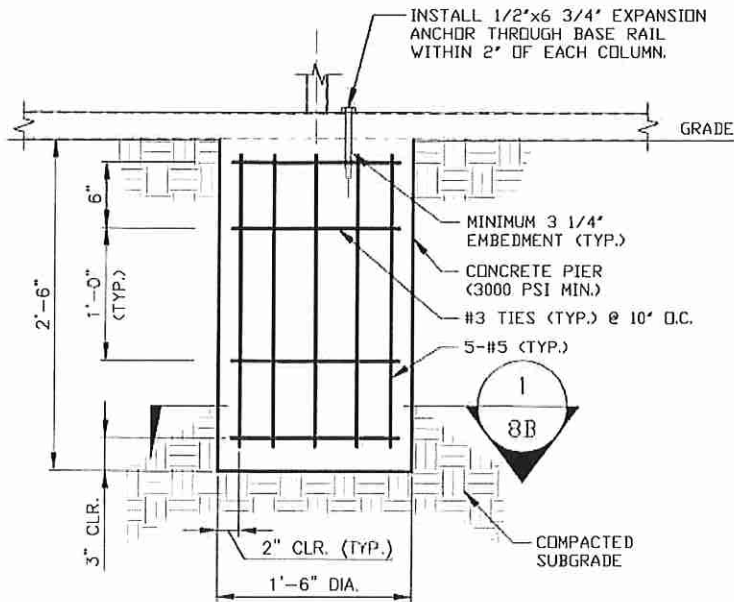
SHT. 8A

DWG. NO: SK-1

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BASE RAIL ANCHORAGE OPTIONS



1
SECTION
SCALE: NTS

2E

DRILLED CONCRETE PIER BASE RAIL ANCHORAGE

SCALE: NTS
(NOTE: MIN. ANCHOR EDGE DISTANCE IS 4")

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

**JOB NO: 17232S/18070S/
18094S/19050S**

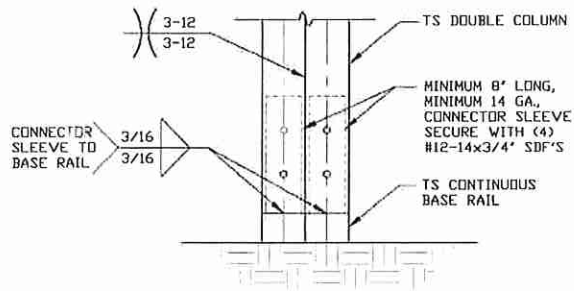
SHT. 8B

DWG. NO: SK-1

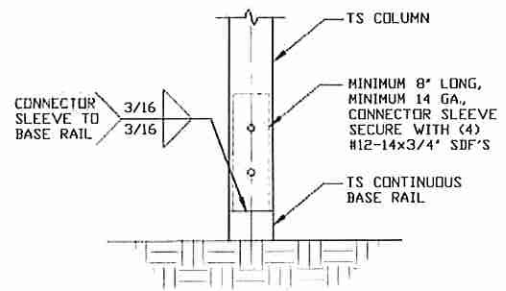
REV: 5

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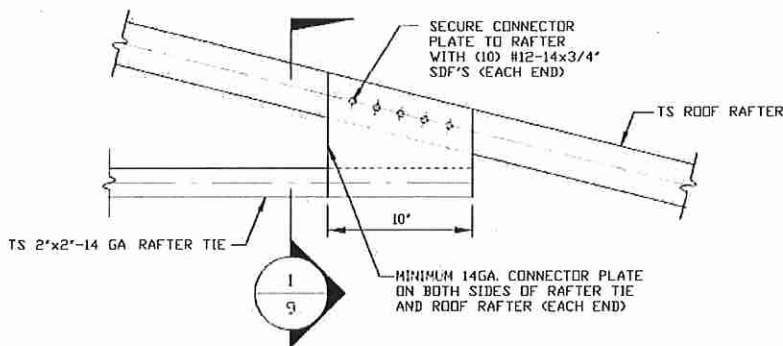
CONNECTION DETAILS



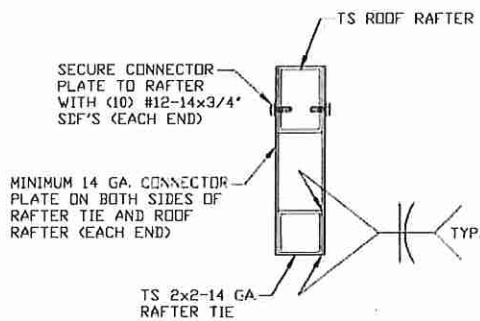
3A RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL
SCALE: NTS



3B RAFTER COLUMN/BASE RAIL
CONNECTION DETAIL
SCALE: NTS



4 ROOF RAFTER TIE
CONNECTION DETAIL
SCALE: NTS



1 SECTION
SCALE: NTS

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

SHT. 9

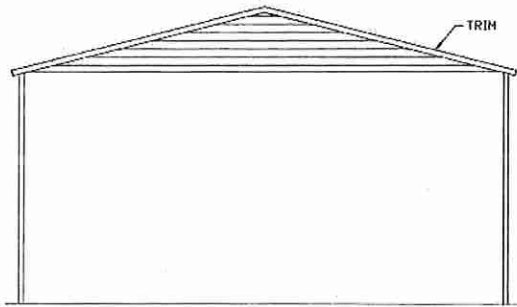
DWG. NO: SK-1

JOB NO: 17E32S/18070S/
18094S/19050S

REV: 5

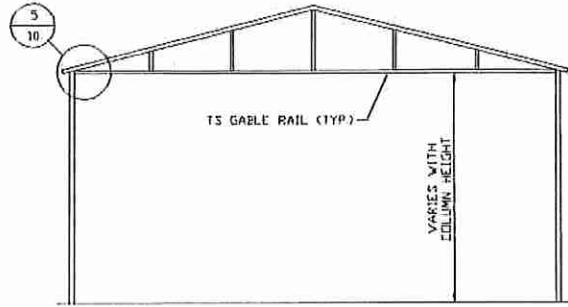
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BOX EAVE RAFTER GABLE END OPTION



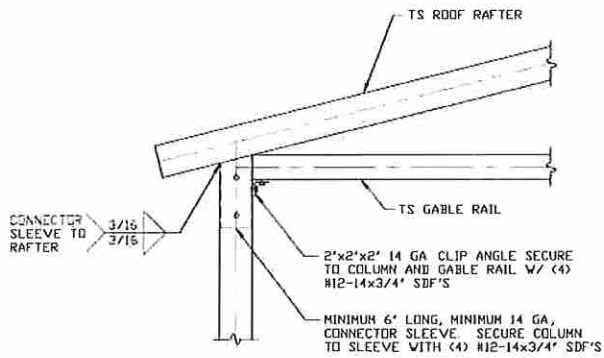
**TYPICAL BOX EAVE RAFTER
GABLE END ELEVATION**

SCALE: NTS



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

SCALE: NTS



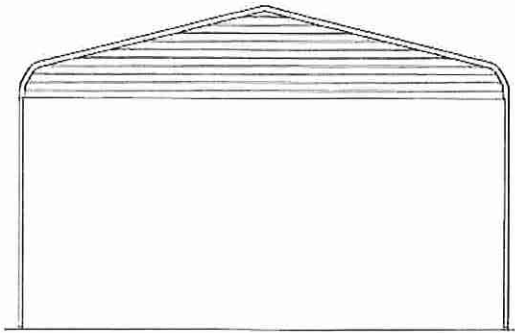
**BOX EAVE RAFTER GABLE RAIL TO
RAFTER COLUMN CONNECTION DETAIL**

SCALE: NTS

5

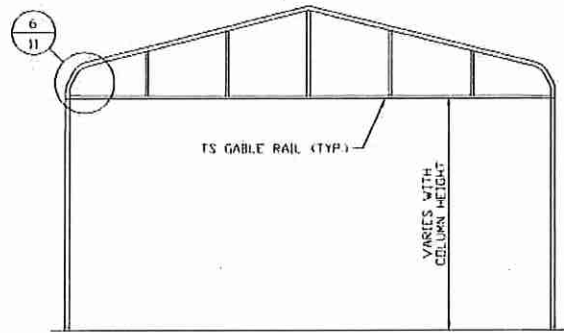
MOORE AND ASSOCIATES ENGINEERING AND CONSULTING, INC.	DRAWN BY: AT	STEEL BUILDING GARAGES 1804 RIVER STREET WILKESBORO, NC 28697 30'x16' FULLY OPEN BUILDING		
	CHECKED BY: PDH			
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	CLIENT: ES	SHT. 10	DWG. NO: SK-1	REV: 5

BOW EAVE RAFTER GABLE END OPTION



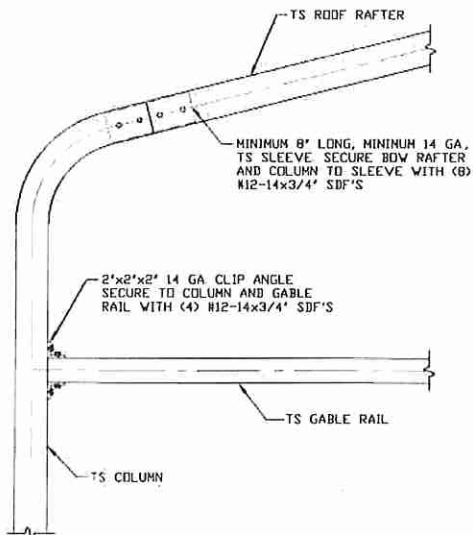
**TYPICAL BOW RAFTER
GABLE END ELEVATION**

SCALE: NTS



**TYPICAL BOW RAFTER GABLE
END FRAMING SECTION**

SCALE: NTS



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

SCALE: NTS

6

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PROJECT MGR: VSH

CLIENT: ES

**STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING**

DATE: 4-3-19

SCALE: NTS

SHT. 11

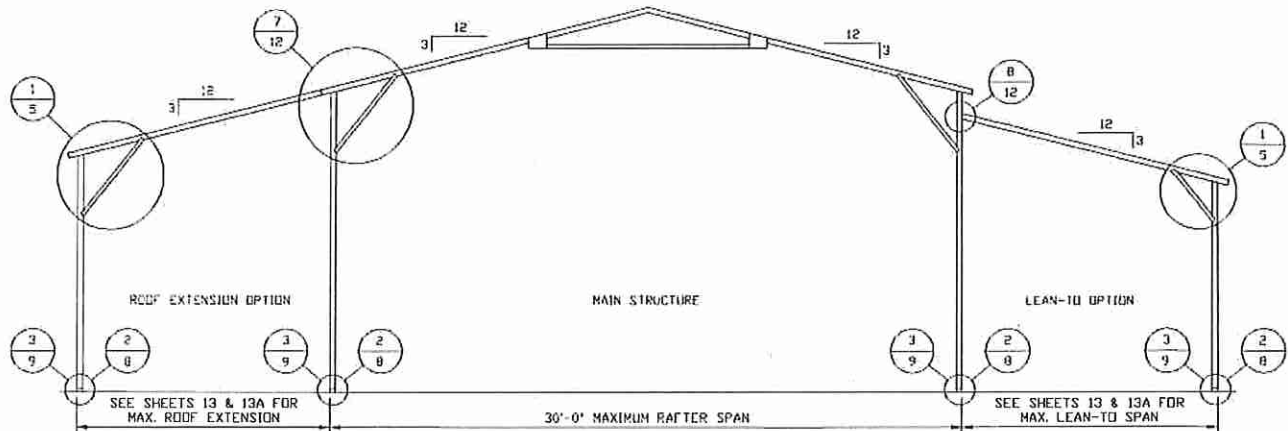
DWG. NO: SK-1

**JOB NO: 17232S/18070S/
18094S/19050S**

REV: 5

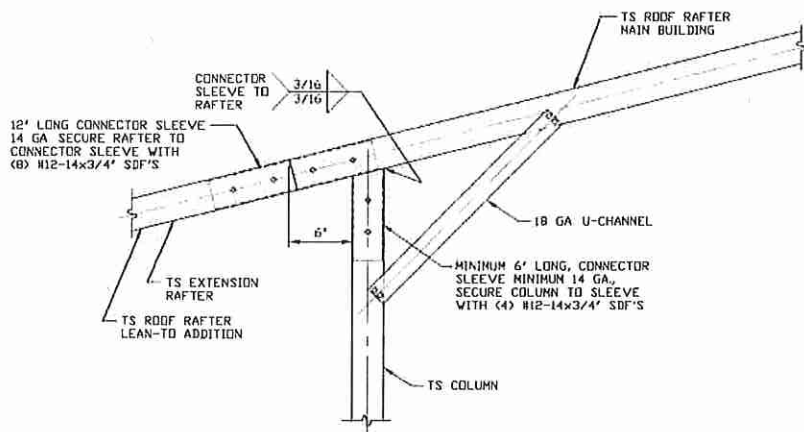
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BOX EAVE RAFTER LEAN-TO OPTIONS



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

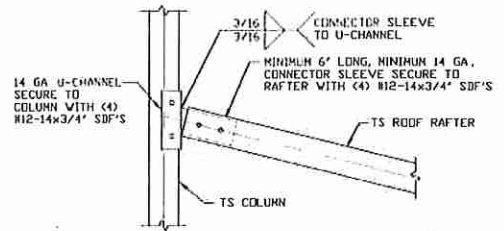
SCALE: NTS



7A

**SIDE EXTENSION RAFTER/COLUMN
DETAIL FOR RAFTER SPANS $\leq 12'-0''$**

SCALE: NTS



8A

**LEAN-TO RAFTER TO RAFTER
COLUMN CONNECTION DETAIL
FOR RAFTER SPANS $\leq 12'-0''$**

SCALE: NTS

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ENGINEERING AND CONSULTING, INC.**

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CLIENT: ES

**STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING**

DATE: 4-3-19

SCALE: NTS

**JOB NO: 17E32S/18070S/
18094S/19050S**

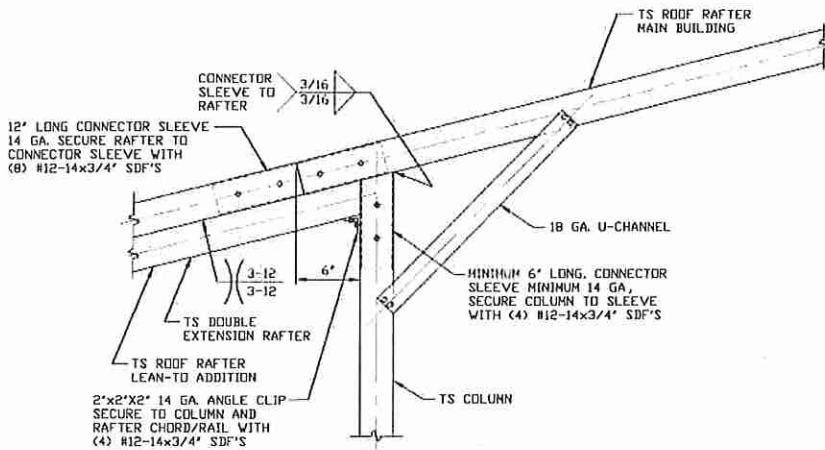
SHT. 12

DWG. NO: SK-1

REV: 5

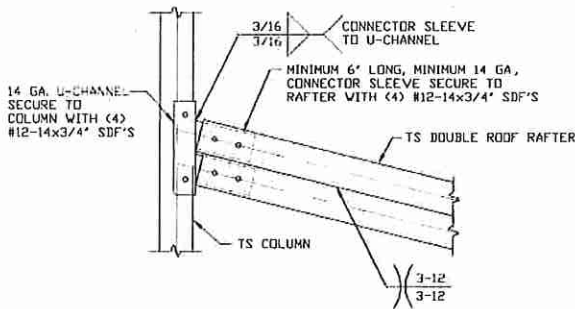
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BOX EAVE RAFTER LEAN-TO OPTIONS



7B

SIDE EXTENSION RAFTER/COLUMN DETAIL FOR RAFTER SPANS 12'-0" < TO ≤ 15'-0"
SCALE: NTS



8B

LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS 12'-0" < TO ≤ 15'-0"
SCALE: NTS

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

JOB NO: 17832S/18070S/
18094S/19030S

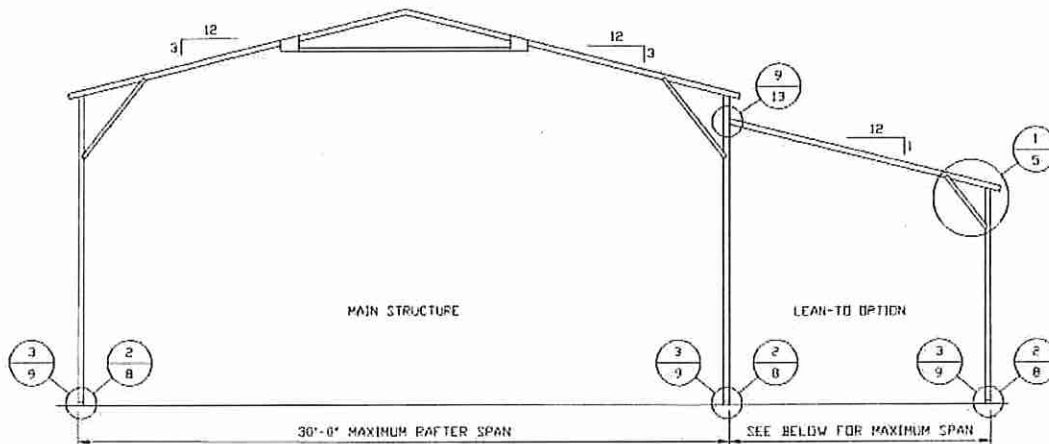
SHT. 12A

DWG. NO: SK-1

REV: 5

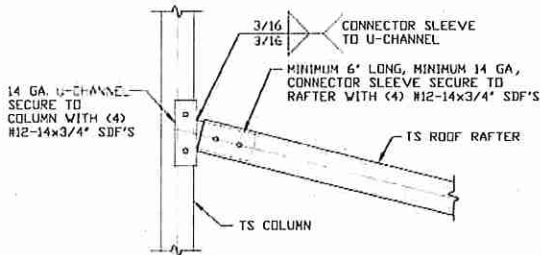
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BOX EAVE RAFTER LEAN-TO OPTIONS



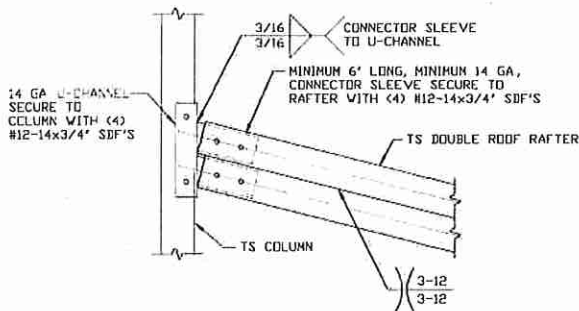
TYPICAL BOX EAVE RAFTER LEAN-TO OPTIONS FRAMING SECTION (BOTH OPTIONS SHOWN)

SCALE: NTS



9A
LEAN-TO RAFTER TO RAFTER
COLUMN CONNECTION DETAIL
FOR RAFTER SPANS $\leq 11'-0''$

SCALE: NTS



9B
LEAN-TO RAFTER TO RAFTER
COLUMN CONNECTION DETAIL
FOR RAFTER SPANS $11'-0'' < TO \leq 15'-0''$

SCALE: NTS

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**STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING**

DATE: 4-3-19

SCALE: NTS

SHT. 13

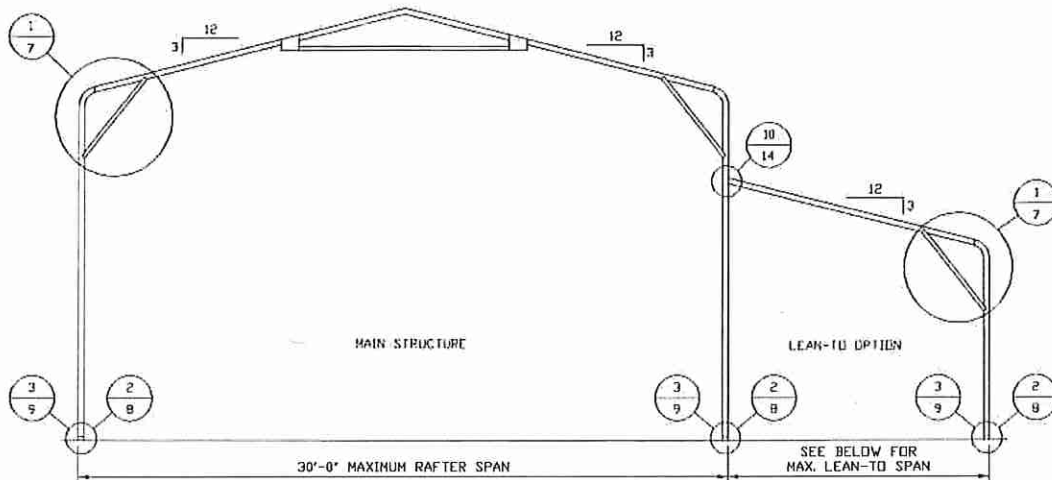
DWG. NO: SK-1

**JOB NO: 17232S/18070S/
18094S/19050S**

REV: 5

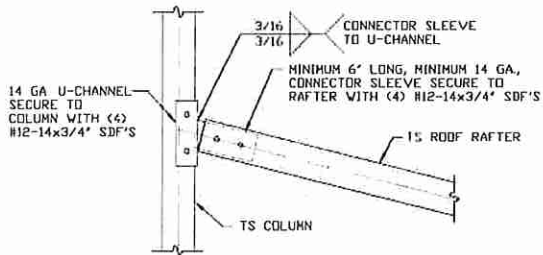
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BOW EAVE RAFTER LEAN-TO OPTIONS



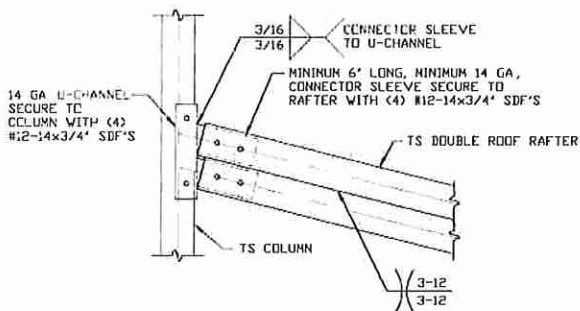
TYPICAL BOX EAVE RAFTER LEAN-TO OPTIONS FRAMING SECTION (BOTH OPTIONS SHOWN)

SCALE: NTS



10A LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $\leq 12'-0"$

SCALE: NTS



10B LEAN-TO RAFTER TO RAFTER COLUMN CONNECTION DETAIL FOR RAFTER SPANS $12'-0" < \text{TO} \leq 15'-0"$

SCALE: NTS

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CLIENT: ES

STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

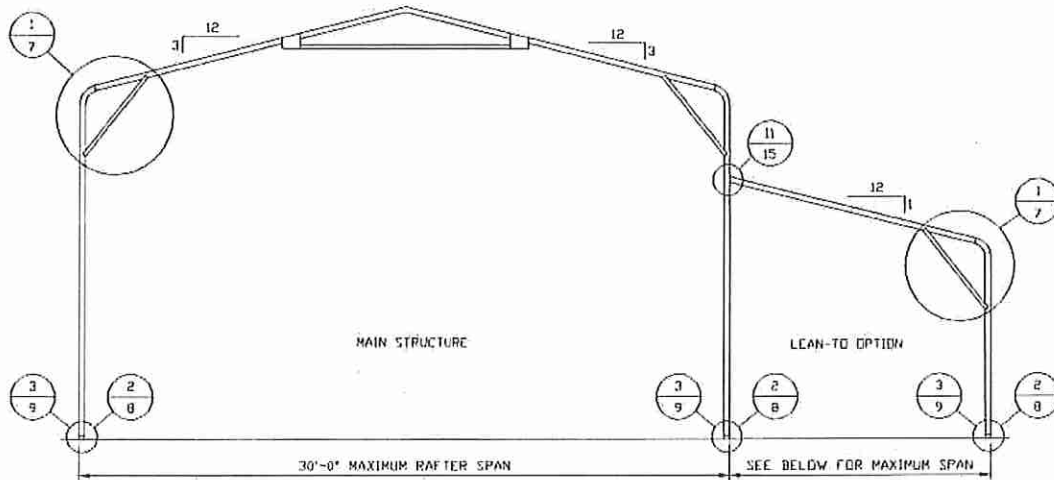
DWG. NO: SK-1

JOB NO: 17232S/18070S/
18094S/19050S

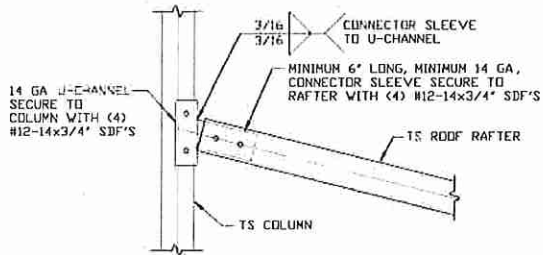
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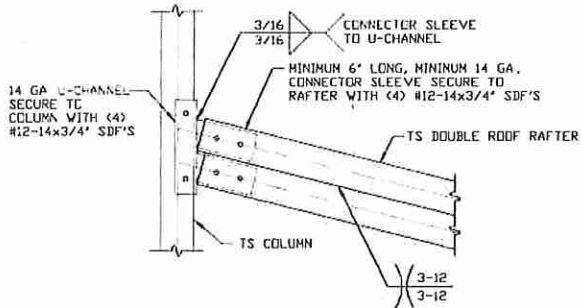
BOW EAVE RAFTER LEAN-TO OPTIONS



TYPICAL BOW RAFTER LEAN-TO OPTION FRAMING SECTION
SCALE: NTS



11A
**LEAN-TO RAFTER TO RAFTER
COLUMN CONNECTION DETAIL
FOR RAFTER SPANS $\leq 11'-0"$**
SCALE: NTS



11B
**LEAN-TO RAFTER TO RAFTER
COLUMN CONNECTION DETAIL FOR
RAFTER SPANS $11'-0" < TO \leq 15'-0"$**
SCALE: NTS

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

**JOB NO: 17232S/18070S/
18094S/19050S**

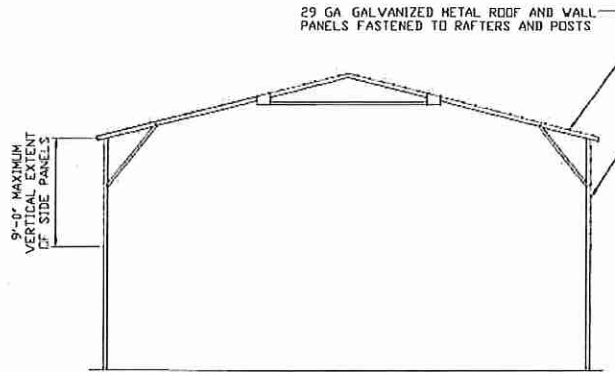
SHT. 15

DWG. NO: SK-1

REV: 5

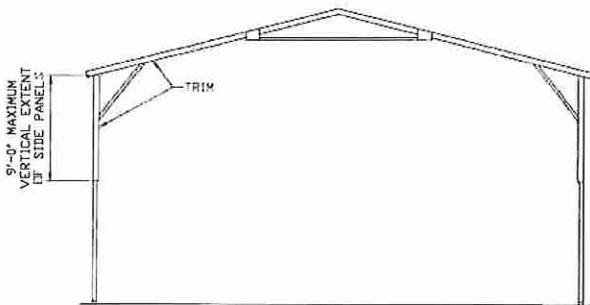
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BOX EAVE RAFTER EXTRA SIDE PANEL OPTION



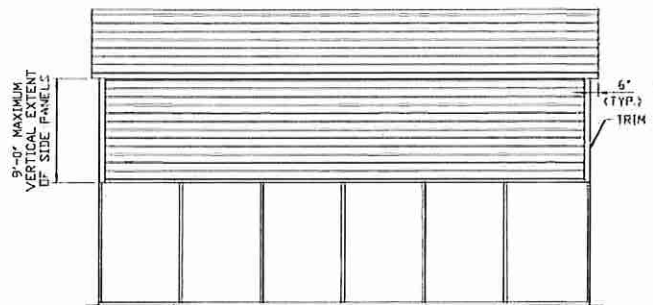
TYPICAL RAFTER/COLUMN FRAME SECTION - EXTRA SIDE PANELS

SCALE: NTS



TYPICAL END ELEVATION
EXTRA SIDE PANELS

SCALE: NTS



TYPICAL SIDE ELEVATION
EXTRA SIDE PANELS

SCALE: NTS

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**STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING**

DATE: 4-3-19

SCALE: NTS

**JOB NO: 17232S/18070S/
18094S/19050S**

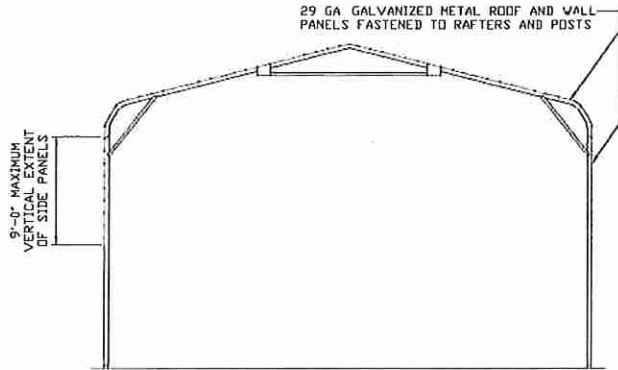
SHT. 16

DWG. NO: SK-1

REV. 5

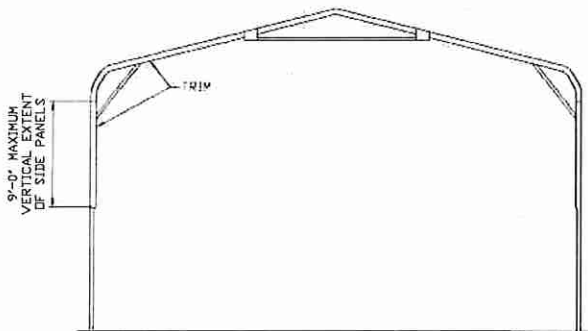
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BOW EAVE RAFTER EXTRA SIDE PANEL OPTION



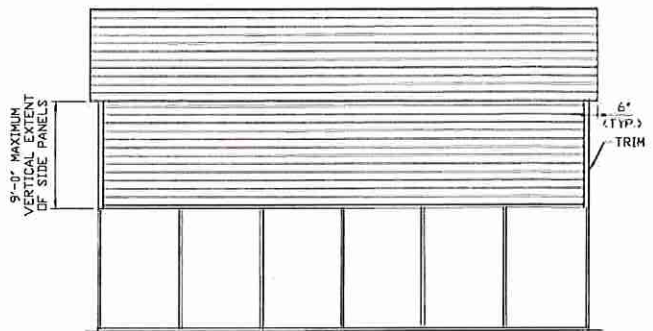
TYPICAL RAFTER/COLUMN FRAME SECTION - EXTRA SIDE PANELS

SCALE: NTS



**TYPICAL END ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS



**TYPICAL SIDE ELEVATION
EXTRA SIDE PANELS**

SCALE: NTS

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**STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING**

DATE: 4-3-19

SCALE: NTS

SHT. 17

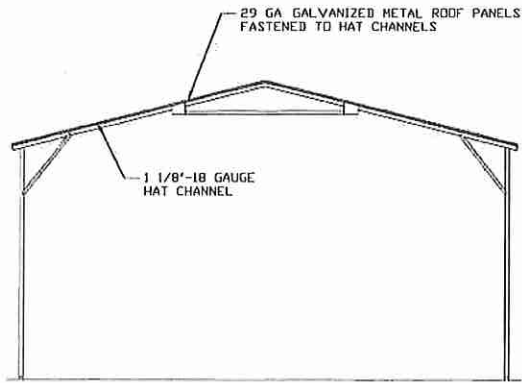
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**JOB NO: 17232S/18070S/
18094S/19050S**

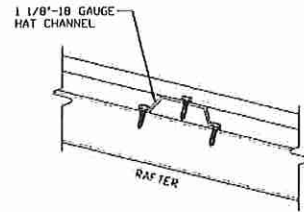
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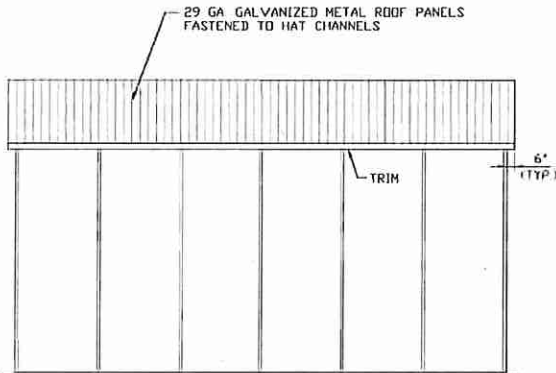
BOX EAVE RAFTER VERTICAL ROOF OPTION



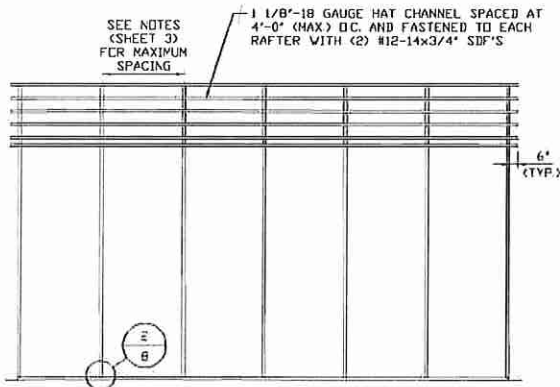
TYPICAL SECTION VERTICAL ROOF OPTION
SCALE: NTS



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



TYPICAL SIDE ELEVATION VERTICAL ROOF
SCALE: NTS



TYPICAL FRAMING SECTION VERTICAL ROOF OPTION
SCALE: NTS

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STEEL BUILDING GARAGES
1804 RIVER STREET
WILKESBORO, NC 28697
30'x16' FULLY OPEN BUILDING

DATE: 4-3-19

SCALE: NTS

SHT. 18

DWG. NO: SK-1

JOB NO: 17232S/18070S/
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