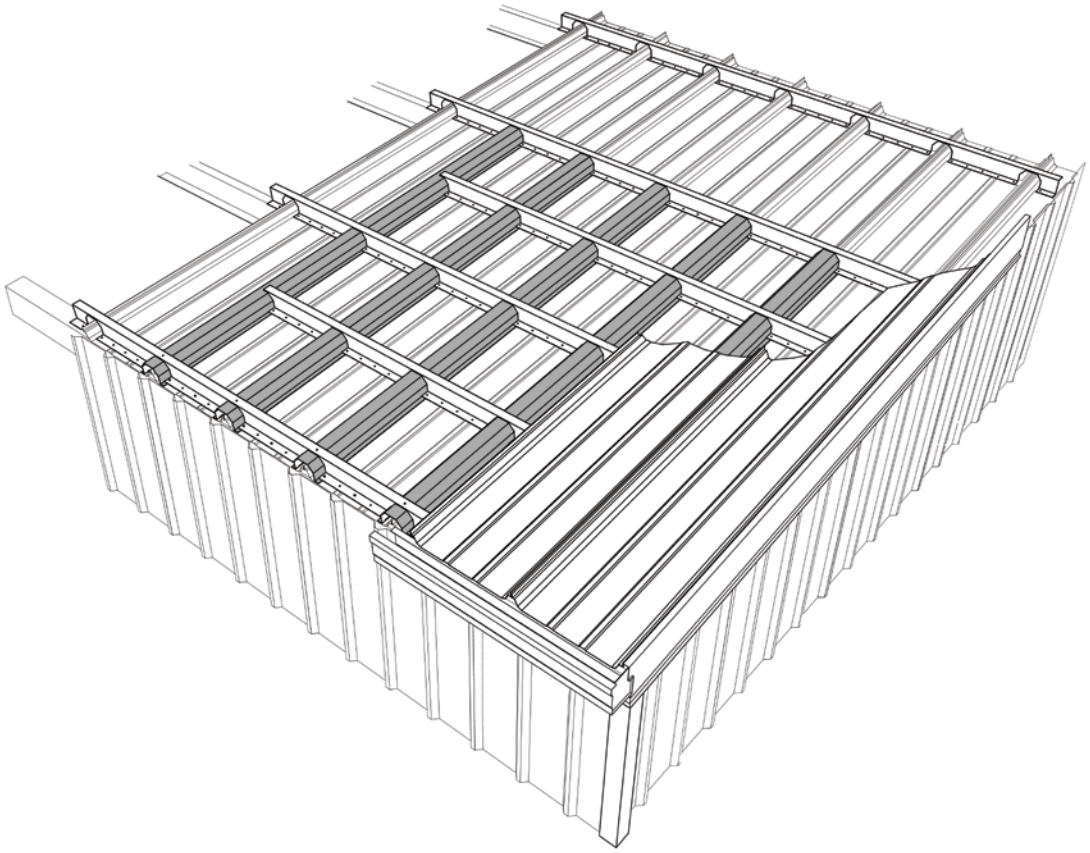
ROOF HUGGER®

Design & Installation Manual



The Most Recognized and Tested

Metal-over-Metal Retrofit Re-roofing Solutions

Roof Hugger, LLC
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Odessa, FL 33556

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Version 4.00 2017

Design and Installation Manual

To Metal-over-Metal

Retrofit Roof Systems

Version 4.00

Dated: September 15, 2017

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The information contained within this manual is intended to serve as a guide to illustrate retrofit metal re-roofing methods as practiced by Roof Hugger, LLC. It is believed to be true and accurate at the time of printing. Certain specifications may be subject to change and some components may vary slightly in appearance from those pictured. Depending on specific project requirements, adaptation, modification or production of custom components may be necessary. All references to the new metal roof system, being installed over the Roof Hugger sub-framing, are not intended to replace those as recommended by any metal roof manufacturer. For specific metal roof system flashing, trim and fastening requirements, refer to your metal roof manufacturer's standard details, specifications and practices. If you have questions relative to a application or condition, please contact Roof Hugger, LLC to ensure you have the most current information available on our sub-framing systems and components.

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Note: Refer to Roof Hugger's website for the most current up-to-date information including our standard construction details.
Visit us at: www.roofhugger.com

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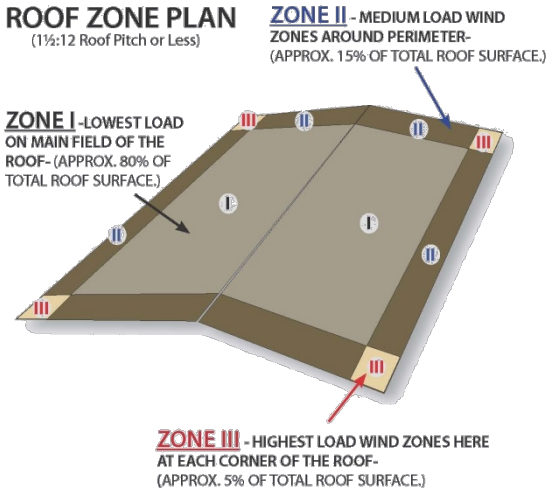
Retrofit Roofing Design Basics

In 2004 most states and municipalities adopted the new "International Building Code" (IBC). This code differs dramatically from the previous building codes in many ways. The most important to you and your project is how it looks at the design load for wind uplift pressures subjected to the roof. Different from years past, the roof is now divided into three zones: The "Field" or central areas of the roof, the "Edge or Perimeter" and the "Corner" zones of the roof. The loads for each "Zone" as shown in the below illustration must now be calculated separately to determine attachment points of the new roof panel system to the Roof Hugger framing system. Essentially, these locations are the same as "Panel Clip" spacing in the case of standing seam metal roofs or fastener placement for thru-fastened metal roofs. It is very important to understand that the required locations of new Roof Huggers on the existing roof will be governed by the new metal roof system's ASTM E-1592 tested values.

The new roof must withstand the full forces calculated for each of these "Zones" on a per project basis. It is important to understand as well, code based reductions allowed in the past are usually not permitted nowadays. Since no two buildings are exactly alike, the size and shape of these "Zones" vary from building to building and depends on numerous factors. Included in these factors are; height above ground, roof geometry, exposure of the roof to surrounding obstructions, distance from coastal areas, etc. Each building must be considered individually and engineered based on the existing conditions and proposed changes. The basic steps in the evaluation process are as follows:



- **STEP 1:** Collect the basic information needed as requested in our Project Questionnaire. This questionnaire can be emailed to you or you can download it from our website at www.roofhugger.com. Please note that if you are looking to obtain a quotation for Roof Huggers where you will determine the total lineal footage required, then the design of the overall system will fall upon your responsibility. However, Roof Hugger can provide this service where the project is engineered using your selected metal roof. This includes us determining the total lineal footage required plus us providing at your option, installation drawings and Engineer's design calculations with or without a "Seal" for your specific project.

- **STEP 2:** A professional engineer should calculate the design pressures for each zone of the roof. This can be completed by your roof panel manufacturer when you request them to provide a "Clip Analysis" if the new roof is a standing seam metal roof or fastener placement requirements if using a thru-fastened roof panel system. If necessary, you may ask us to run a preliminary design. However, this is based on our data base records of manufacturer panel systems. We do not have the pressures for all manufacturers, but do have for many of them. If we can provide you an analysis, please understand that this information is preliminary in nature and must be reviewed by an engineer before ordering any materials. It is only to be used to provide a preliminary design and Roof Hugger cannot be responsible for the results. The corner

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Retrofit Roofing Design Basics

zone/edge zone dimensions will be listed in our results as well as the intervals that the new roof panel must be attached to the Roof Huggers.

- **STEP 3:** Once the design analysis is completed, the next step is to determine what is required in the Roof Hugger sub-framing system. This is done by comparing the new roof panel maximum allowed pressures (uplift capacity) with the existing building's purlin spacing. If the existing purlin spacing is 5' (typical in older buildings) you would compare the capacity of the new panel on 5' purlin spacing. If the new panel cannot meet the require uplift pressures (PSF) for a 5' purlin spacing, then an additional Roof Hugger will be required between the existing building's purlins. This needed framing can be achieved by adding additional purlins from under the old roof (usually very difficult if not impossible) or by adding additional framing on top of the existing roof.

- **STEP 4:** If additional framing is needed to reduce the purlin spacing, it must be determined what that framing consists of. Roof Hugger, LLC has designed many above roof options for reducing the purlin spacing in the corner and edge zones when needed. The specific design will depend on the existing panel type and rib spacing. If the existing roof is a 12" o.c., "PBR" type panel, Roof Hugger, LLC has several FLORIDA PRODUCT APPROVED Systems that may work in this case. Other existing panels may require special grid framing designs consisting of Hats, Cee's or Zee's or a combination of all.

- **STEP 5:** Once the new roof's sub-framing has been determined and the overall height of the framing is established, the Roof Huggers can be estimated.

PLEASE NOTE ASCE-7 2016 WAS MODIFIED FROM PREVIOUS VERSIONS CURRENTLY IN USE. MANY STATES AND/OR MUNICIPALITIES MAY ADOPT IBC 2016 BEGINNING IN 2018. THE NEW VERSION WILL BE DIFFERENT THAN EARLIER VERSIONS AND IT WILL RAISE WIND LOADING IN COASTAL AREAS AND IT WILL INCREASE THE NUMBER OF ROOF ZONES AND THE MODIFY PRESSURES IN EACH OF THESE ZONES. PLEASE CHECK WITH ROOF HUGGER IF YOUR PROJECT WILL BE PERMITTED UNDER THIS NEW CODE.

If you need assistance with the above process please feel free to call Roof Hugger, LLC (800-771-1711) to discuss your specific project.

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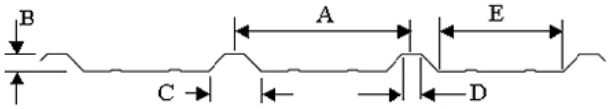
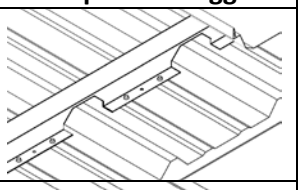
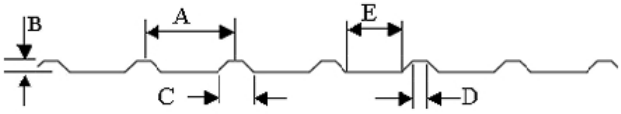
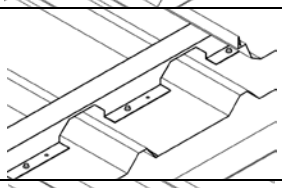
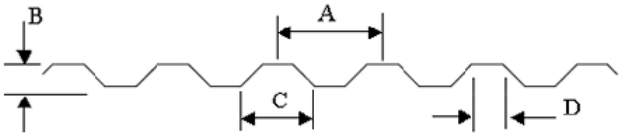
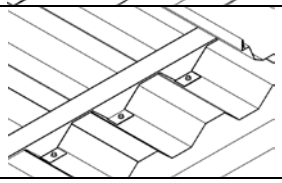
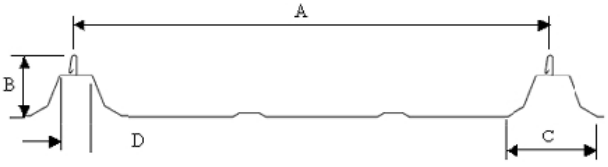
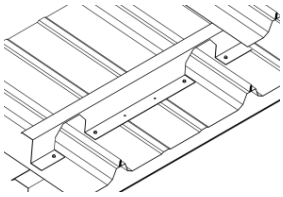
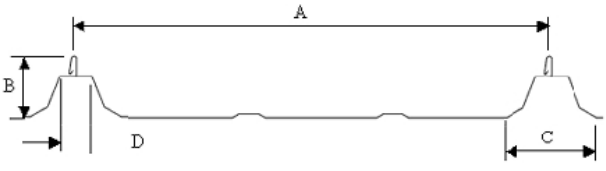
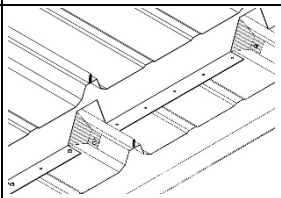
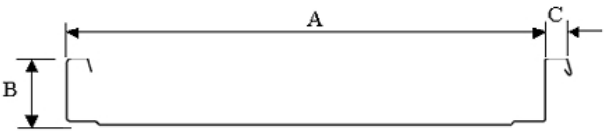
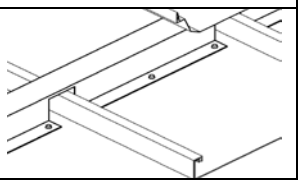
Hugger Applications

Initially developed for re-roofing existing metal buildings and metal roofing, some of the Roof Hugger products are also used very effectively in installations over conventional roofing materials in sloped applications. For new construction applications where an air-space cavity is necessary between a new metal roof and a sub-deck for energy efficient and solar thermal systems, Huggers can accommodate the needed airflow.

Below are the most common Hugger profiles for adaptation to an existing metal roof. If your project includes a profile not seen here, all is needed are the physical dimensions of the existing roof.

Roof Hugger Profiles	
Existing Roof Panel with Required Dimensions	**Compatible Hugger**
12” O.C. Ribbed Panel *(Our Model “C”)* 	
6”-10” O.C Ribbed Panel 	
7.2” Industrial Rib 	
Trapezoidal SSR <u>Without Stand-off Clips</u> 12”, 18” and 24” *(24” is Our Model “D”)* 	
Trapezoidal SSR <u>With Stand-off Clips</u> 12”, 18” and 24” *(24” is Our Model “T”)* 	
Vertical Rib SSR 12”, 16”, 18” and 24” 	

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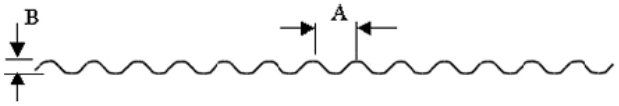
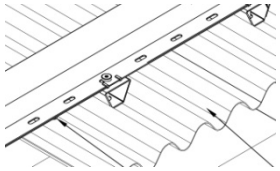
Hugger Applications

Over Corrugated Roofs
2.5", 2.67", 2.75"
and 4.2"



For Information, Refer to our **Corru-Fit™** *Design Guide*



Because of the manner Huggers are manufactured, they can match virtually any known metal roof profile. As you can see from the profiles on the preceding page, the most common are ribbed panels with varying rib spacing and standing seam systems (SSR) with varying seam spacing.

For Corrugated type panels, our Corru-Fit™ sub-framing product as shown above is a special system that takes the issues related to these roof's inconsistent corrugation spacing. For more information on this product, please refer to Corru-Fit's Design Guide on our website.

Since 1991, we have maintained a library of published and hand drawn obsolete metal roof profiles that include their physical dimensions, rib spacing and other critical information. Having this allows us in many cases to verify the existing roof profile you are trying to identify, ensuring the new Roof Huggers are manufactured to "Nest" over the existing roof and its major ribs providing a low-profile sub-purlin system. Some of the manufacturers included in our library of older metal roof profiles are shown below. Even nowadays we occasionally discover a roof profile that we did not know existed. With Roof Hugger's custom fabrication capability, it is typically not a problem to accommodate these.

A&S
AEP-Span
American Buildings
Behlen
Braden
Butler Manufacturing
Chief Buildings
Cuckler Building Systems
Dean Steel Buildings
Delta Buildings
Gulf States Manufacturing
Inland Buildings
Kirby Buildings
Ludwig Buildings
MBCI
McElroy Metal
Mes-Tex Buildings
Metallic Buildings
Metal Sales
Mesco Buildings
Midwest
Mitchell Buildings (CECO)
Nucor Building Systems
Pascoe
Ruffin Buildings
Soule'
Steelox-Armco
Star Buildings
Stran Buildings
Vic-West
United Structures of America
Varco Pruden Buildings
Whirlwind Buildings

Today, Roof Hugger has become the re-roofing sub-purlin system of choice by Private and Military Design Professionals, Roof Consultants, Contractors and Facility Managers throughout the Nation.

This Design and Installation Guide is intended to provide the User with an expanded view into the world of Metal-over-Metal roof replacement over and existing sloped roof without removal it. If you should have any questions that this manual cannot answer please feel free to call us at 1-800-771-1711.

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Energy Efficient Re-roofing

It is important to understand that when retrofitting over existing sloped metal or solid deck roof systems, the Roof Hugger sub-purlin will create an air-space/cavity between the old roof and underside of the new roof. This air-space presents several options to the contractor and building owner. Simply stated, the space can be used to improve the building inhabitant's comfort and environment as well as provide significant energy benefits through alternative energy resources. Consider the following before finalizing your re-roofing plans.

Insulated Systems

Unfaced Fiberglass

Rigid Board Insulation

Metal building construction over the years has historically used low R-value insulation between the existing purlins and metal roofing. Because of this, these buildings may be inefficient in reducing heat gain through the roof assembly in the summer as well as heat loss during the winter months. Adding insulation between the old and new roofs is a cost-effective measure to decrease the building's energy consumption while paving the way to pay for itself in a relative short time frame.

As shown in the photos above, fiberglass insulation is predominantly used in a "Metal-over-Metal assembly, but to gain even more thermal resistance in the minimal space, rigid board (polyiso) can be easily incorporated. With fiberglass, unfaced without a vapor barrier is typically used, but in some cases for projects located in the far northern climates, a laminated vapor barrier has been used.

Please note that the thickness of the insulation may vary dependent on code requirements, as may be required with the ASHRAE 90.1 Model Energy Code or IECC 2015. If the code does require a minimum R-Value, the depth of the Huggers can easily be increased to permit thicker insulation without adding major cost to the project.

Actual project case studies have illustrated up to 25% reduction in energy fuel source consumption for heated and air-conditioned buildings.

The following Tables on this page and the next provide published thermal resistance values (R-Value) for the type and thicknesses commonly found in existing metal building roofs. These values are recognized as being accurate for currently available insulation:

Vinyl-Faced Fiberglass insulation typically found in existing metal buildings	
Thickness	**R-Value**
1½"	5.0
2"	7.0
3"	10.0
4"	13.0
6"	19.0

Tables are Cont'd next page

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Energy Efficient Re-roofing

Low Density Unfaced Fiberglass *insulation (Laminated Fiberglass is not recommended)*	
Thickness	**R-Value**
2”	7.0
3.4”	10.0
3.7”	12.0
4.3”	13.5
5.3”	16.5
6.3”	20.0

Rigid Board *polyisocyanurate insulation (Dow™ Thermax or equal) being added between and/or top of Huggers*	
Thickness	**R-Value**
1”	6.5
2”	13.0
3”	19.0
4”	25.2

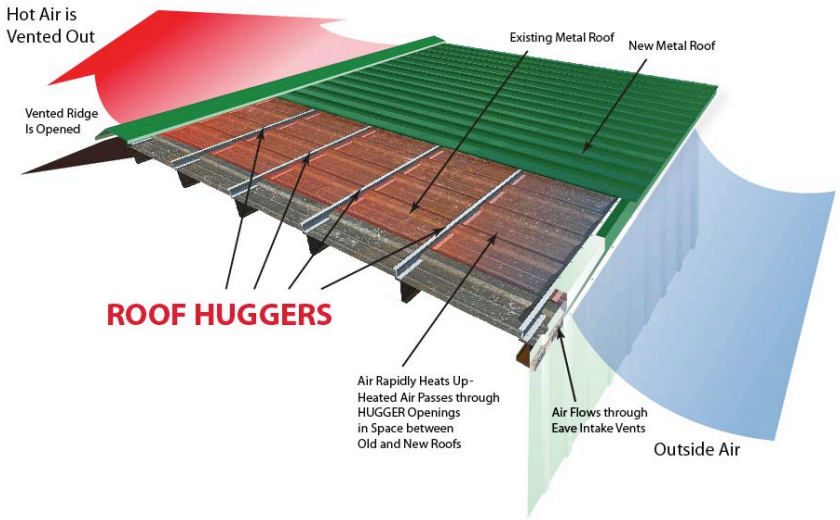
Notes pertaining to tables on the previous page:

1. When adding insulation to comply with locally adopted Energy Codes, the existing insulation should be included in the overall R-Value.
2. When using rigid board insulation, it has been recommended that the air-space void between the existing roof panel’s ribs to be filled with unfaced low-density fiberglass to prevent moisture from infiltration of warmer air from the building
3. Polystyrene is not an acceptable rigid insulation board for Metal-over-Metal assembly’s due to fire class ratings and it may require a minimum 22-gauge deck/existing roof.
4. If “Continuous Insulation” (CI) is required by the building code, at least one-layer of minimum thickness rigid insulation must be installed over the Huggers with joints taped, therefore requiring the new metal roof system to use a roof clip with a bearing plate. “CI” cannot be accomplished with screw-down/thru-fastened metal roofs or using fiberglass insulation

Ventilated Systems

If the building that is being retrofitted is not thermally controlled, then adding insulation may not be of benefit. If this is the case, then the air-space should be ventilated. This is easily accomplished using economical ventilation products at the low eave and high point (ridge, high eave, etc.) of the roof. When ventilated, the air in the cavity becomes a radiant barrier that reduces heat gain/loss. This roofing technology is known throughout the metal roofing industry as Above Sheathing Ventilation or “ASV”.

Please note that this assembly is very effective for buildings that are temperature controlled. Case studies for these systems have illustrated



nearly 21% decrease in energy consumption. In warmer climates, this system is very effective in

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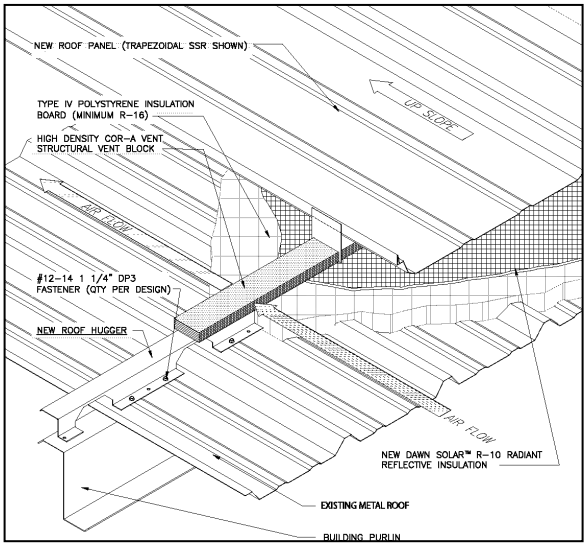
Energy Efficient Re-roofing

improving the building's interior environment. This is especially true for buildings that have working occupants such as livestock confinement, manufacturing and warehousing.

Ventilated and Insulated Systems

It is possible to incorporate both new insulation and ventilation in the cavity between the old and new roofs as shown in the illustration below. In fact, building envelope industry experts claim this is the best of both worlds. To accomplish this, the thickness of insulation is determined and the Roof Hugger sub-purlins are then manufactured approximately two inches taller to permit air-flow above the insulation. Another technique can be used by installing a Cor-A-Vent strip atop the Huggers for systems using new standing seam metal roofs with tall stand-off type clips.



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Testing and Approvals

ASTM E-1592 TESTING OVER 16 GA HUGGERS

McElroy Metal & Architectural Building Components 24 GA x 18" JSM200 DL
Test A – Hugger and purlin spacing @ 5'-0"
Test B – Purlins @ 5-0", Sub-rafters @ 24"
and Huggers @ 2'-6" over 26 GA "PBR"
Test C – Purlins @ 5-0", Sub-rafters @ 12"
and Huggers @ 1'-3" over 26 GA "PBR"

Custom-Bilt Metals 24 GA x 16" CB-2000
Test A – Hugger and purlin spacing @ 5'-0"
Test B – Hugger and purlin spacing @ 1'-0"
Test C – Purlins @ 5-0", Sub-rafters @ 24"
and Huggers @ 2'-6" over 26 GA "PBR"

Englert, Inc. 24 GA x 16" Series S-2500
Test A – Hugger and purlin spacing @ 5'-0"
Test B - Hugger and purlin spacing @ 2'-6"

Englert, Inc. 0.040" x 16" Series S-2500
Test A – Hugger and purlin spacing @ 5'-0"
Test B - Hugger and purlin spacing @ 2'-6"

Firestone Building Products 24 GA x 18" UC-6
Test A – Hugger and purlin spacing @ 5'-0"
Test B – Hugger and purlin spacing @ 1'-0"
Test C – Purlins @ 5'-0", Sub-rafters @ 24"
and Huggers @ 2'-6" over 26 GA "PBR"

Firestone Building Products 22 GA x 18" UC-6
Test A – Hugger and purlin spacing @ 5'-0"
Test B – Hugger and purlin spacing @ 1'-0"
Test C – Purlins @ 5'-0", Sub-rafters @ 24"
and Huggers @ 2'-6" over 26 GA "PBR"

MBCI 24 GA 16" SuperLok™
Test A – Hugger and purlin spacing @ 5'-0"
Test B - Purlins @ 5'-0", Sub-rafters @ 1'-0"
and Huggers @ 2'-6" over 26 GA "PBR"
Test C – Purlins @ 5'-0", Sub-rafters @ 24"
and Huggers @ 2'-6" over 26 GA "PBR"

MBCI 24 GA "PBR over 26 GA "PBR"
Test 06B – Hugger and purlin spacing @ 5'-0" fastened at 12"-12"-12"
Test 06C - Hugger and purlin spacing @ 5'-0" fastened 7"-5"-7"-5"
Test 06D – Purlins @ 5'-0", Sub-rafters @ 24" and Huggers @ 2'-6" fastened 7"-5"-7"-5"
Test 06E – Purlins @ 5'-0", Sub-rafters @ 12" and Huggers @ 2'-6", fastened 7"-5"-7"-5"

Notes:

- All Testing per ASTM E-1592-01 - TAS 125-03
- Refer to Installation Section, pages 27 & 28 for Sub-rafter/Hugger details of construction
- Existing purlins spaced @ 5'-0" for all tests unless noted otherwise
- Dade County Lab Certification: No. 05-1122.13

AISI GRAVITY AND WIND UPLIFT LOAD BASE TESTING *(Refer to Special Note no. 5 at end of this testing information for disclaimer)*

Standard Model "C" 16 GA Hugger with ¼" bridge above panel rib notch for 12" o.c. "R" Panel – *Refer to Detail HL-01-G on page 63*

Purlin Depth and Gauge	Existing Purlin Span FT	Wind Uplift % Increase	Gravity Load % Increase
8"X16	25'-0"	85%	42%
8"X14		50%	37%
8"X12		0.2%	25%

Special 16 GA Hugger with 1" bridge above panel rib notch for 12" o.c. "R" Panel – *Refer to details HL-02-/16-14 and HL-03-R/12 on pages 59 and 60.*

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Testing and Approvals

Purlin Depth and Gauge	Existing Purlin Span FT	Wind Uplift % Increase	Gravity Load % Increase
8”X16	25’-0”	94%	79%
8”X14		65%	66%
8”X12		22%	37%

AISI Testing Notes:

1. Dade County Laboratory Certification: No. 05-1122.13
2. All roof assemblies were tested with LGSI standard Purlins with 26 GA roof panels attached to top flange
3. All roof assemblies were tested with bottom flanges completely unbraced
4. All tests were conducted in compliance with AISI TS-8-02 Base Test Method for Purlins supporting a standing seam roof.
5. **Special Note:** *It is the responsibility of the owner or general contractor to hire a design professional to do a thorough investigation of the existing metal building system to ensure that the design is adequate for the additional loading. Our testing has confirmed that the additional loads of the Roof Hugger System were more than compensated by the existing system for purlins depths up to 8-inch. However, existing purlin laps where combined shear and bending occurs were not evaluated due to the limitations of the AISI Base Test Method. Our engineering design only addresses the performance of the Roof Hugger System, its attachment to existing purlins, and the interaction of the new metal roof system.*

Roof Hugger Sub-Purlin Rollover Testing

Testing on various height Sub-Purlins and various profiles to determine rollover limitations to control panel drag loads.

Factory Mutual Standard 4471 Approval

Approval No. 3033681, Architectural Building Components 15-7/8” wide 24 Ga. JSM 238T as provided by McElroy Metal of Bossier City, LA. with various clips over several Roof Hugger profiles @ 5’-0” O.C. met Classes 1-75, 1-120 and 1-195, *Visit www.mcelroymetal.com for details.*

APPROVALS WITH NEW THRU-FASTENED/SCREW-DOWN METAL ROOFING – 2015 Master 9352-R3

Product Approval – FL 9352.2

This product approval is for buildings with an existing 12” O.C. “PBR” panel 26 Ga. or heavier through-fastened roof with a new roof panel 12” O.C. “PBR” 26 Ga. as provided by MBCI of Houston, TX (Panels with equivalent properties are acceptable). The Product Approval includes a table indicating several retrofit framing options and sub-frame spacing’s. Each assembly having varying capacities from -40 PSF to -140 PSF at the noted deflection levels.

Product Approval – FL 9352.3

This product approval is for buildings with an existing 12” O.C. “PBR” panel 26 Ga. or heavier through-fastened roof with a new roof panel 12” O.C. “PBR” 24 Ga. as provided by MBCI of Houston, TX (Panels with equivalent properties are acceptable). The Product Approval includes a table indicating several retrofit framing options and sub-frame spacing’s. Each assembly having varying capacities from -40 PSF to -145 PSF at the noted deflection levels.

Product Approval – FL 9352.4

This product approval is for buildings with an existing 12” O.C. “PBR” panel 26 Ga. or heavier through-fastened roof with a new roof panel 12” O.C. “PBR” 22 Ga. as provided by MBCI of Houston, TX (Panels with equivalent properties

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Testing and Approvals

are acceptable). The Product Approval includes a table indicating several retrofit framing options and sub-frame spacing's. Each assembly having varying capacities from -48.1 PSF to -124.9 PSF at the noted deflection levels.

APPROVALS WITH NEW STANDING SEAM METAL ROOFING

Product Approval - FL 9352.1

This product approval is for buildings with an existing 12" O.C. "PBR" panel 26 Ga. Or heavier through-fastened roof with a new 238-T 18" O.C., 22 Ga., vertical rib standing seam roof as provided by McElroy Metals of Bossier City, LA. The Product approval includes a table indicating several retrofit framing options and sub-frame spacing's. Each assembly having varying capacities from -55 PSF to -125 PSF at differing sub-purlin spacing's.

Product Approval - FL 9352.5

This product approval is for buildings with an existing 12" O.C. "PBR" panel 26 GA. or heavier through-fastened roof with a new 16" SuperLok, vertical rib standing seam roof as provided by MBCI of Houston, TX. The Product Approval includes a table indicating several retrofit framing options and sub-frame spacing's. Each assembly having varying capacities from -47.5 PSF to -80 PSF at differing sub-purlin spacing's.

Product Approval - FL 17626

This product approval is for buildings with an existing 12" O.C. "PBR" panel 26 GA. or heavier through-fastened roof with a new 24 GA 18" x 2" vertical rib 238-T standing seam roof as provided by McElroy of Bossier City, LA. The Product Approval includes a table indicating several retrofit framing options and sub-frame spacing's. Each assembly having varying capacities from -123.5 PSF to -161 PSF at differing sub-purlin spacing's over structural steel decking.

NOTES FOR LISTED APPROVALS:

All Existing Purlin Spacing = 5'-0" O.C. max

All New PBR Panel is 36" wide with 1¼" tall rib

- 26 GA = 80 KSI
- 24 GA = 50 KSI

Hats = Special Hugger Sub-rafters

ROOF HUGGER COMPOSITION & MATERIALS
Roof Hugger Sub-purlin System's base materials is G-90 galvanized finished steel sheet per ASTM A-446 or A-570 with 50 ksi minimum yield strength. Material thickness is available to meet design loads in 16 and 14 gauges.

PROFILES AND CHARACTERISTICS
The profile used for Florida Product Approval is the Roof Hugger standard roll-formed Type "C" model, manufactured to accommodate existing ribbed metal roofing with maximum 1½" high major ribs spaced at 12" on center. In addition, other standard types include Hugger profiles manufactured to accommodate the following popular panel types:

12" to 24" O.C. Trapezoidal Rib SSR
12" to 20" O.C. Vertical Rib SSR
6"-10" O.C. Ribbed Panel
2.5", 2.67", 2.75" and 4.2" Corrugated
7.2" Industrial Rib

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All Roof Hugger Sub-purlins are zee shaped steel members with 1.06" minimum bottom flange and 2.0" minimum top flange plus a .25" minimum lip. The web depth varies based on the existing panel profile dimension or desired insulation thickness. The die-stamped web window that allows nesting over the existing roof system ribs also may vary per job application and requirements. All are shipped in 10'-0" lengths plus or minus to fit existing panel rib or seam modules.

Roof Hugger Sub-purlins are intended to attach directly above and to the existing building secondary support members. These members are most commonly zee shaped purlins, steel bar joist or other types of framing. When these members exceed the maximum spacing as dictated by the new roof panel system, the Roof Hugger Sub-purlins must employ "sub-rafter" hats and/or "struts" that span over the existing purlin. By doing this, the Roof Hugger Sub-Purlins can be installed at mid-span conditions (between existing purlins).

OTHER ROOF HUGGER TESTING

Many other metal roof panel manufacturers have tested their systems in accordance with ASTM E-1592 Standard Test Method for Structural Performance of Metal Roof and Siding Systems by Uniform Static Air Pressure Difference. Please visit our website for the most current reports on these tests.

BUILDING CODES

Current data on building code requirements and product compliance may be obtained from ROOF HUGGER technical support specialists. Installation must comply with the requirements of Chapters 15, 16 and 22 of the FBC 2010 Code.

FLORIDA PRODUCT APPROVAL LIMITATIONS AND CONDITIONS OF USE FOR NON-HIGH VELOCITY HURRICANE ZONES (NON-HVHZ)

DESIGN PROCEDURE: Based on the dimensions of the structure, appropriate loads are determined using Chapter 16 of the Florida Building Code (FBC) for roof cladding wind loads. These component wind loads for roof cladding are compared to the allowable negative/positive pressures listed in the load table. The design professional shall select the appropriate erection details to reference in his/her drawings for proper fastener attachment to the structure and analyze the panel fasteners for pullout and pullover. Support framing must be in compliance with FBC Chapter 22 for steel and Chapter 16 for structural loading.

OTHER CONDITIONS:

Minimum Roof Slope Limitation: ½:12

Existing Purlin Spacing: Maximum 5'-0" O.C. designed by a Florida P.E.

Existing Roof Panel: Based on 26 GA R-Panel or "PBR", 80 KSI with 12" O.C. x 1¼" tall ribs and 36" coverage

Substrate Attachment: Designed by a Florida P.E.

Fire Barrier: Class B fire exposure rating in accordance with FBC Section 1505.3

Underlayment: Vinyl or reflective foil faced fiberglass batt insulations that have a flame spread rating of no more than 25 and a smoke development rating of not more than 450 assumed under the existing roof

Shear Diaphragm: Shear diaphragm values were outside the scope of the Approval reports

MAXIMUM ROOF COMPONENT UPLIFT PRESSURES:

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Product Approval – FL 9352.1 *(238T Panel System over Roof Huggers)*

238T Panel Clip	16 GA Fixed	24 GA Continuous Clip	22 GA Continuous Clip
Maximum Design Pressure	-55.0 PSF	-100.0 PSF	-125.0 PSF
Roof Hugger	Standard Model "C"	Standard Model "C"	Gusseted Model "C"
Roof Hugger Spacing	5'-0" O.C.	5'-0" O.C.	5'-0" O.C.
Roof Hugger # of Fasteners	(2) per Foot	(2) per Foot	(4) per Foot

*Design Pressure includes a Safety Factor = 2.0

Product Approval – FL 9352.2 *(PBR Panel System over Roof Huggers)*

System No.	Maximum Allowable Pressures (Psf)			
	Allowable Test Value	Controlled by Panel Deflections		
		L/120	L/180	L/240
1	40.0	40.0	40.0	38.8
2	65.0	65.0	45.7	33.8
3	110.0	110.0	110.0	110.0
4	140.0	140.0	140.0	116.7

Product Approval - FL 9352.3 *(PBR Panel System over Roof Huggers)*

System No.	Maximum Allowable Pressures (Psf)			
	Allowable Test Value	Controlled by Panel Deflections		
		L/120	L/180	L/240
1	35.0	35.0	31.44	26.42
2	60.0	60.0	60.00	58.14
3	116.0	116.0	111.77	85.14
4	145.0	145.0	120.41	92.24

Product Approval – FL 9352.4 *(PBR Panel System over Roof Huggers)*

Maximum Allowable Pressures (PSF)				
Roof System	Allowable Design Pressure (PSF)	Based on Panel Deflections		
		L/120	L/180	L/240
1	48.1	48.1	46.0	35.2
2	88.5	58.1	40.6	32.7
3	124.9	124.9	124.9	124.9

*Design Pressure includes a Safety Factor = 2.0

Product Approval – FL 9352.5
(Super Lok 16-24 Panel System over Roof Huggers)

Negative Design Loads (PSF)		
Roof Hugger spacing	E-1592 load	Allowable Design load
2.50 FT	160.0	80.0
5.00 FT	95.0	47.5

Product Approval - FL 17626 *(238T Panel System over Roof Huggers)*

Maximum Design Pressure	-125.3 PSF	-161.0 PSF
Roof Hugger Spacing	4'-0" O.C.	2'-0" O.C.
Roof Hugger # of Fasteners	(3) #14-13 per 36"	(3) #14-13 per 16"

Design Pressure includes a Safety Factor = 2.0

INSTALLATION REQUIREMENTS:
Please contact Roof Hugger to obtain specific FL Product Approval erection details.

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Product Guide Specifications

PLEASE NOTE: These specifications are available in a MS Word document that is editable to suit your project. Refer to the "Editable Design Specifications 13145" file included on our complimentary Flash Drive, or you may download from our website at www.roofhugger.com under "Helpful Documents".

SECTION 13 34 21 - STRUCTURAL RETROFIT ROOF SUB-FRAMING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. The structural retrofit roof sub-framing system will provide support for a new metal roofing system constructed over the existing building roof. It shall be engineered in accordance with

B. the specified code and design loading and shall transfer positive acting loads at each attachment location into an existing structural member.

C. Furnish labor, material, tools, equipment and services for the fabrication of retrofit roof sub-framing as indicated, in accordance with provisions of the Contract Documents.

D. Completely coordinate work with of other trades.

E. Although such work is not specifically indicated, the contractor/installer shall coordinate with the metal roof system supplier to furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

F. Reference Division 1 for General Requirements

1.2 RELATED WORK

A. Section 05 40 00 - Cold-Formed Metal Framing.

B. Section 07 22 00 - Roof and Deck Insulation.

C. Section 07 40 00 - Metal Roofing.

D. Section 07 72 00 - Roof Accessories.

E. Section 08 60 00 – Skylights.

F. Section 13 34 19 - Pre-Engineered Structures (Metal Building Systems).

G. Section 22 05 00 - Basic Mechanical Materials and Methods for Plumbing Piping.

H. Section 23 31 00 Ventilation Ducts.

Product Guide Specifications

I. Section 26 05 00 – Electrical Demolition and Modifications.

1.3 QUALITY ASSURANCE AND REFERENCES

A. ASTM International

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

3. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

B. American Iron and Steel Institute (AISI)

1. AISI D100-13: Cold-Formed Steel Design Manual, [2013 Edition].

2. AISI S100-16: North American Specification for the Design of Cold-Formed Steel Structural Members, [2016 Edition].

C. American Institute of Steel Construction (AISC)

1. ANSI/AISC 360-16: - Specification for Structural Steel for Buildings, [2016 Edition].

D. 2015 Florida Product Approval FL9352-R3, FL17626

1. FL 9352.1 22 GA. 18” Wide 238-T over Roof Hugger Re-Roofing System

2. FL 9352.2 26 ga. PBR over Roof Hugger Re-Roofing System.

3. FL 9352.3 24 ga. PBR over Roof Hugger Re-Roofing System.

4. FL 9352.4 22 ga. PBR over Roof Hugger Re-Roofing System.

5. FL 9352.5 Super Lok 16-24 over Roof Hugger Re-Roofing System.

6. FL 17626.1 24 GA. 18” Wide 238-T over Roof Hugger Re-Roofing System.

1.4 SUBMITTALS

A. Comply with Section 01 33 00 - Submittals.

B. Product Data: Submit manufacturer's product data, including installation instructions.

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C. Shop Drawings: Submit manufacturer's shop drawings for sub-purlins indicating gauge, yield strength, flange and web sizes, cut-out dimensions, and punch pattern for attachment holes in base flange.

D. Design Data: Submit design data from independent engineering firm indicating table of wind uplift capacity of sub-purlins.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened bundles, containers, and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.

2. Protect sub-purlins from corrosion, deformation, and other damage.

3. Store sub-purlins off ground, with 1 end elevated to provide drainage.

1.6 EXISTING ROOF SYSTEM AND PRE-CONSTRUCTION INSPECTION

A. The existing roof is a [*Insert existing roof description here per specifier notes below*]

B. Conduct a detailed inspection of the existing roof(s) to identify any existing roof elements that are a cause for concern such as: panel deterioration, structural deterioration, equipment curbs, plumbing and electrical penetrations, special flashing requirements, and any other items that should be submitted to the Architect [Engineer][Consultant] for review and evaluation.

C. Perform a detailed survey of the existing roof(s) and confirm the existing panel dimensions, type and profile. In the case of existing standing seam roofing it should be determined if the existing roof employs standard or tall clips. If high panel clips are existing, the standoff dimension must be determined.

D. Record field measurements on the existing roof geometry including width, length, eave height, roof pitch and purlin spacing. This information is to be forwarded to the retrofit sub-framing system manufacturer for coordination and integration into the design and installation documents.

1.7 DESIGN REQUIREMENTS

A. General

1. Design for approval and installation in accordance with the Contract Documents, a complete retrofit sub-framing and metal roof panel assembly as a structural package.

Product Guide Specifications

2. Engineer and factory fabricate sub-framing system in accordance with applicable references.

3. Coordinate design with the retrofit sub-framing manufacturer and the metal roof panel manufacturer to perform as one engineered structural package where the metal roof system controls the placement of sub-framing members.

4. Any additions/revisions to sub-framing members as a result of field conditions and/or demands, shall be the contractor's responsibility, and shall be submitted for review and approval by the manufacturer.

B. Engineering Design Criteria:

1. Building Code: *[IBC 2015/ASCE7-2010, FBC 2010, IBC 2009/ASCE7-2009, BOCA, Florida Building Code, Etc.]*

2. Additional Requirements: [*None, Factory Mutual, Underwriters Lab, US Army Corps of Engineers Standard, Miami Dade, Other]*
3. Occupancy Group: *[Assembly-A, Business-B, Educational-E, Factory Industrial-F, High-Hazard-H, Institutional/Industrial-I, Mercantile-M, Storage-S, Etc.]*.
4. Occupancy Category: *[I (Low Hazard), II (General), III (300+Occupancy), IV (Essential)]*.
5. Importance Factor: *[0.87, 1.0, 1.15] (IBC 2009 or earlier only)*
6. Minimum Roof Snow Load: *[XXX]* PSF.
7. Ground Snow Load: *[XXX]* PSF.
8. Wind Speed: *[XXX]* MPH, 3 Second Gust.
9. Exposure Category*: [B, C, D]*.
10. Enclosure: *[Enclosed, Partially Enclosed, Open]*.

PART 2 - PRODUCTS

2.1 MANUFACTURER QUALIFICATIONS

A. Manufacturer shall have a minimum of five years' experience in manufacturing and fabrication of retrofit sub-framing systems of this nature.

B. Light-gauge steel sub-framing components specified in this section shall be produced in a factory environment by roll forming and press-brake equipment assuring the highest level of quality control.

C. Acceptable Manufacturers

Product Guide Specifications

1. Roof Hugger, LLC., PO Box 1027, Odessa, Florida 33556. Toll Free Phone (800) 771-1711. Toll Free Fax (877) 202-2254. Phone (813) 909-4424. Fax (813) 948-4742. Website: www.roofhugger.com. E-Mail: sales@roofhugger.com.
2. Other manufacturers must submit a request for approval prior to the established bid date according to applicable Division 1 Section(s) and shall be equal to Roof Hugger, LLC.

2.2 RETROFIT STEEL SUB-PURLINS

A. Standard Retrofit Factory-notched Sub-Purlins: "Roof Hugger".

B. Description:

1. 1-piece, custom-notched and punched, Z-shaped section.
2. Pre-punched to nest over existing through-fastened, low clip and high clip standing seam roof panel ribs for low-profile attachment.
3. Pre-punched for attachment fasteners.
4. Integrally formed Anti-Rotational Arm as required for high clip standing seam panels.
5. Fastens directly into existing purlins, joists or structural decking with fasteners.

C. Material:

1. Galvanized steel, ASTM A 653 or A 1011, G-90, yield strength 50 KSI.
2. Thickness: [*0.060inch minimum, 16-Gauge] or [0.071inch minimum, 14-Gauge]*.
3. Web Height: [_____ inches] [manufacturer's standard].
4. Base Flange Width: Pre-punch base flange to manufacturer's standard unless otherwise specified.
5. Top Flange Width: Nominally 2inches with 0.25inch minimum stiffening lip unless otherwise specified.
6. Length: Nominally 10 feet long, plus an additional +/- 1inch top flange extension for part lap or per manufacturer's recommendations.

D. Attachment Fasteners/Anchorage

1. "Standard" Roof Hugger Sub-Purlin:
   a. Attachment to Existing Purlins/Joist/Decking: [two- 1/4"--14 x 2 inch], DP3 self-drilling screws.
   b. Existing Purlin Strengthening, Top Flange Lap Connection: [four- #10-16 x 1 inch] pancake head screws through overlapping sub-purlin top flanges, joining them into a continuous member, per lap connection or as specified.

c. Mid-Span Hugger Sub-Purlin to Sub-Rafter: [two, 1/4"-14 1 inch], DP3 self –drilling on each side of cutout and [one #10-16 x 1 inch] pancake head screw installed through sub-purlin top flange, into sub-rafter.

d. Mid-Span Hugger Sub-Purlin to Existing Panel: #17-14 fasteners shall be installed through the mid-span of sub-purlin into the existing roof panels as specified or per standard details (over-drilling of pre-punched hole will be required).

e. Fastener Length: As required to penetrate existing purlins in accordance with fastener attachment standards.

2. "Special" Roof Hugger Sub-Purlin w/ Anti-Rotational Arm:

   a. Attachment to Existing Purlins/Joist/Decking: Typical 2-1/4"-14 x 2inches DP3 self-drilling fastener with 1inch standoff or as specified.

   b. Attachment of Anti-Rotational Arm to Existing Panel: #17-14 fastener or as specified.

3. Integral Sub-Rafters beneath the rib cut out in the sub-purlin: ¼inch-14 threads per inch, DP3 self-drilling fasteners install through the sub-purlin, through the integral sub-rafter, through the existing panel and into the existing purlin, rafters or joist; quantity as specified by design (typically 4 per intersection).

4. Sub-Rafter Hat Channels for designated high load areas:

   a. Attachment to Existing Purlins, Trusses, Rafters or Joist: 1/4"-14 threads per inch DP3 self-drilling screws.

   b. Length as required for minimum required penetration into truss, rafter or joist.

5. Sub-Purlin Hat Channels: Attachment to installed sub-rafters: ¼ inch-14 threads per inch, DP3 self-drilling fasteners, quantity as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing roof areas to receive sub-purlins. Notify Architect [Engineer][Consultant] if areas are not acceptable or structurally adequate. Do not begin installation until unacceptable conditions have been corrected.

B. Verify existing purlins and eave struts are in good serviceable condition, without rust-thru of flanges.

C. Field Verify Before Ordering of and Installation of Sub-Purlins:

   1. Existing panel profile and panel rib dimensions.

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2. Existing panel run-out by measuring roof over several 20-foot areas to confirm panels were installed on module and in-square. Note variations.

3.2 INSTALLATION OF SUB-FRAMING AND OTHER ROOFTOP APPURTENCES

A. Install sub-purlins in accordance with manufacturer's instructions at locations indicated on the standard details or Engineered Drawings if provided.

B. Limit installation of sub-purlins to amount that can be roofed over each day.

C. Install [1] [2] [3] fasteners per linear foot or as directed by Manufacturer.

D. Install sub-purlins directly over existing purlins and fasten to existing purlin through existing panel pan section.

E. If integral sub-rafters are used, loosely lay Sub-rafters over the existing panel high ribs and between the existing purlins. Sub-rafter spacing and number of fasteners shall be as specified on the [engineered Drawings] [applicable Roof Hugger, Florida Product Approval].

F. Press the Roof Hugger sub-purlins over the sub-rafters on the existing purlin lines in areas where they are specified and install [1/4”-14 DP3 screws] [fasteners shown on engineered Drawings] through the base flange of the sub-purlin, through the sub-rafter and then into the existing purlins being careful to maintain the alignment of the sub-rafters.

G. Install sub-purlins onto the integral sub-rafters between the existing purlins as specified with 1/4”-14 threads per inch, DP3 fasteners, typically one fastener on each side of the sub-rafter unless otherwise specified.

H. Where the sub-purlin is attached to the existing roof panel the pre-punched base flange hole should be drilled out to the correct diameter to allow for the installation of a #17-14 fastener through the Roof Hugger and into the existing roof panel.

I. Where the sub-purlin passes over the fitted sub-rafter, fasten through the top flange of the sub-purlin with a #10-16 pancake head fastener into the top of the new fitted sub-rafter.

J. Removal of Existing Roof Fasteners: Do not remove existing roof fasteners unless installation of sub-purlins over fasteners causes sub-purlins to “roll” or “porpoise”. Some distortion of base flange of sub-purlins caused by existing roof fasteners is normal.

K. Skylights:

1. Install sub-purlins over existing skylights prior to removal of the old skylight.

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2. Modify existing skylights according to provisions of Section 08 60 00.
3. Seal gap between existing metal roof and new metal roof with sheet metal trim to prevent air infiltration into the newly created roof cavity.

L. Existing Rooftop Components and Equipment

1. When mechanical equipment locations conflict with retrofit roof sub-framing components, the contractor will provide additional framing that accommodates the relocation, replacement or re-flashing of the equipment. Submit construction details for this condition to the Architect [Engineer][Consultant].
2. When electrical service and equipment needs to be removed, extended and reinstalled at the new metal roof system height/plane, extend the wiring in accordance with the Section 26 05 00, local building and electrical codes.
3. Comply with provisions Section 07 40 00, Section 22 05 00 and local building codes for extending, relocating and flashing vent pipes.
4. Comply with provisions Section 07 40 00, Section 23 31 00 and local building codes for extending, relocating ducts and curbs.

M. New Equipment within the New Roof Cavity

1. Review all clearances, attachment requirements, penetrations, and other critical details as necessary for the proper installation of any equipment to be installed within the new roof cavity.
2. Obstructions with new sub-purlins shall be avoided. If cutting of sub-purlins is necessary, a continuous top flange must be provided to provide continuous bearing for the new metal roof system.

END OF SECTION

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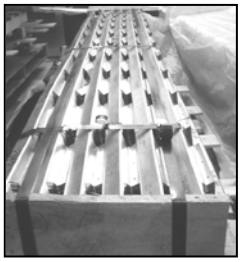
Hugger Installation



RECEIVING MATERIALS: ROOF HUGGERS are typically placed on wood pallets 3'-5' wide and approximately 10' long weighing up to 5,000 lbs. ROOF HUGGERS are shipped via closed van for "LTL" less than truckload quantities or flatbed for truckload quantities. The installer is responsible for unloading the material and providing the suitable equipment to safely unload the material from the delivery truck.

Upon receipt of material, check for damage; if damage is found, please note the damage on the carriers Bill of Lading at the time of delivery. Notify ROOF HUGGER, Inc. of this damage within 48 hours

HANDLING: Proper care is required while unloading to prevent personal injury or material damage. Band straps should never be used for pulling or lifting of the pallets. If the pallets are to be lifted onto the roof, confirm the structure has adequate capacity first. If the structure is capable, the pallet should only be placed above the existing structural frames, 1-pallet per frame maximum unless otherwise directed by the engineer of record for the project.

INSTALLATION: Unless otherwise noted, install Huggers only directly over and into existing purlins through the existing panel pan section. (HUGGERS are normally installed with the top flange pointing up the roof slope.)

Wherever possible, layout new panels as to minimize the possibility of new panel fasteners or attachment clips from falling on the cut ends of the ROOF HUGGERS. Standing seam systems can be ordered with a narrower starter panel to offset the new panel from the existing panel module. If landing on the cut ends is unavoidable then attach the adjacent HUGGERS overlapping top flange ends with (2) #10 pancake head fasteners in addition to the clip fasteners or back lap the HUGGERS one full corrugation to produce a double thickness and continuity of the top flange across the lap.

SPECIAL CONSIDERATIONS: Weathertightness: During erection, prior to the installation of the new roof panel the ROOF HUGGERS are NOT WEATHERTIGHT. It is recommended that only the amount of HUGGERS to be covered with new roof panels be installed in a given workday. Mastic can be placed beneath the ROOF HUGGERS at the attachment points to minimize water intrusion during construction but this may not provide a complete water seal.

Flashing and Trim: Rake angles, trims, curbs and flashings are not provided by ROOF HUGGER. Consult your panel manufacturer for the necessary details and required materials to meet their design requirements. ROOF HUGGER is available to discuss any special situations.

Bridging: Bracing or bridging may be required where the Hugger height exceeds 3-$^{3}/_{8}$". Consult your local engineer for specific requirements for your locale. We can provide details of previous installations upon request.

Out of Module Existing Roof Panels: In some rare cases, the existing roof panels may be installed so poorly the they do not maintain the proper panel rib spacing (i.e.: a 12" o.c. "R" panel may gain $^{1}/_{8}$" per L.F., so in 10' the roof would measure a gain of 1-¼") The ROOF

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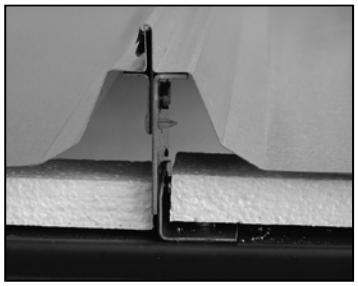
HUGGER "notches" are over cut to allow for most conditions, however some cases may exceed our tolerances. If this occurs, the ROOF HUGGER may be cut to allow it to fit properly. Use care to avoid fasteners or clips from falling on the resulting gap, back lap the HUGGERS if necessary.

Installing Over Skylights: DO NOT REMOVE EXISTING SKYLIGHTS prior to installing ROOF HUGGERS. Run HUGGERS across existing skylight and screw into position.

Cut out and trim opening if new skylights are to be installed above, or leave panel in position if skylights are to be eliminated. Removal of skylight prior to installing HUGGERS may result in an undesirable depression of the new roof over the old skylight area.

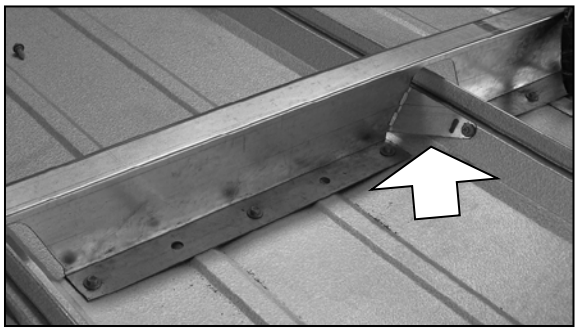
If skylights are to be installed where interior condensation could be an issue, it is desirable to replace the old skylight with a new one and install another new skylight above it to minimize any condensation issues in this area. Consult your local moisture control professional.



Existing Standing Seam Roofs with Tall Clips and/or Thermal Blocks: Existing roofs that have tall clips (clips that hold the roof ½" to 1½" above the purlin) require special attachment.

A special self-drilling fastener or a fastener with a standoff sleeve will be provided by ROOF *HUGGER unless otherwise specified.*

Note: Field verify the standoff by drilling a small hole over the purlin and measure the distance between the existing panel and the existing purlin (typically 1"). The number of fasteners per L.F. is determined by the specific project design, generally four (4) fasteners are required every 24" or three (3) fasteners every 16", however higher loads could require additional attachment. Since the ROOF HUGGER Sub-purlins cannot be pulled down to the existing purlin because of the standoff clip they have been specially designed with an ***"anti-rotational arm or tab***".



This arm prevents the ROOF HUGGER from rolling front to back under load and it is attached with a #17 fastener into the side of the existing panel high rib. Note that if the anti-roll tab is above the side of the existing high rib the ROOF HUGGER may not be pulled fully down into its correct position.

Also note that more holes may be punched into the base flange than are required for attachment. Eave attachment is generally with ¼"-14 x 1-½" Tek-3 (T-3) fasteners since tall clips are not normally used here.

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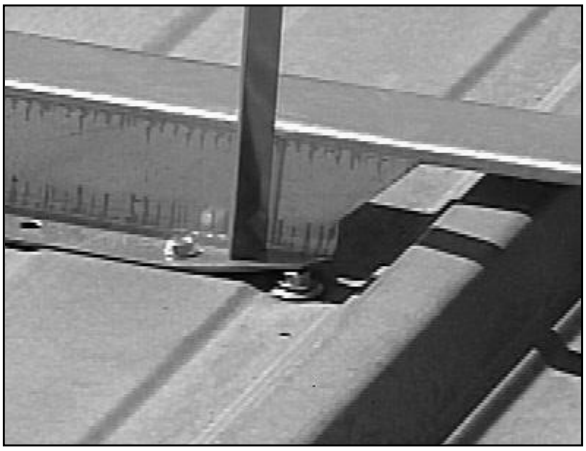
EXISTING FASTENERS:
The existing fasteners can remain provided they do not cause the ROOF HUGGERS to "porpoise" up or roll front to back out of plane with the existing roof.

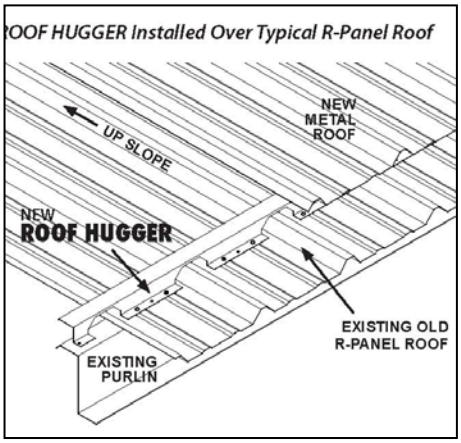


(Typical "R" Panel installation showing the bending of the bottom flange caused by the existing fastener is normal.)

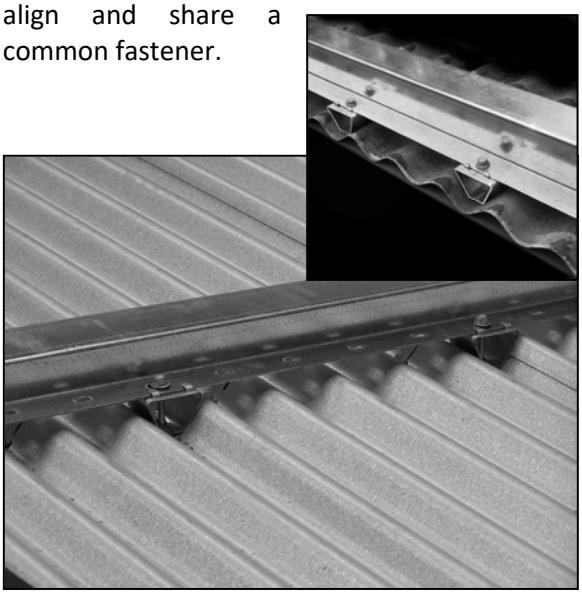
Fasteners located in the center of the pan of the existing sheet may need to be removed. On an 8"-12" o.c. panel this should only occur at a panel lap, ridge cap or eave area. Narrower ribbed panel such as 6" o.c. panels, with fasteners in the center of the sheet pan, may require removal of all fasteners.

ROOF HUGGER can provide special punching to minimize removal of these fasteners if requested during the pricing and ordering of the HUGGERS.

ROOF HUGGER FASTENERS AND FASTENER PATTERNS: ROOF HUGGERS are typically attached with ¼"-14, self-drilling, T-3 fasteners, 14 treads per inch, 1-¼" to 1-½" in length ¼"-14 x 1-½". The number of fasteners per L.F. is determined by ROOF HUGGERS project design or as specified by the engineer of record. Generally speaking, (2) fasteners are required per L.F. for proper attachment. Holes are pre-punched in the bottom flange of the HUGGERS for installation of the fasteners. Note: There may be more holes punched in the base flange than are required for attachment. ROOF HUGGER can provide fasteners if requested.



Installing on Existing Corrugated Panels: ROOF HUGGERS Corru-Fit product for existing 2.50", 2.67" and 2.75" corrugated panels up to 1.25" tall is a 2-part system. A 1.25" triangular shaped spacer and a 1.5" tall slotted Zee. Spacer/fastener spacing is per engineering design, (2.75" total assembly height). Call ROOF HUGGER for estimated loads and spacing (subject to review). Lap ends are designed to align and share a common fastener.



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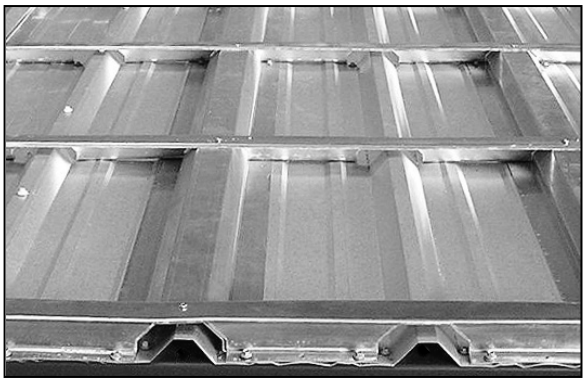
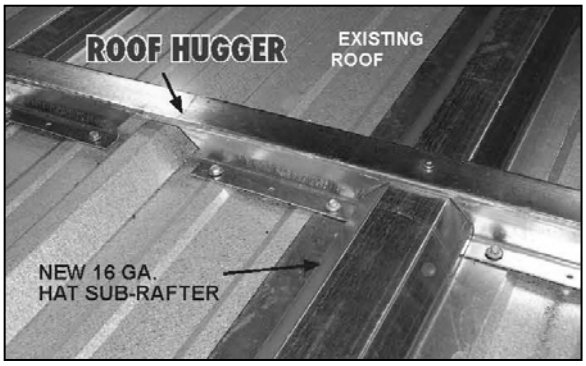
Midspan Attachment: When the existing purlin spacing is not adequate to meet code required loads, ROOF HUGGER will supply an Integral Sub-Rafter System or Hat Grid (see Grid Framing). An Integral Sub-Rafter System means the Sub-Rafters are specifically built to fit the cutout provided in the ROOF HUGGER Sub-Purlin.



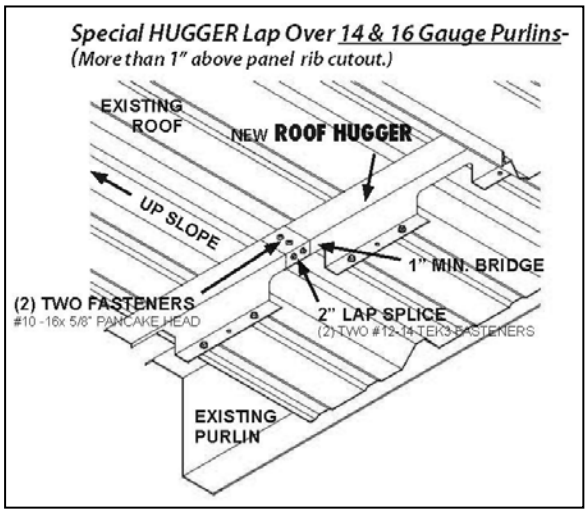
Note: If integral (fit under the HUGGERS) structural Sub-Rafters are provided, loosely place hats and HUGGERS in position prior to installing any fasteners to prevent alignment problems in these areas.



The Sub-Rafters will typically fit over the top of the major panel Ribs between 12”-24” centers. The Sub-Rafters will span from existing purlin to existing purlin and the ROOF HUGGERS will be placed on and into these members. The parts over the existing purlins will have ¼”-14 T3 fasteners installed through the HUGGERS, through the Integral Sub-Rafter, through the existing roof panel and into the existing purlin. Oversize pre-drilling of the HUGGERS at Integral Sub-Rafter is recommended. The number of fasteners will be per the engineered design.
ROOF HUGGERS that are installed “mid-span” between the existing purlins are attached to the Integral Sub-Rafters with ¼”-14 T3 fasteners as specified and if the HUGGERS are to be attached into the old panels the existing ¼” hole in the HUGGER should be drilled out and a #17 fastener installed through the HUGGER into the existing panel, (1) one each side of the major rib. A #10-16 pancake head fastener may also be required between the top flange of the HUGGER and the top of the Integral Sub-Rafter.

Existing Purlin Strengthening: HUGGERS have been tested for the effect they have on strengthening the existing purlins to accommodate the weight of the HUGGERS and new roof panel as well as additional code required snow loads and increased wind loads. If required by design, the following explains the proper Hugger lapping conditions.

Should a panel clip fall in the lap area, (2) clip



fasteners will replace (2) pancake fasteners provided the clip fasteners penetrate both overlapping flanges of the HUGGER. Higher profile HUGGERS (1” or more of material above the rib cutout) receive (2) #10-16 x 1” (or equal)

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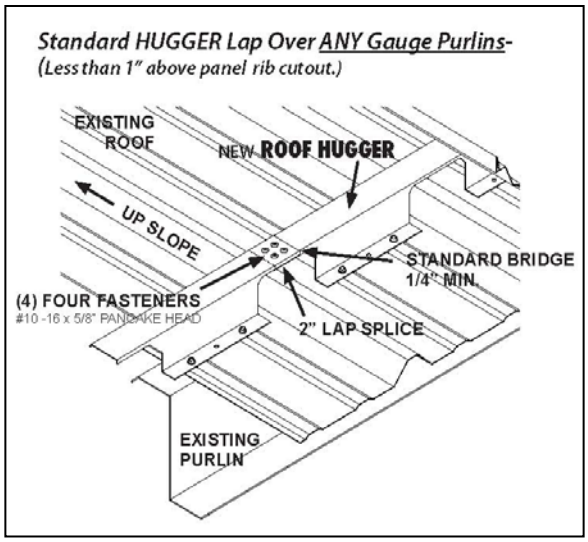
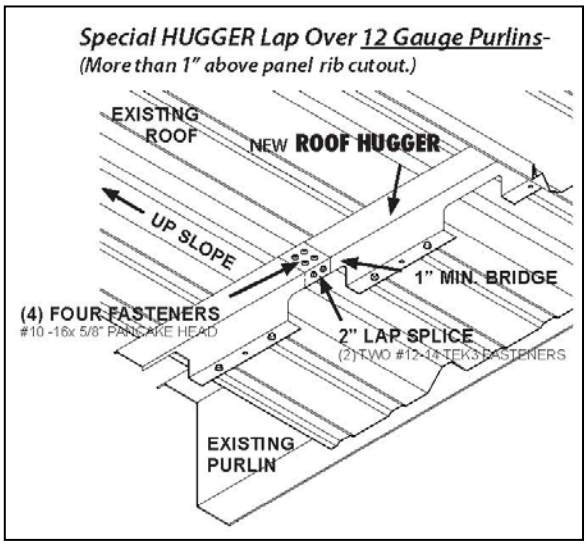
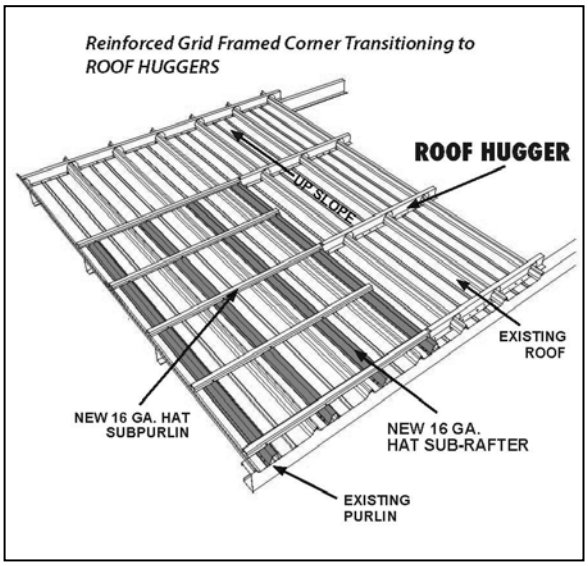
pancake head, self-drilling fasteners in the top flange lap and (2) ¼" x 14 x 1-½" T3 in the vertical web.

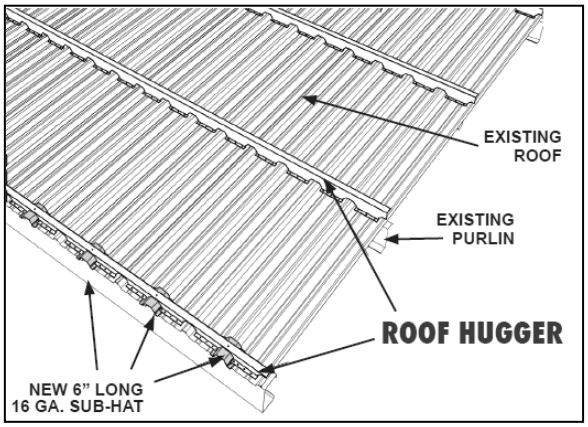




Grid Framing: When needed in the corners and edges, hat channel grid framing may be used. Hats that run parallel to the existing panel ribs between the existing purlins are called "Sub-Rafters". They are normally installed 12"- 24" o.c. with (4) ¼" x 14 x 1¼" T3 fasteners into the existing purlins and are designed to transfer the panel loads back to the existing purlins. The hats that run across these members are called "Sub-Purlins" and they attach on top of and perpendicular to the sub-rafters. They are normally attached with (2) ¼" x 14 x 1-½" T3 fasteners. In some cases, fasteners will attach the sub-rafters to the existing roof panels. *(See your contract installation drawings for details.)*



Eave/Ridge Blocking: To control the direction of motion on floating clip standing seam metal roof systems a "Point of Fixity" is typically required. ROOF HUGGER may specify that one or more purlin lines at the eave or ridge have extra framing to accomplish this. *(See detail below or refer to contract drawings for details.)*



Fastener Types: The following fasteners are those used in typical Roof Hugger installations

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as indicated below. Please note their specific use as described in this section and manual.

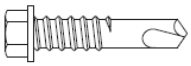
Typical Screw Nomenclature: ¼" -14 x 1 ¼" DP3 or T3 is explained this way: ¼" is screw diameter, – 14 is threads per inch, x 1¼" is length and DP3 or T3 is the type of drilling tip. Please note that in lieu of DP3, Roof Hugger uses Tek-3 or T3 in our standard details and other construction documents to describe any self-drilling screw.

Size: #10-16 X 1" TEK-3
Locations:

A. Attaching Hugger top flange to sub-rafter at corner/edge wind uplift zones
B. At Hugger laps for Purlin Strengthening

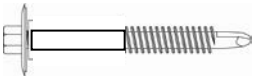
Size: #17-14 AB (washer typically not required)
Locations:

A. Attaching Hugger into existing Roof panels at Mid-span locations
B. Securing Hugger anti-rotational arm to existing Trapezoidal SSR panel rib

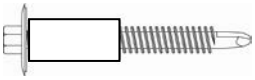


Size: ¼"-14 X 1½" TEK-3
Locations:

A. Attachment of Hugger Sub-Purlin to existing purlin or joist
B. Attachment of Hugger sub-purlin in corner/edge zone to sub-rafter, spanning between existing purlins, to create a mid-span purlin.
C. Securing Hugger anti-rotational arm to existing Vertical Rib SSR panel rib.



Size: ¼"-14 X 2" TEK-3 Special Stand-off Screw
Location: Attachment of Hugger to existing purlin or joist when existing Roof panel is a trapezoidal or vertical rib standing with stand-off clip and thermal spacer. **These fasteners are furnished by Roof Hugger.**



Size: ¼"-14 X 3" TEK-3 with "Spirol" spacer

When in doubt about any special situation, consult your project architect or engineer first. Roof Hugger is also available to discuss any issues or details. In this manner, problems can be avoided and the highest industry standards of a quality installation will be assured.

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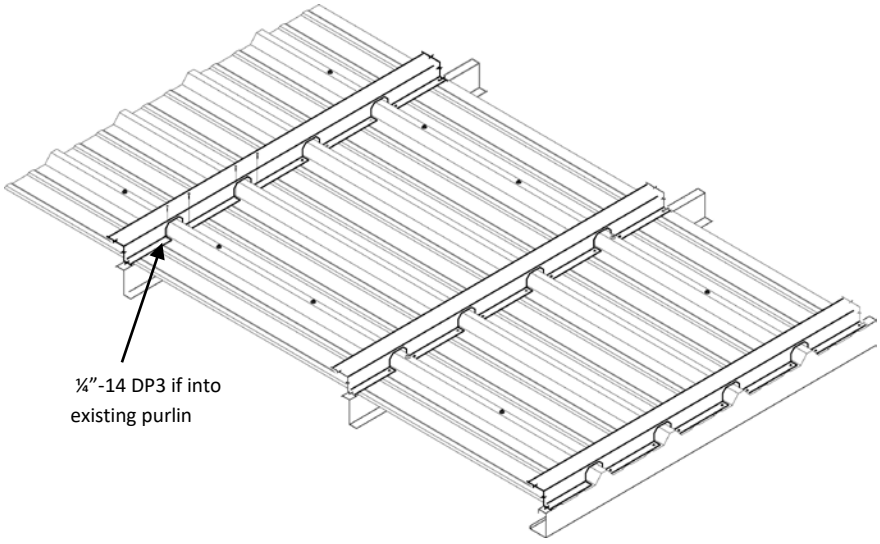
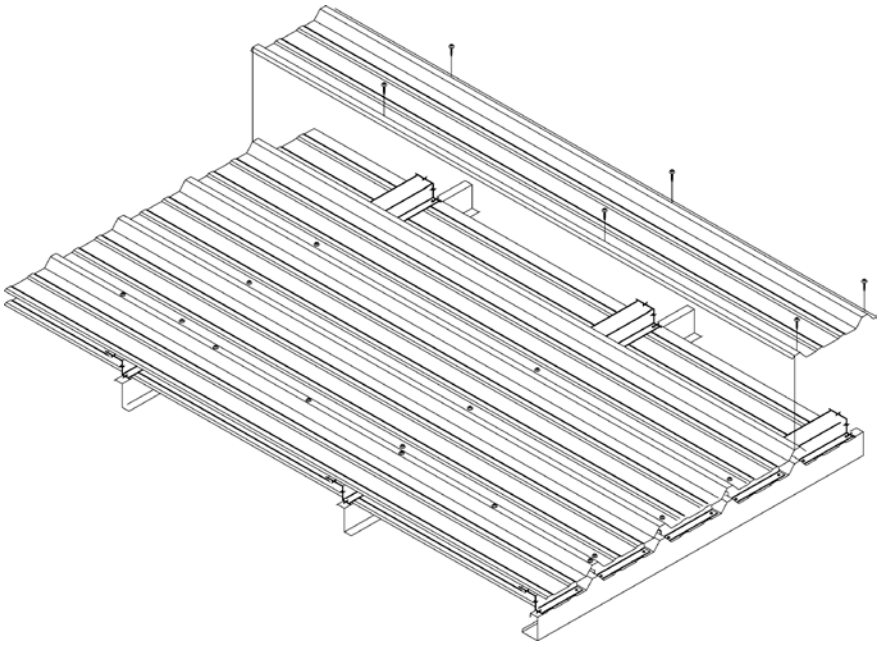
Step-by-Step Hugger Installation

Standard Installation (Corner/Edge Zone Framing not required)

Step 1: Install Huggers directly over and into existing building purlins with ¼”-14 TEK-3 self-drilling fasteners. Center existing panel’s major rib in Hugger cut-out. Ensure Hugger straightness along purlin run by frequently monitoring dimension from existing Roof eave. Stringlines can be used if elected by Installer.



Step 2: Install metal Roof panel system in accordance with manufacturer’s standards



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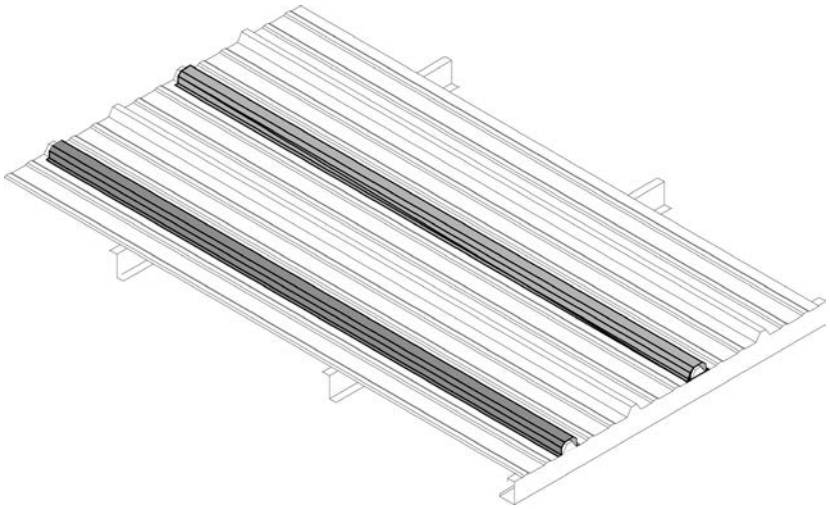
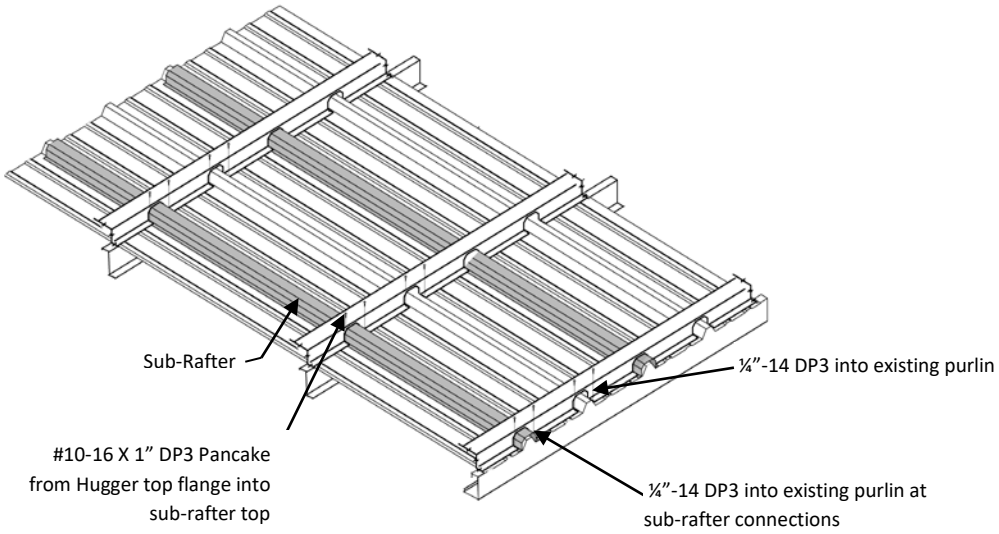
Step-by-Step Hugger Installation

Corner and/or Edge Zone Framing Installation

Step 1: Loosely place Hugger sub-rafters spaced perpendicular to Roof slope as directed (normally no more than 2'-0" o.c.). DO NOT ATTACH sub-rafters until new Huggers have been placed into position.



Step 2: Place new Huggers into position ensuring all new sub-framing is square and tightly fitted. Secure the positioning of the Huggers and sub-rafters by installing one ¼"-14 at juncture of the two members (Hugger top flange into top of sub-rafter). Begin final attachment of members at juncture of the Hugger and sub-rafter's base flanges for locations that are directly over an existing purlin using ¼"-14 TEK-3 fasteners at each side of sub-rafter.



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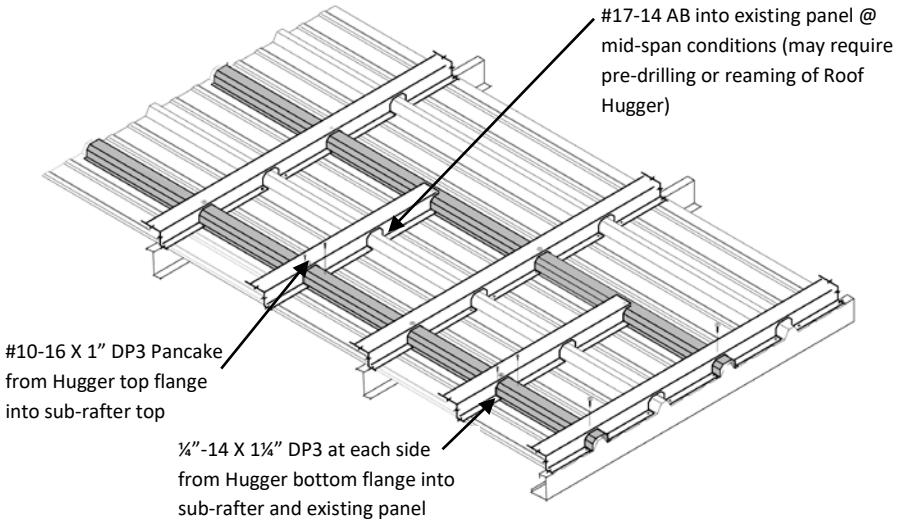
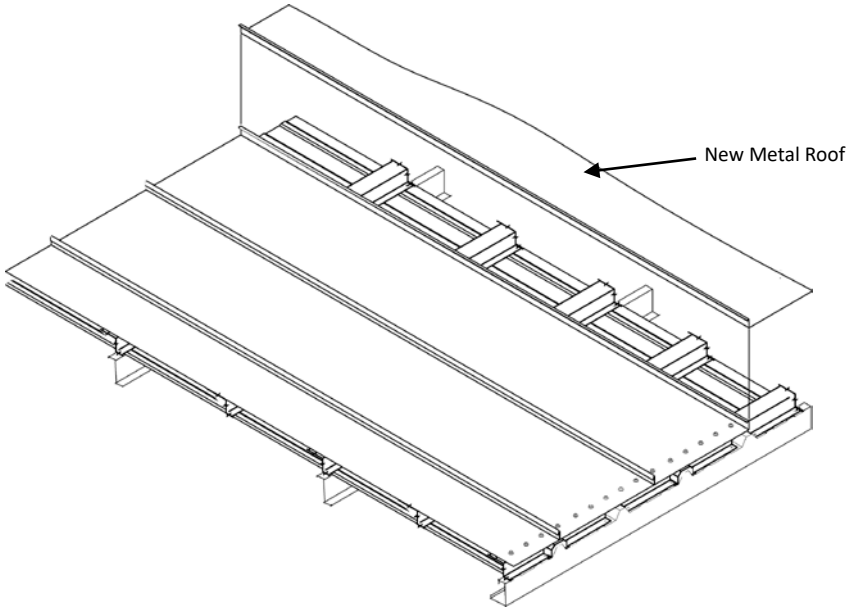
Step-by-Step Hugger Installation

Step 3: Begin positioning mid-span Huggers as directed. These are the Huggers that will not be installed over an existing purlin, rather over the existing panel only. Once in place, install a #17-14 AB fasteners through the Hugger into the existing Roof panel at each side of the panel's major rib. Pre-drilling of Hugger may be necessary. Complete installation by installing a #10-16 TEK-3 Pancake at the intersection of each Hugger and sub-rafter. Refer to page 34 for more information.



Step 3: Install metal Roof panel system in accordance with manufacturer's standards



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Structural Hat Grid Framing

Corner and/or Edge Zone Framing Installation using Structural Hats

Dependent on panel clip attachment and wind uplift tested values, usually in higher wind zone areas, Roof Hugger will have to utilize structural 16 GA hat-shaped members to make up the corner and/or edge zone framing. The illustration below explains the difference, but you can review page 66 for more detailed information.

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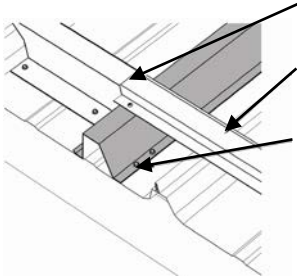

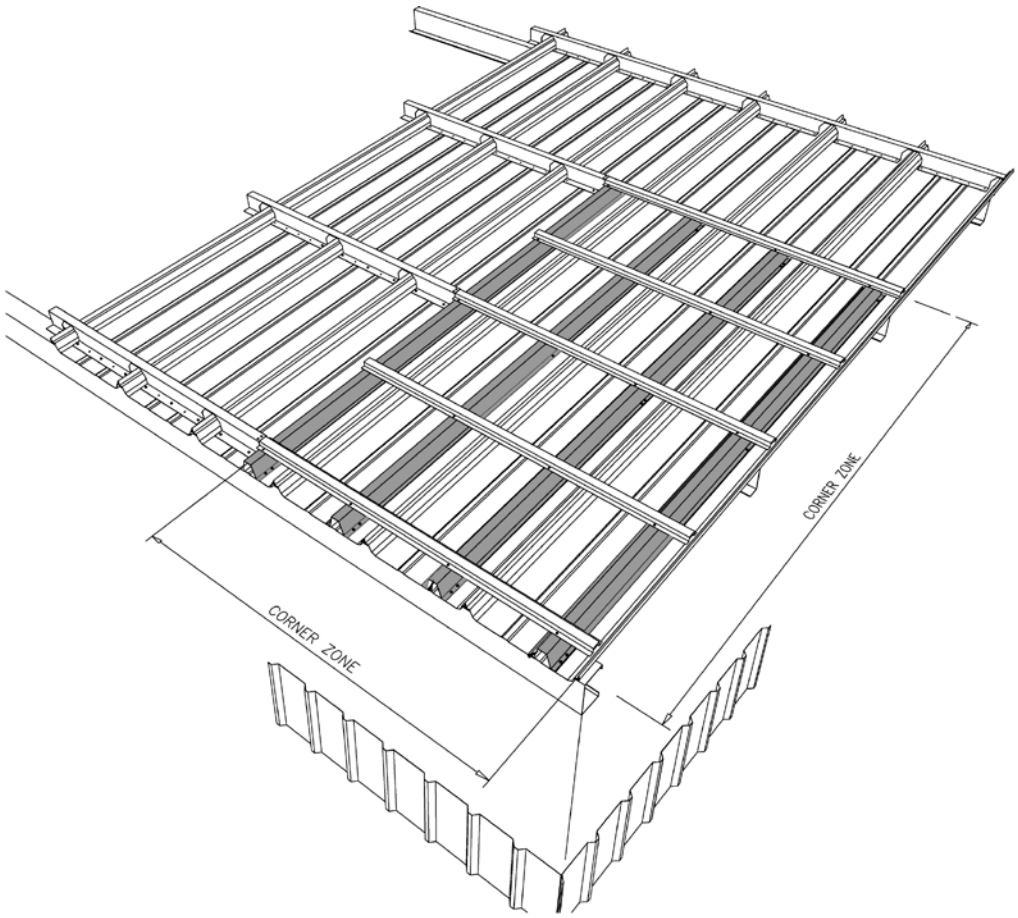

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Standard Construction Details

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Standard Construction Details

Hugger Corner/Edge Wind Zone Framing with various existing roof panels		
3D – Huggers over existing "R" panel using sub-rafters	63	ZF-01-R
3D – Huggers over existing trapezoidal SSR using sub-rafters	64	ZF-02-T
3D – Huggers over existing vertical rib SSR using sub-rafters	65	ZF-03-V
3D – special "Hat Grid" framing over existing trapezoidal SSR	66	ZF-04-R
Low Eave Conditions with various existing roof panels		
2D – Vented or non-vented with/without gutter – generic panels	67	LE-01-G
3D – new "R" or "PBR" panel roof over existing "R" panel roof	68	LE-02-R/R
3D – new trapezoidal SSR roof over existing "R" panel roof	69	LE-02-T/R
3D – new trapezoidal SSR roof over existing trapezoidal SSR roof	70	LE-03-T/T
3D – new trapezoidal SSR roof over existing vertical rib SSR roof	71	LE-04-T/V
3D – new vertical rib SSR over existing vertical rib SSR roof	72	LE-05-V/V
3D – new vertical rib SSR over existing "R" panel roof	73	LE-06-V/R
3D – new vertical rib SSR over existing trapezoidal SSR roof	74	LE-07-V/T
High Eave Conditions with various existing roof panels		
2D – non-vented high eave with any roof panels	75	HE-01-G
3D – new "R" or "PBR" panel roof over existing "R" panel roof	76	HE-02-R/R
3D – new trapezoidal SSR roof over existing "R" panel roof	77	HE-02-T/R
3D – new trapezoidal SSR roof over existing trapezoidal SSR roof	78	HE-03-T/T
3D – new trapezoidal SSR roof over existing vertical rib SSR roof	79	HE-04-T/V
3D – new vertical rib SSR roof over existing vertical rib SSR roof	80	HE-05-V/V
2D – vented high eave with any roof panels	81	HE-06-V/T
3D – new vertical rib SSR roof over existing "R" Panel roof	82	HE-07-V/R
Rake Conditions with various existing roof panels		
2D - new "R" or "PBR" panel roof over existing "R" panel roof	83	RE-01-R/R
2D – new trapezoidal SSR roof over existing "R" panel roof	84	RE-02-T/R
2D – new trapezoidal SSR roof over existing trapezoidal SSR roof	85	RE-03-T/T
2D – new vertical rib SSR roof over existing "R" panel roof	86	RE-04-V/R
2D – new vertical rib SSR roof over existing vertical rib SSR roof	87	RE-05-V/V
2D – new vertical rib SSR roof over existing trapezoidal SSR roof	88	RE-06-V/T
Ridges, Hips, Valleys, Roof-to-Wall Conditions and Roof Expansion Joint		
2D – non-vented ridge with any new SSR type roof systems	89	RD-01-G
2D – vented ridge with any new SSR type roof systems	90	RD-02-GV
3D – hip for any new SSR type roof systems	91	HP-01-G
3D – valley for any new SSR type roof systems	92	VL-01-G
2D – valley for any new SSR type roof systems	93	VL-02-G

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Standard Construction Details

2D – valley gutter with any new SSR type roof systems	94	VG-01-G
2D – typical Lean-to Step condition or any type roof systems	95	LT-01-G
2D – pitch-break/roof-to-wall with any new SSR type roof systems	96	PB-01-G
2D – rake-to-wall with new trapezoidal SSR roof over existing “R” panel roof	97	RW-01-T/R
2D – rake-to-wall with new trapezoidal SSR roof over existing trapezoidal roof	98	RW-02-T/T
2D – rake-to-wall with new trapezoidal SSR roof over existing vertical rib SSR	99	RW-03-T/V
2D – rake-to-wall with new vertical rib SSR roof over existing “R” panel roof	100	RW-04-V/R
2D – rake-to-wall with new vertical rib SSR roof over existing vertical rib SSR	101	RW-05-V/V
2D – rake-to-wall with new vertical rib SSR roof over existing trapezoidal SSR	102	RW-06-V/T
2D – Huggers at existing panel expansion joints – New trapezoidal SSR over existing “R” panel roof	103	EJ-01-T/R

PLEASE NOTE: All standard details were specifically created to illustrate the installation of Roof Hugger’s retrofit sub-framing systems only. Even though they include the new metal roof system and its flashing, trim and fastening methods, they are not intended to replace any metal roof manufacturer’s recommended details. Refer to your selected metal roof manufacturer’s details to comply with their requirements.

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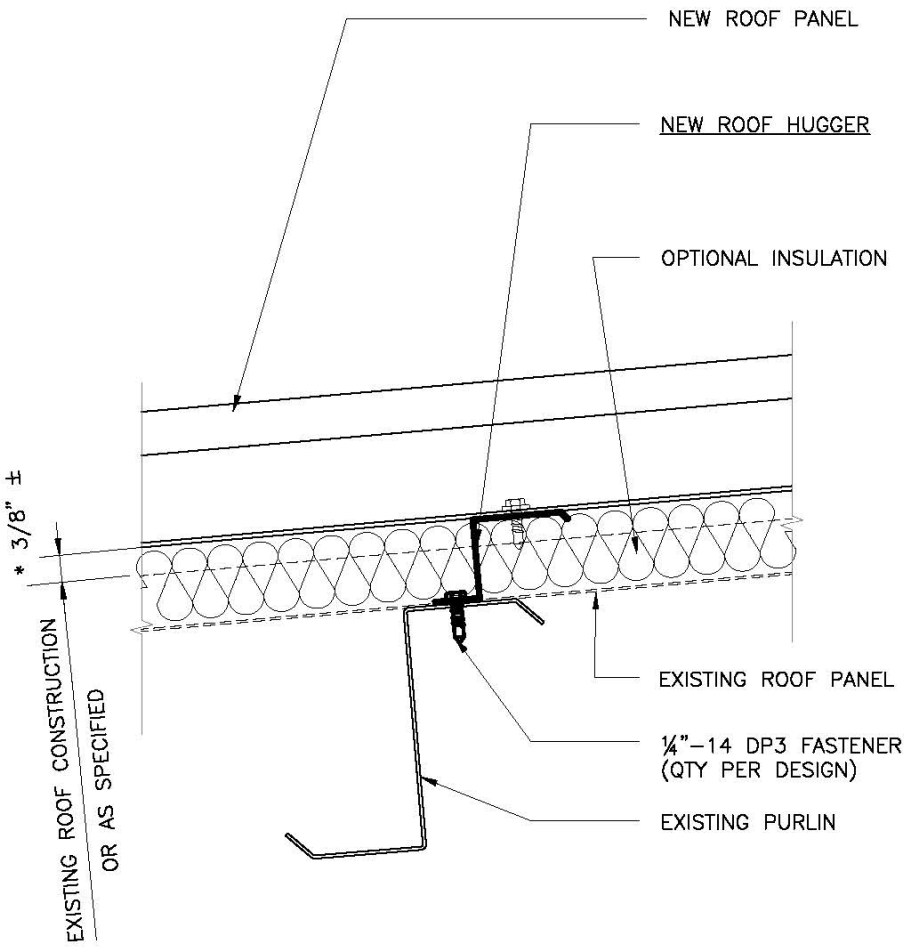
Hugger Attachment (HA-01-G)



* ROOF HUGGERS ARE MANUFACTURED TO ALLOW 3/8"–1/2" MIN. ABOVE EXISTING PANEL RIB/SEAM. THIS DIMENSION MAY VARY TO ACCOMMODATE MATERIAL UTILIZATION AND SCRAP REDUCTION ON CUSTOM ROOF HUGGERS

NOTES:

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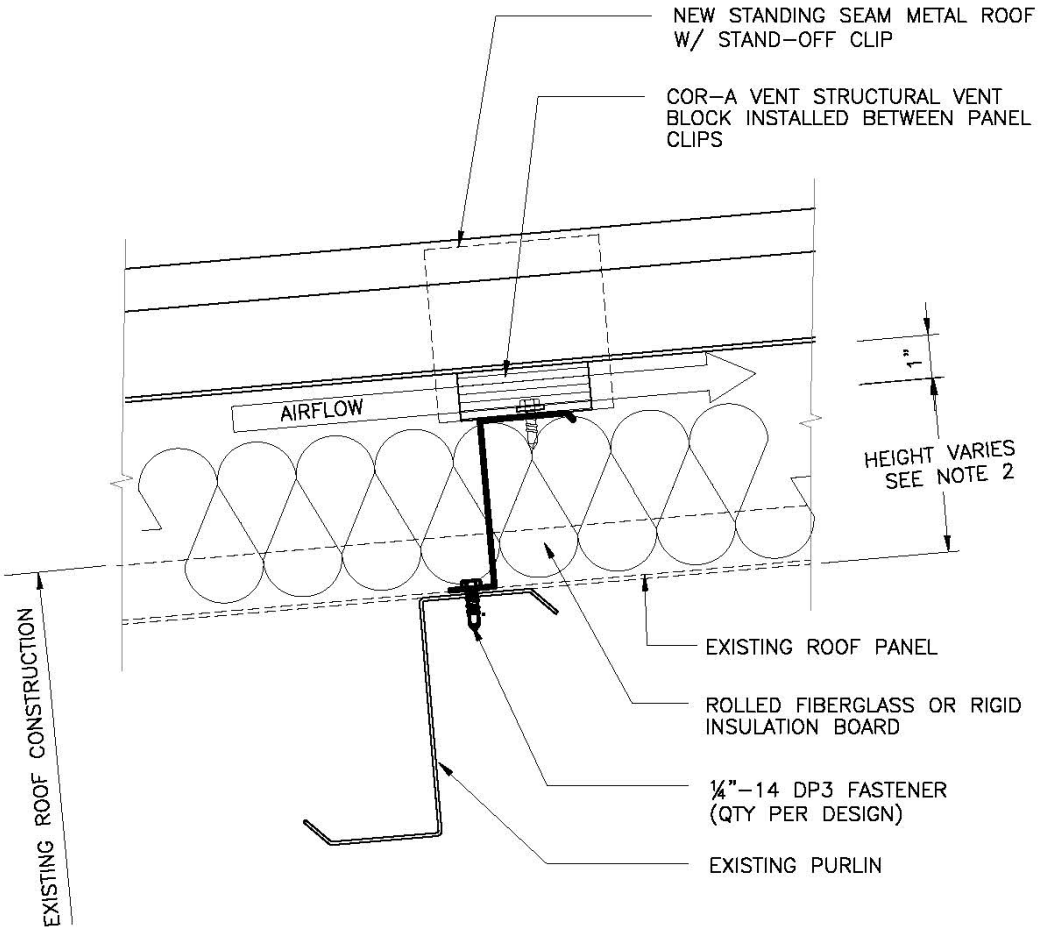
Hugger Attachment (HA-02-GV-F)



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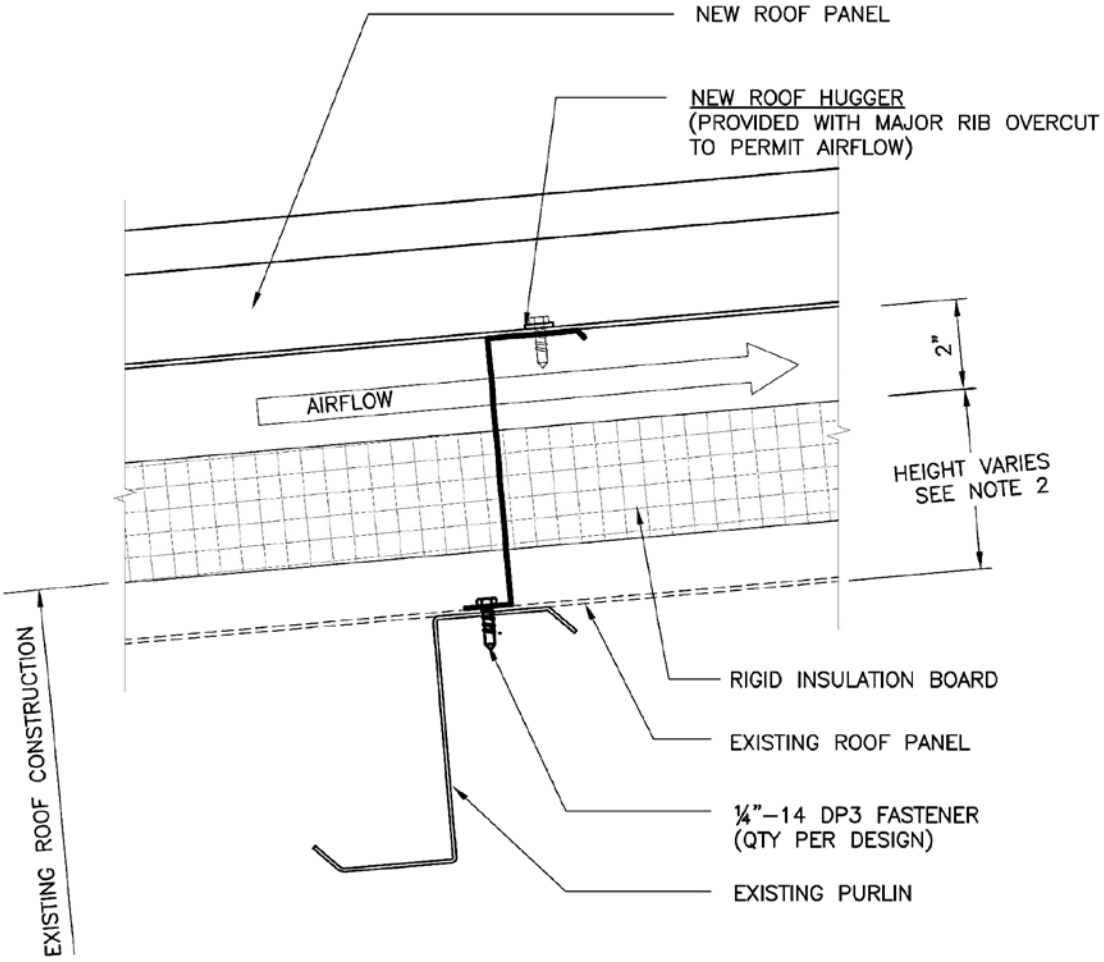
Hugger Attachment (HA-02-GV-R)



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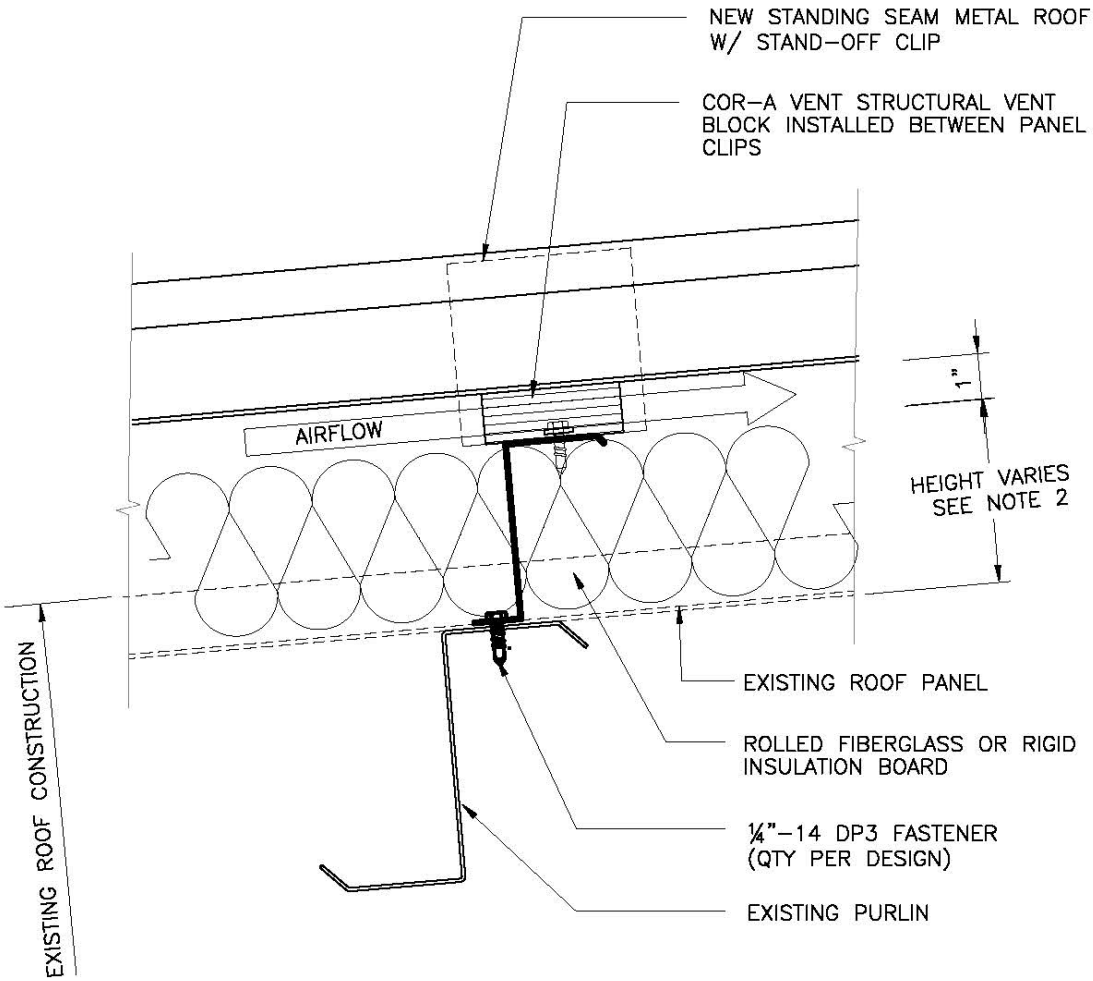
Hugger Attachment (HA-02-GV-CV)



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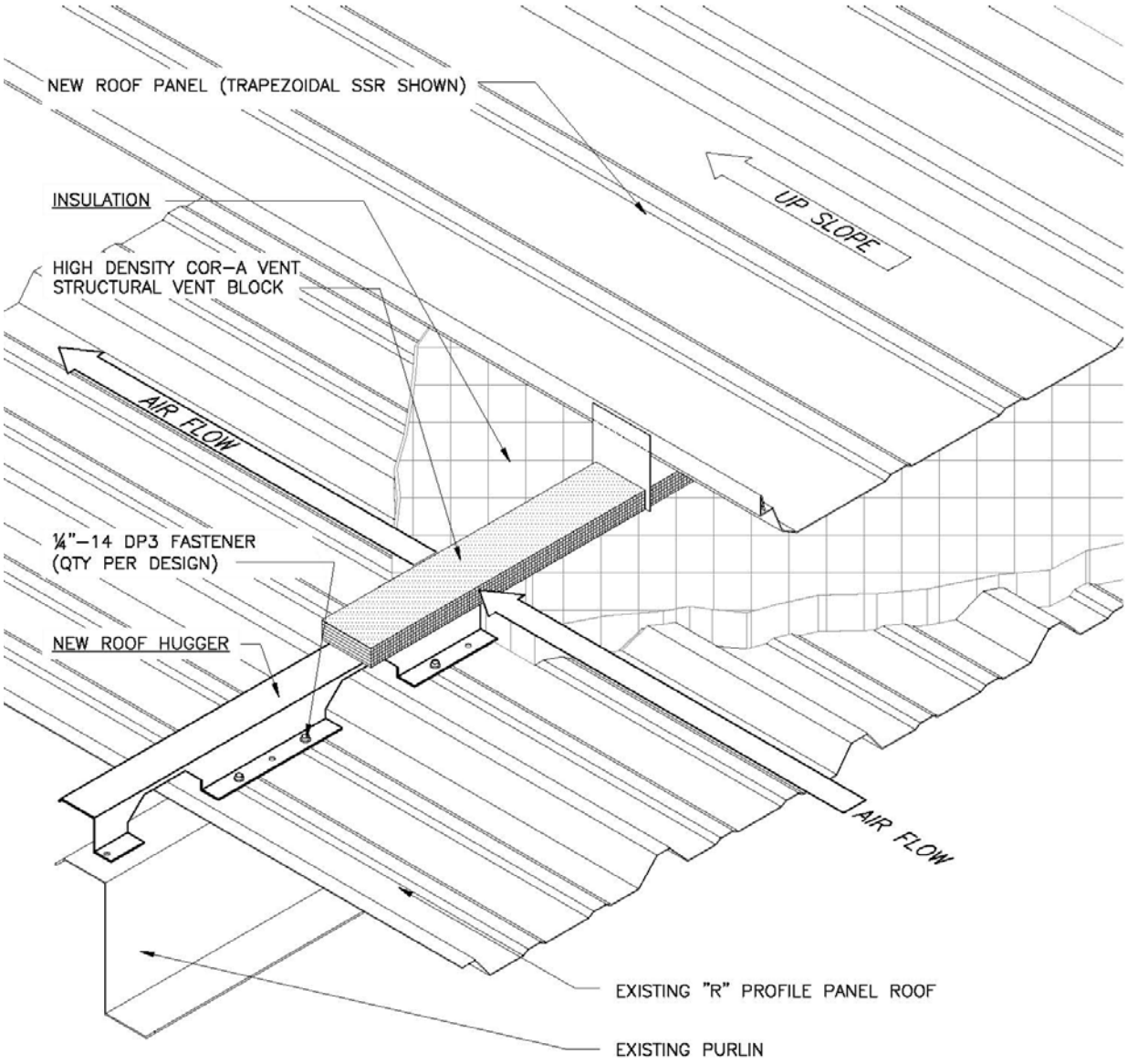
Hugger Attachment (HA-02-T/R-CV)



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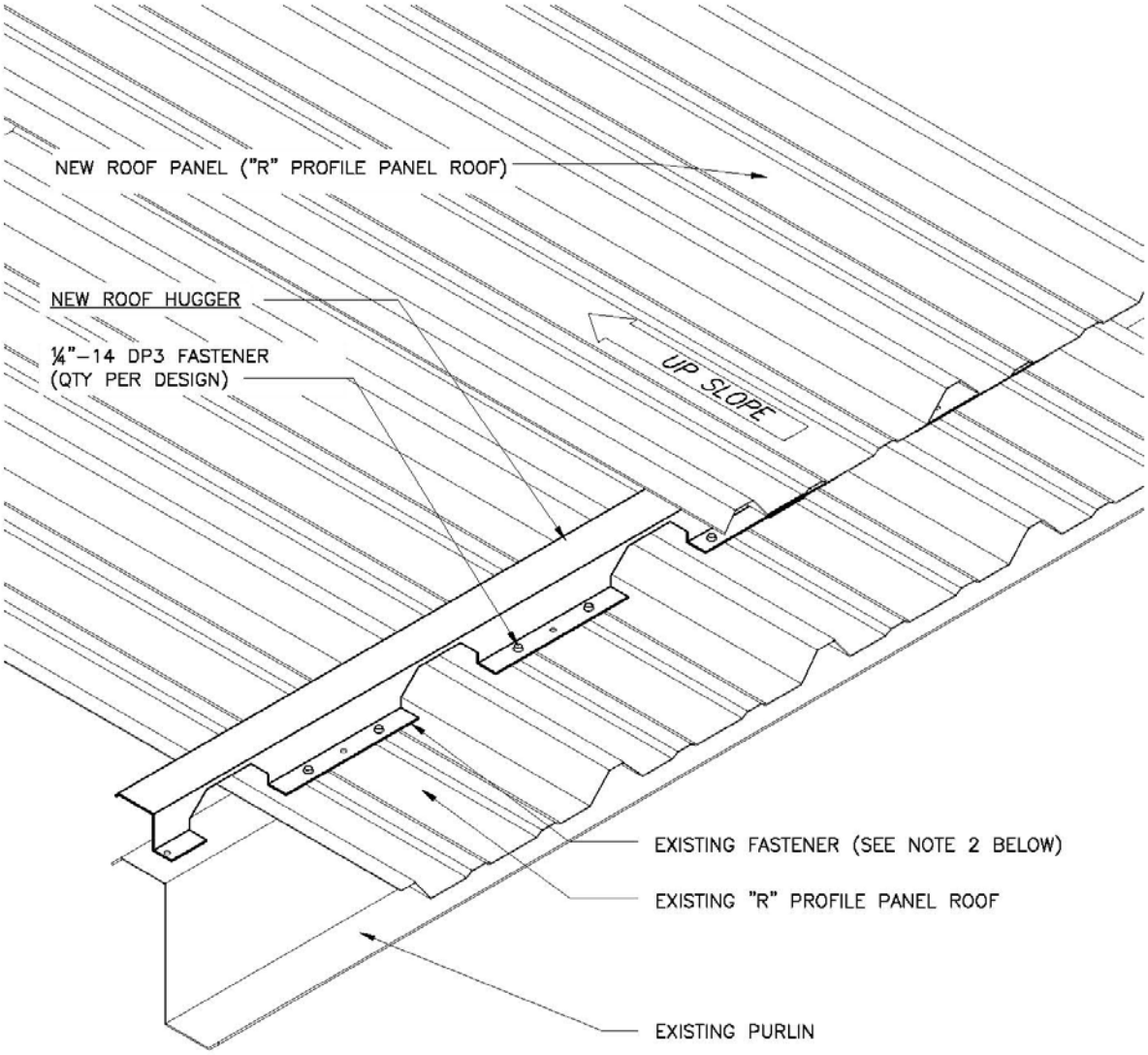
Hugger Attachment (HA-03-R/R)



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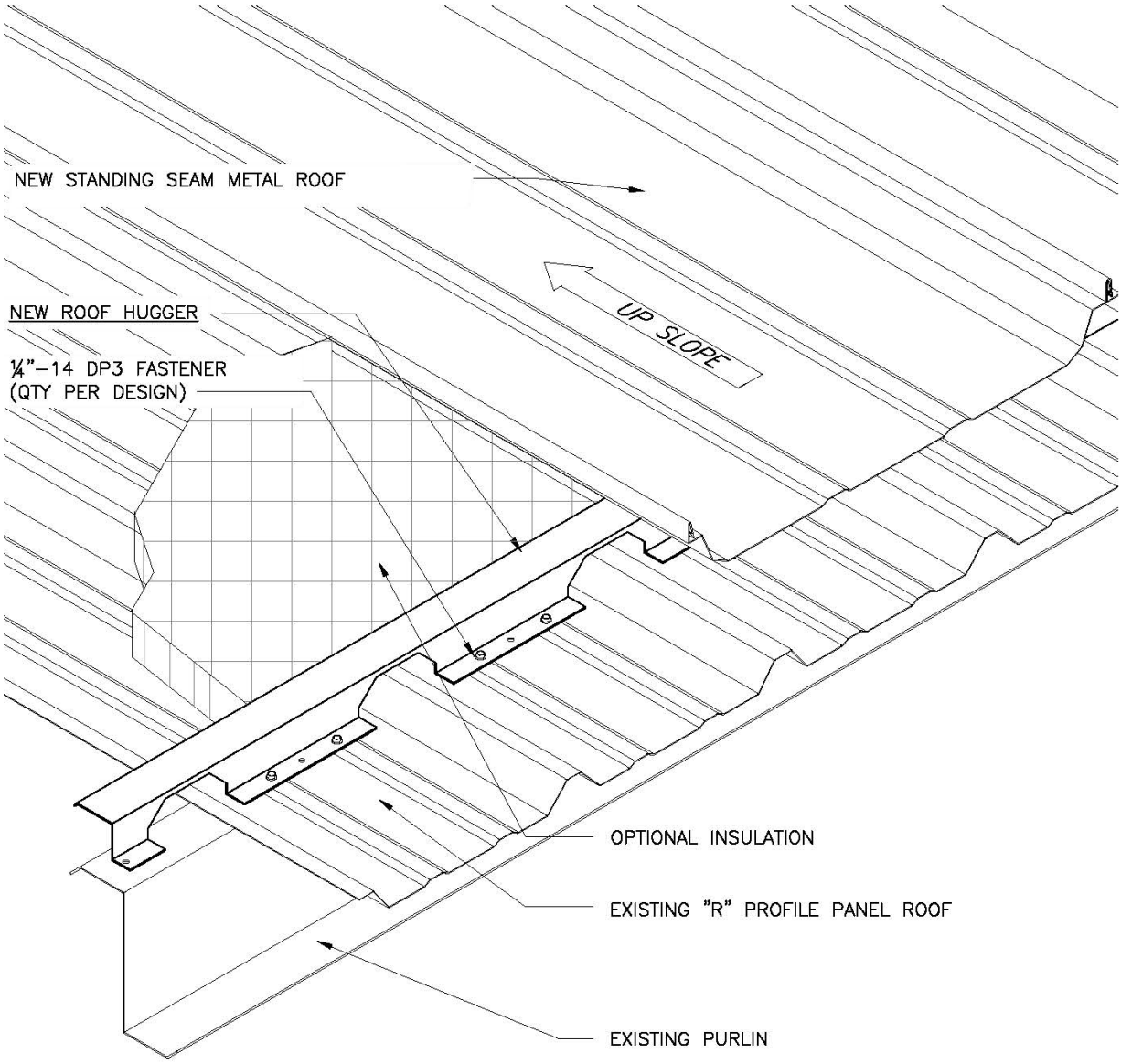
Hugger Attachment (HA-03-T/R)



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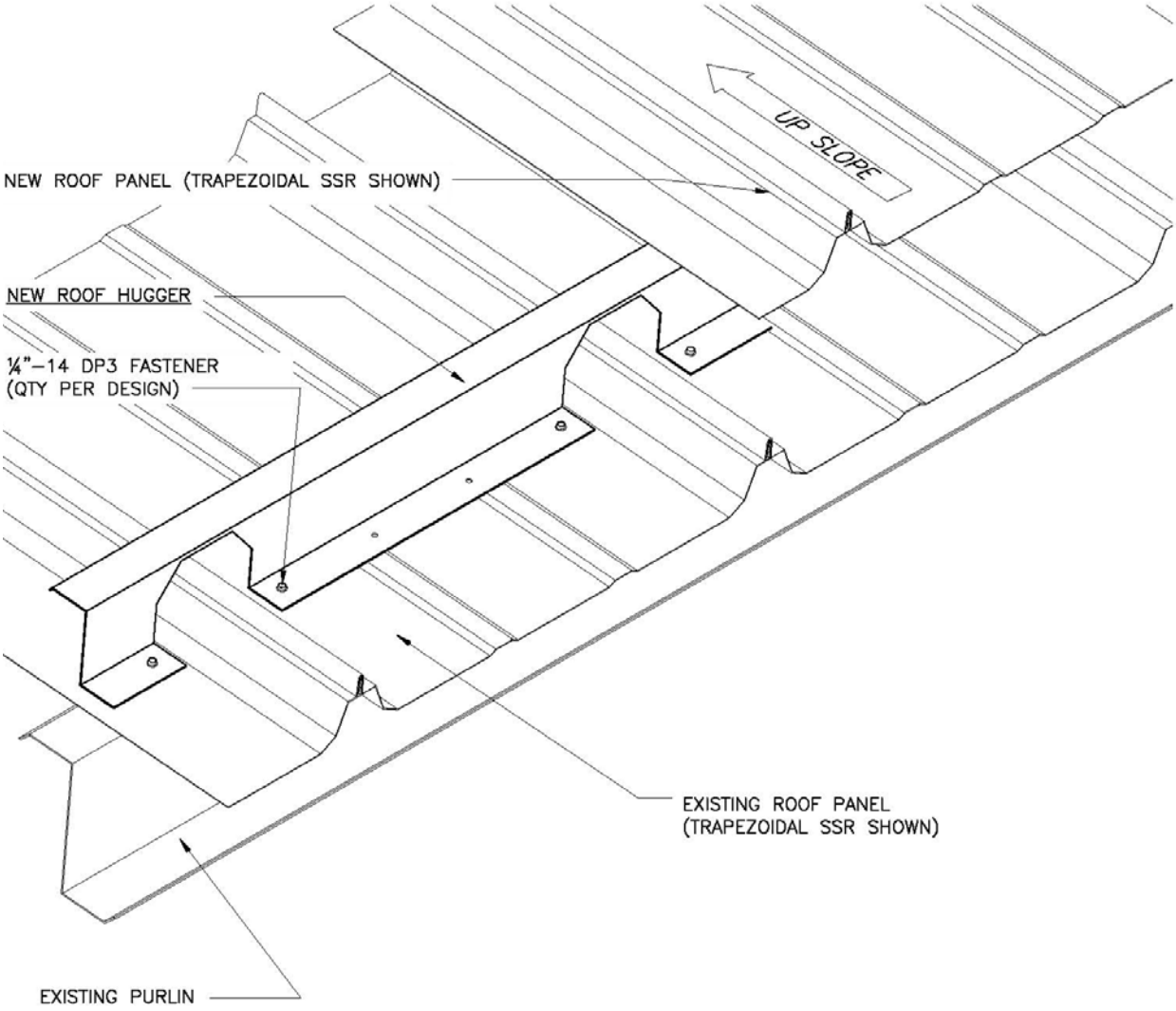
Hugger Attachment (HA-04-T/T)



NOTES:

1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE.
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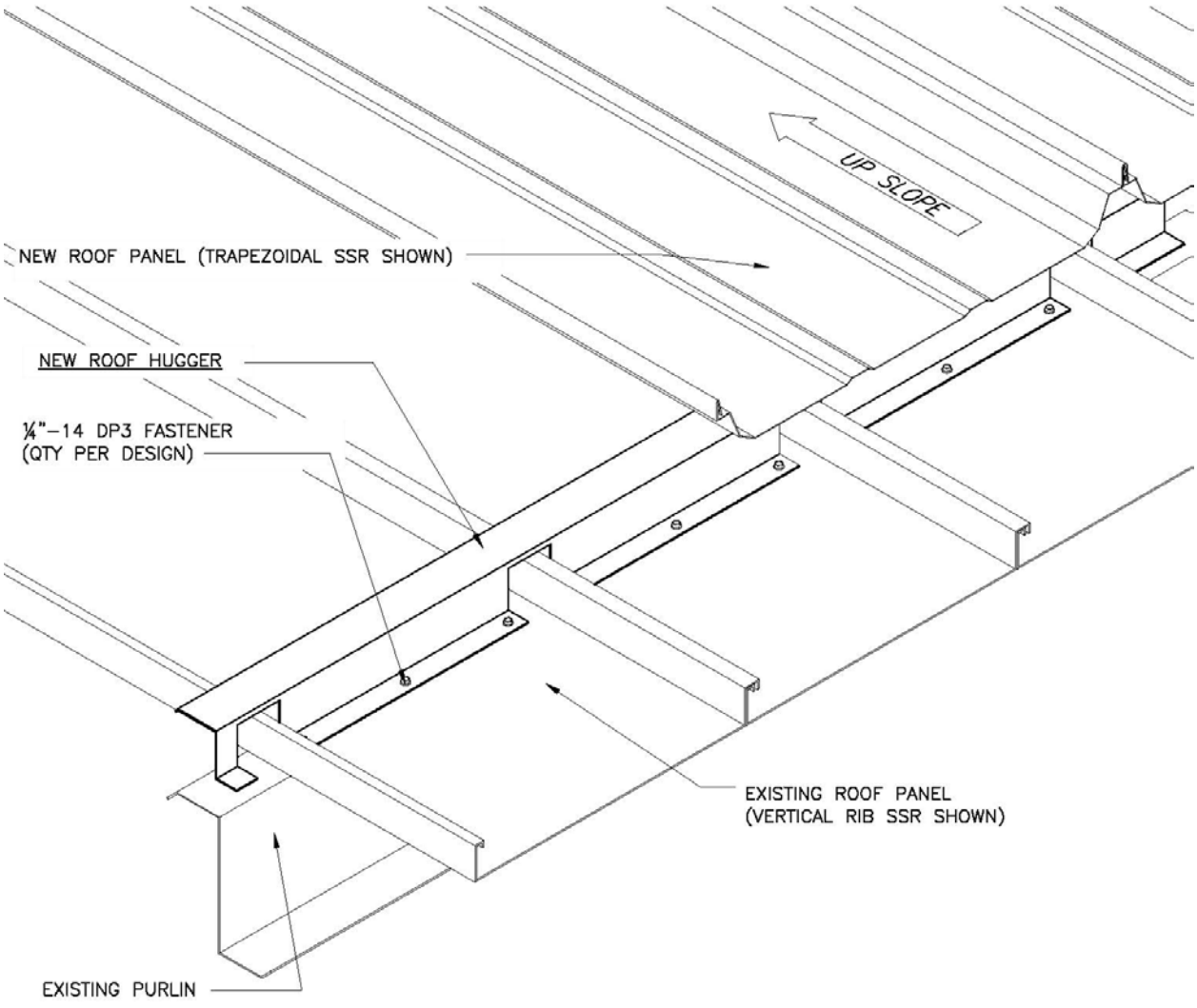
Hugger Attachment (HA-05-T/V)



NOTES:

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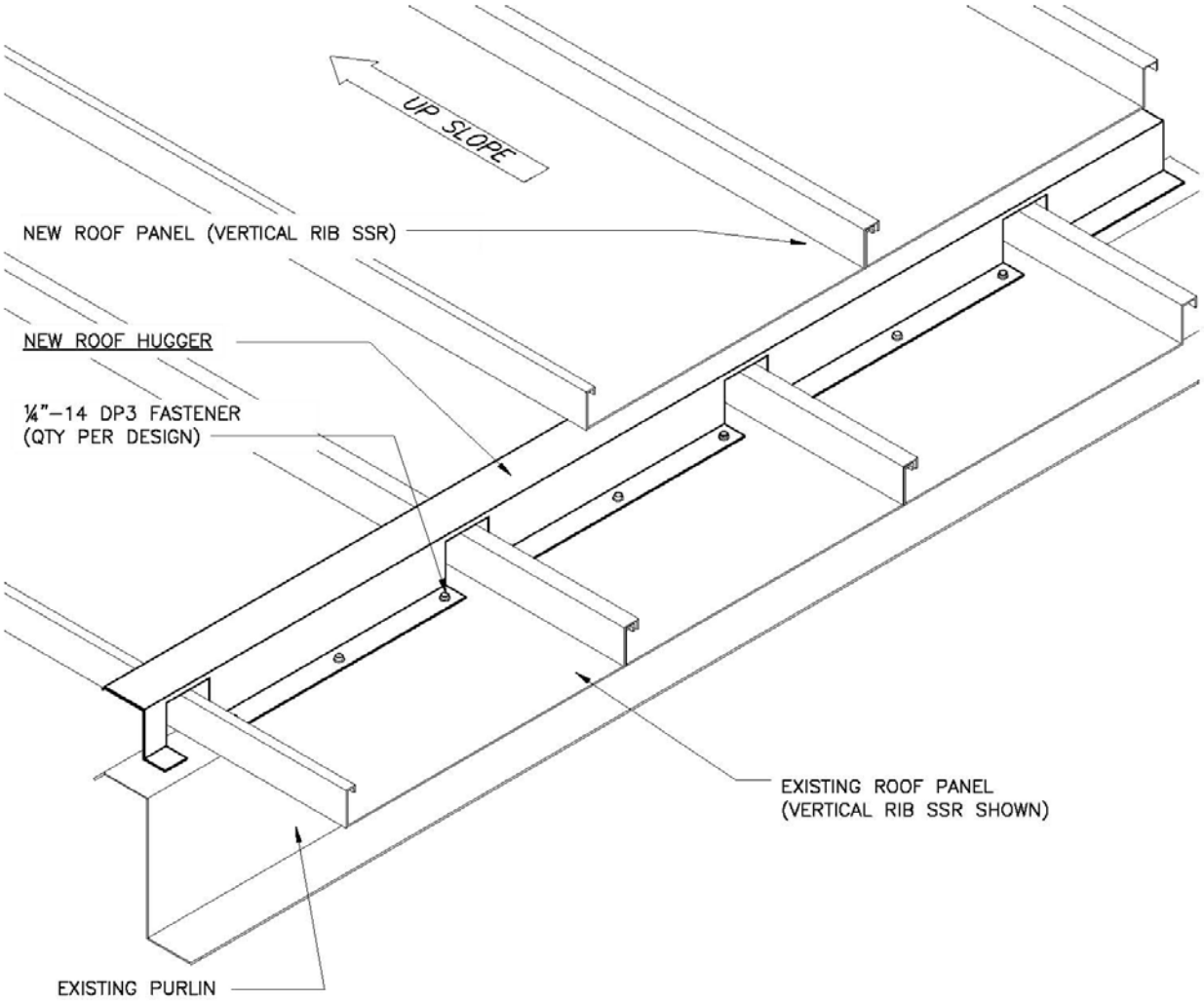
Hugger Attachment (HA-06-V/V)



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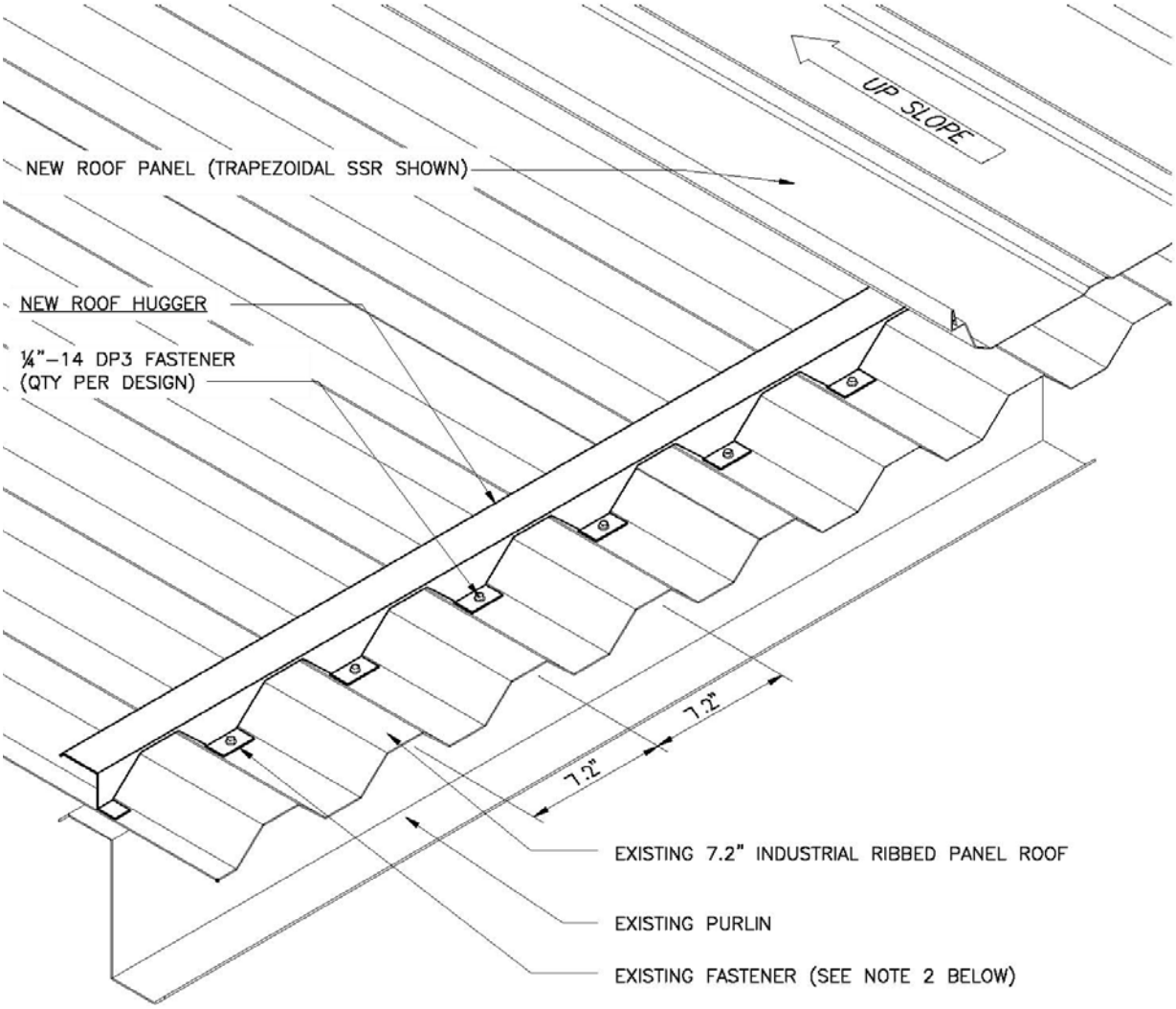
Hugger Attachment (HA-07-T/7.2)



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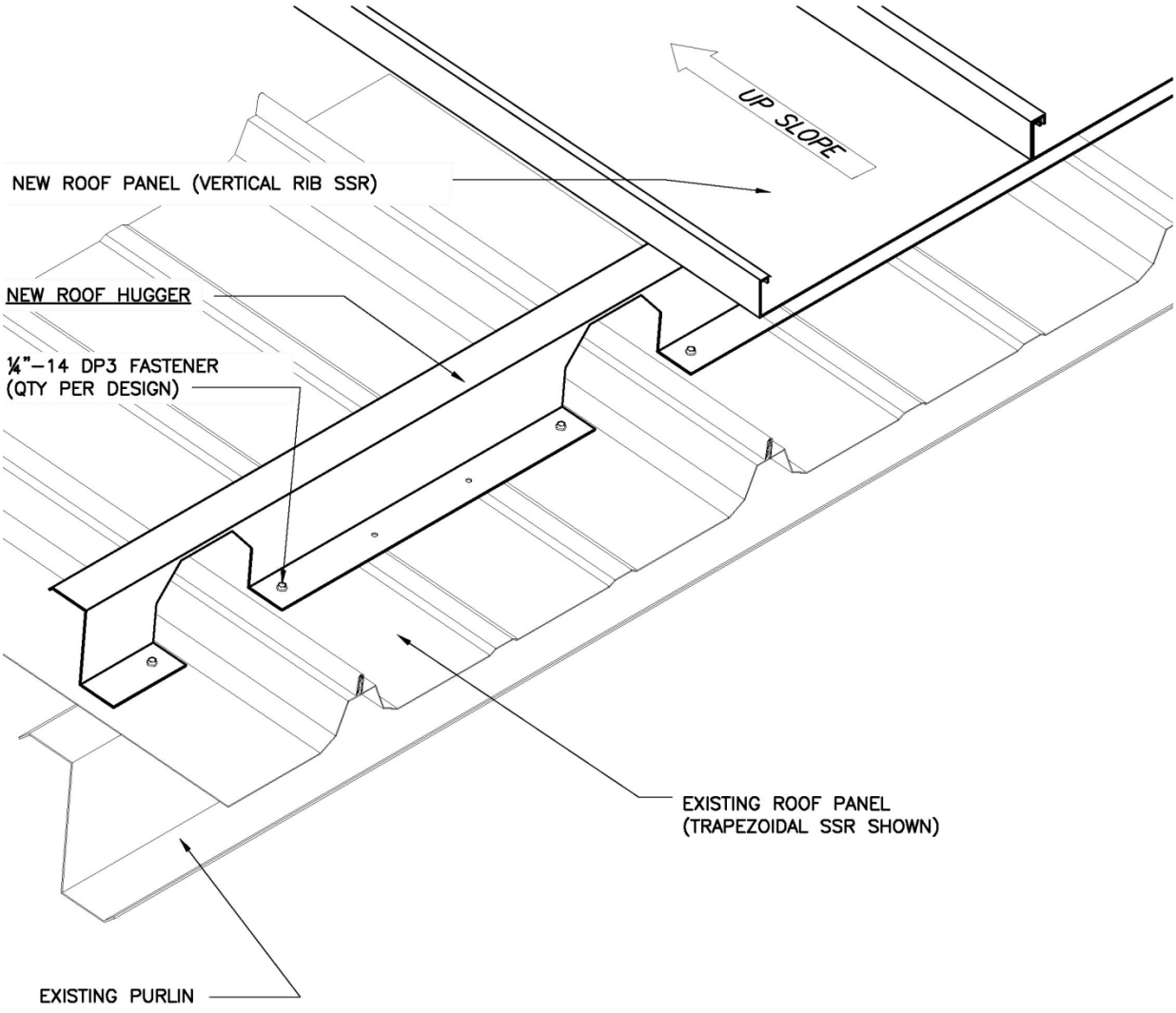
Hugger Attachment (HA-08-V/T)



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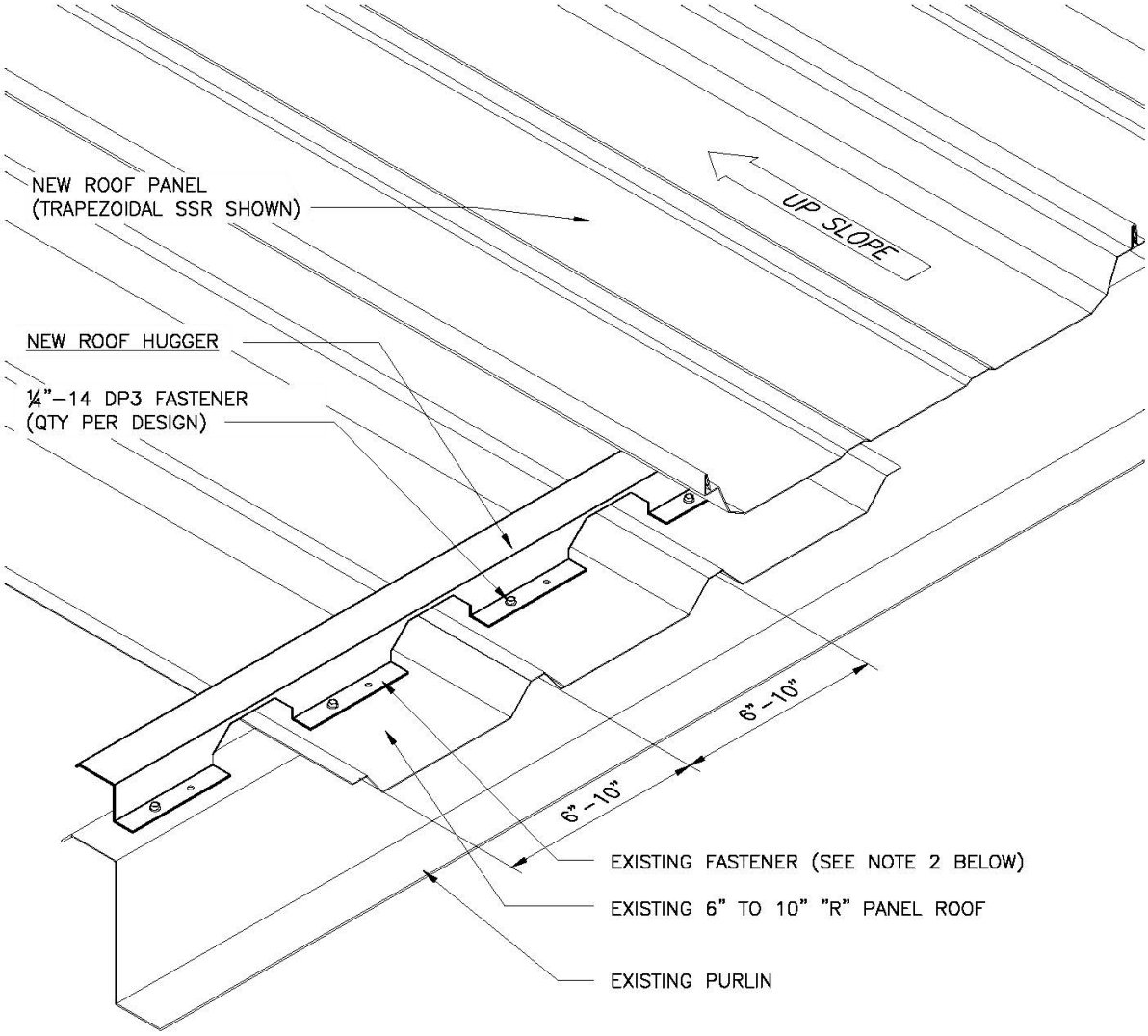
Hugger Attachment (HA-09-T/6-10)



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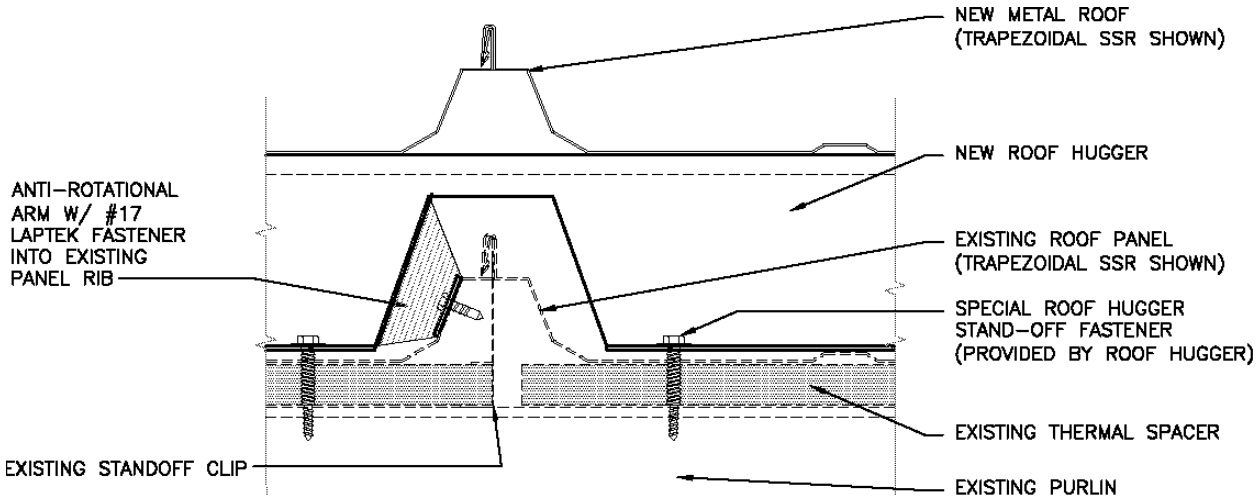
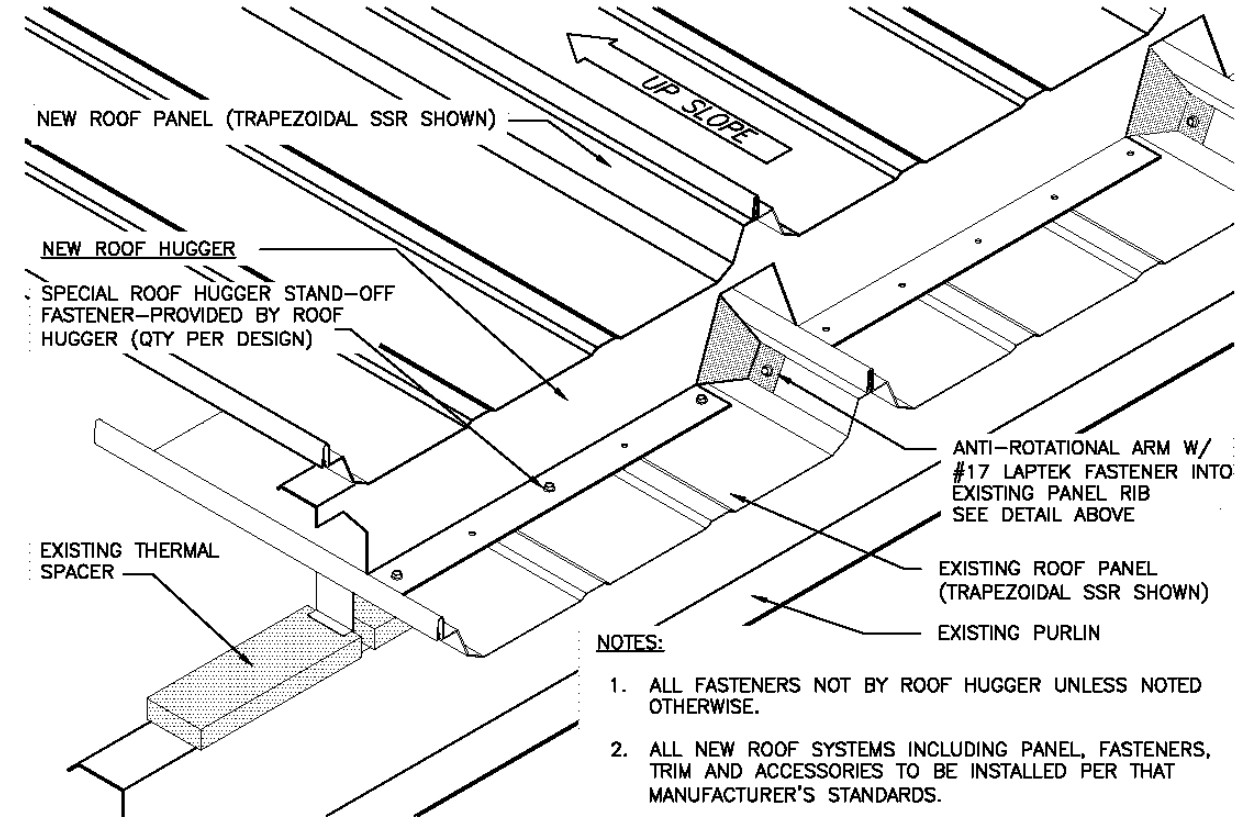
Hugger Attachment (HA-10-T/TSO)

For Existing Trapezoidal SSR Roofs with Thermal Blocks and/or Stand-off Clips





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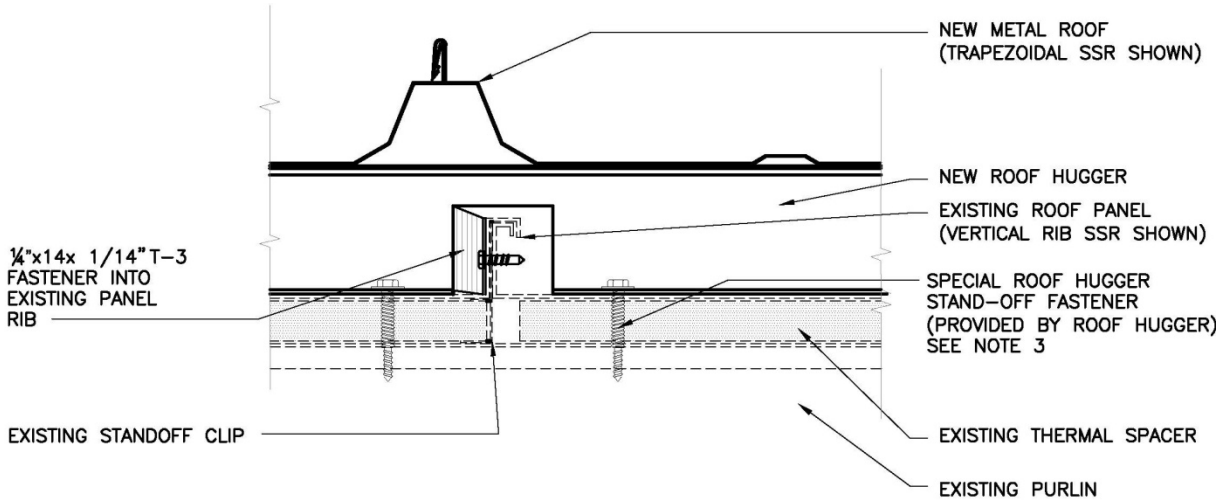
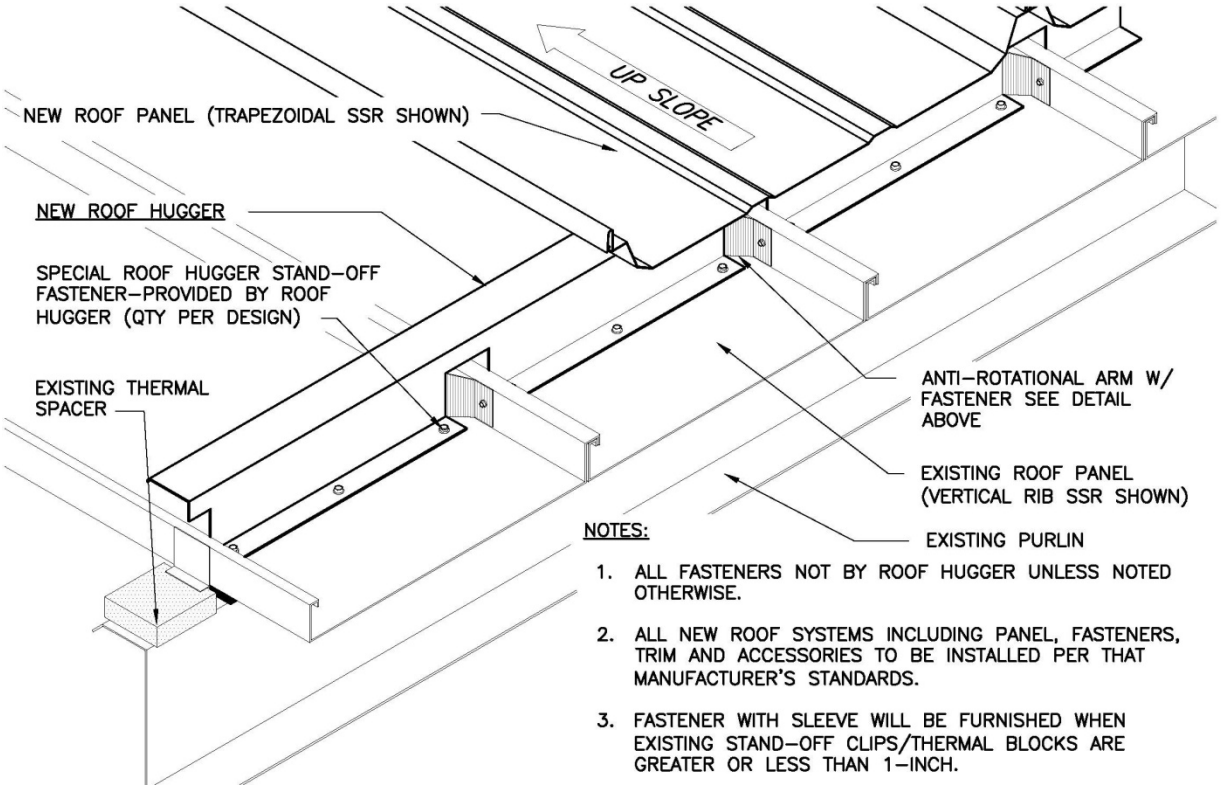
Hugger Attachment (HA-11-T/VSO)

For Existing Vertical Rib SSR Roofs with Thermal Blocks and/or Stand-off Clips





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3. FASTENER WITH SLEEVE WILL BE FURNISHED WHEN EXISTING STAND-OFF CLIPS/THERMAL BLOCKS ARE GREATER OR LESS THAN 1-INCH.

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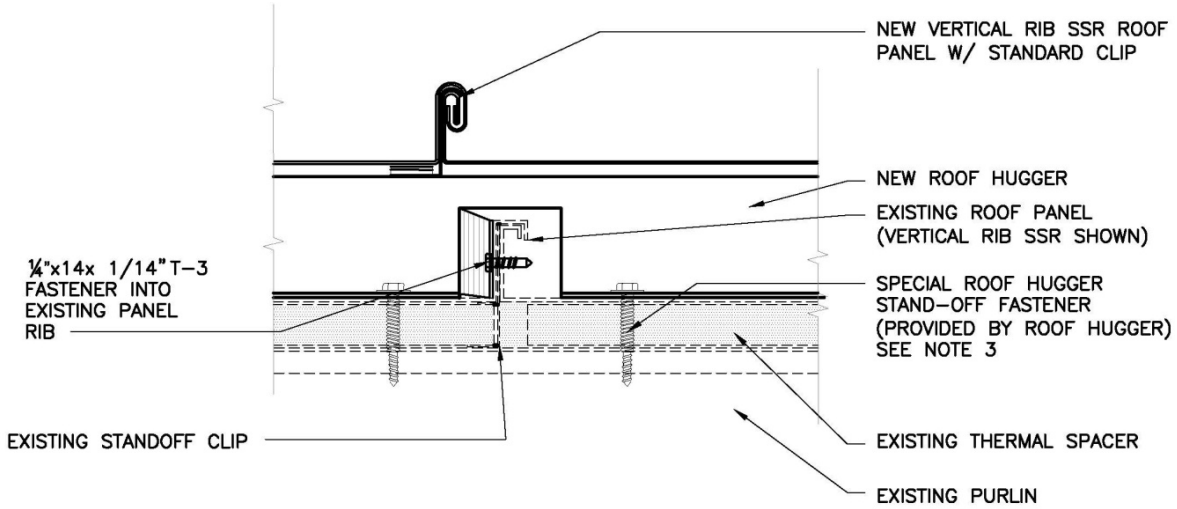
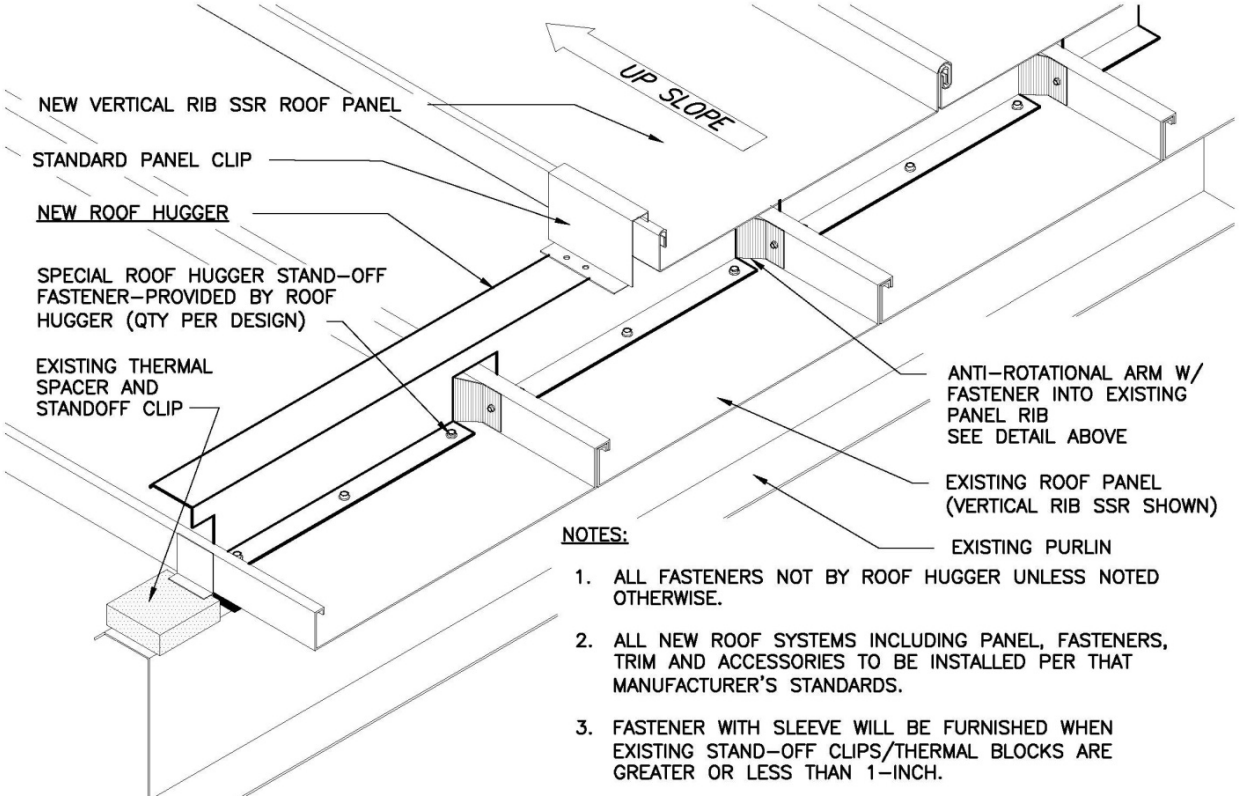
Hugger Attachment (HA-12-V/VSO)

For Existing Vertical Rib SSR Roofs with Thermal Blocks and/or Stand-off Clips





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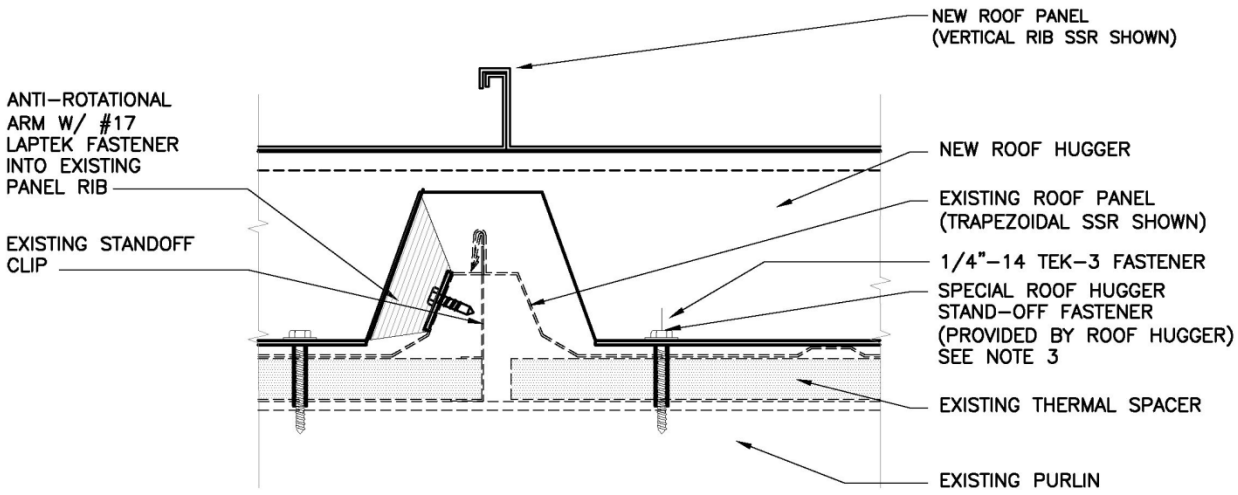
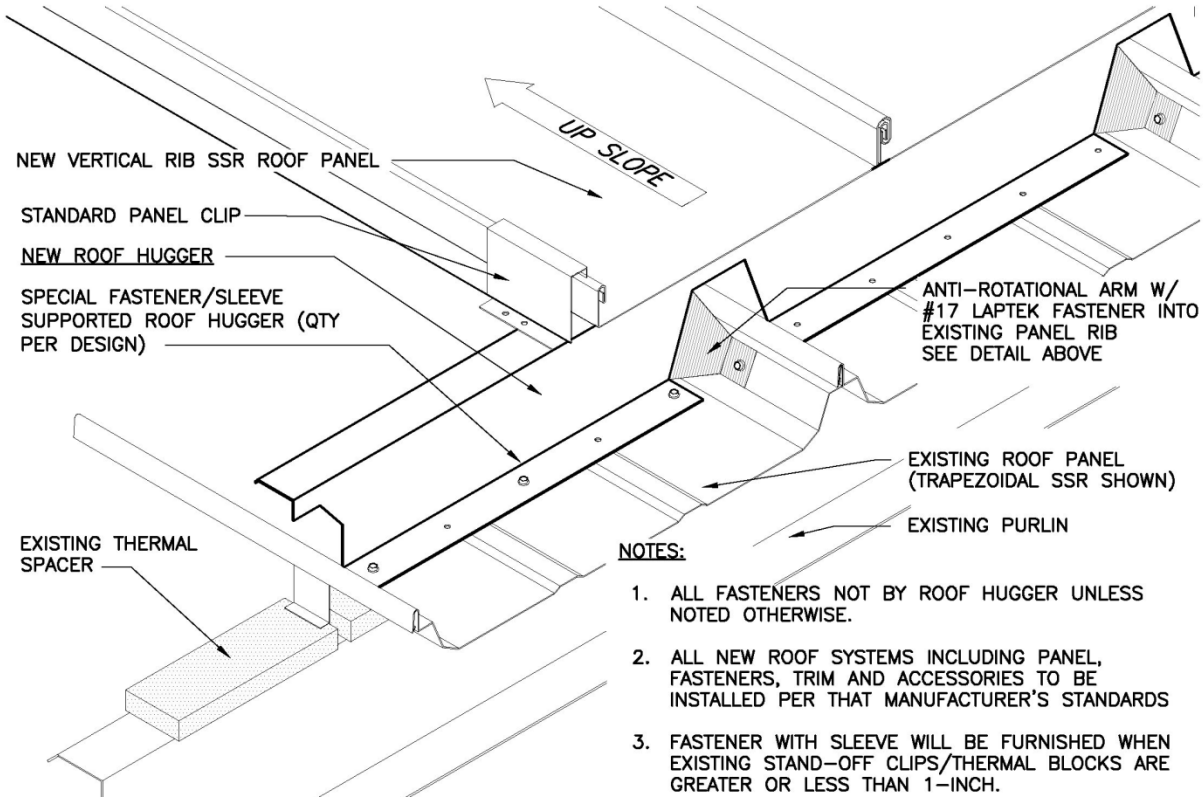
Hugger Attachment (HA-13-V/TSO)

For Existing Trapezoidal SSR Roofs with Thermal Blocks and/or Stand-off Clips





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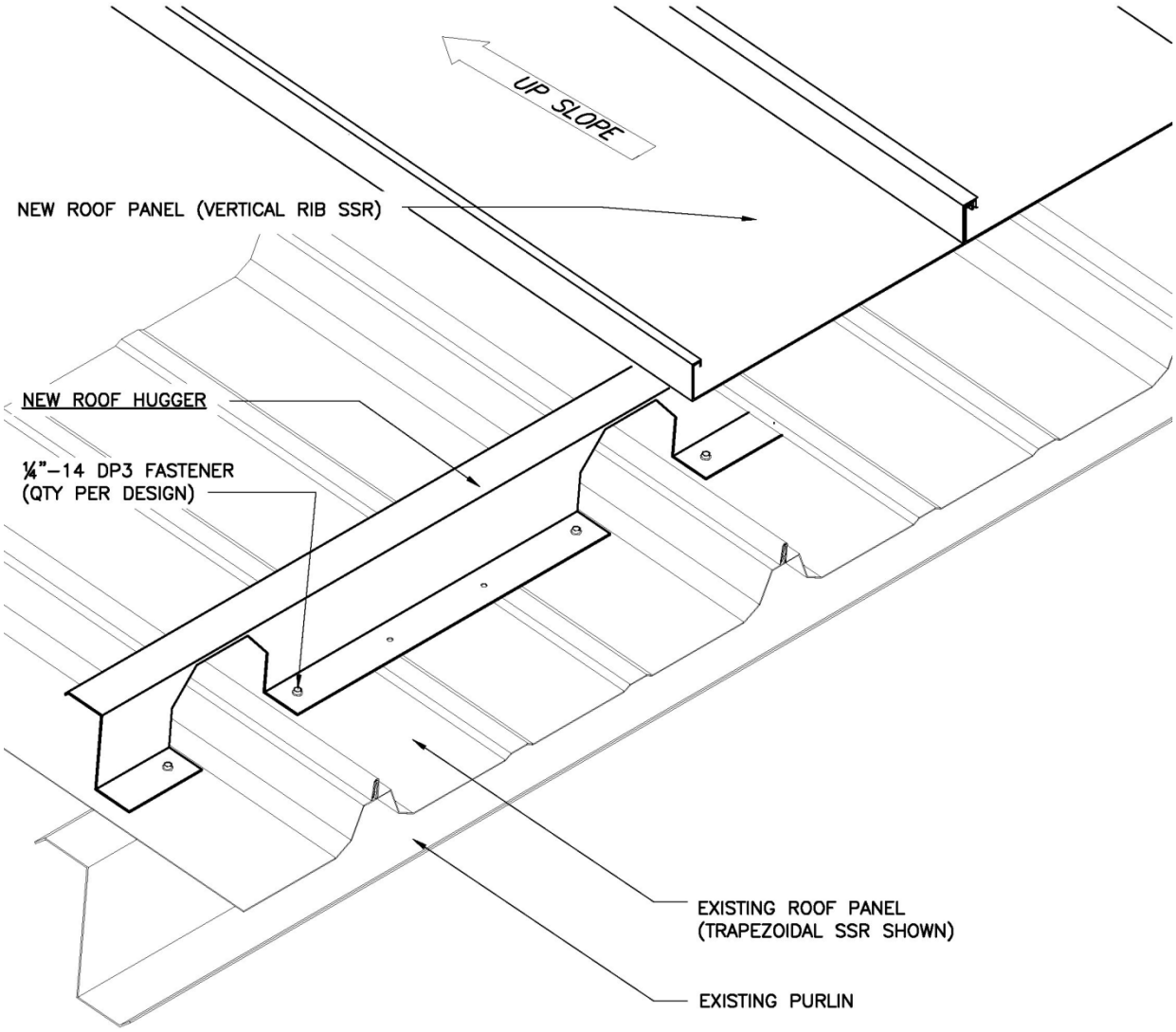
Hugger Attachment (HA-15-V/T)



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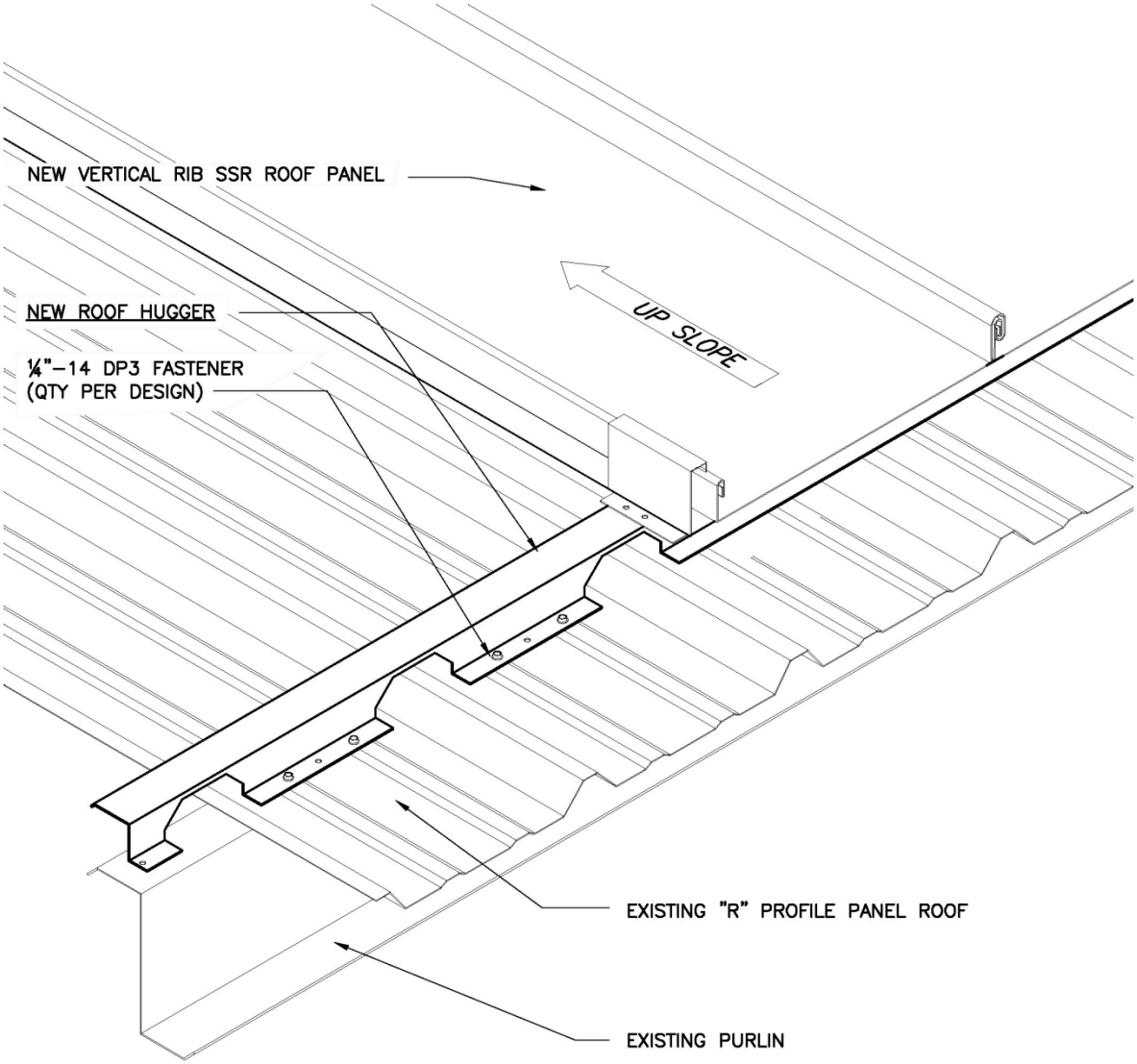
Hugger Attachment (HA-16-V/R)



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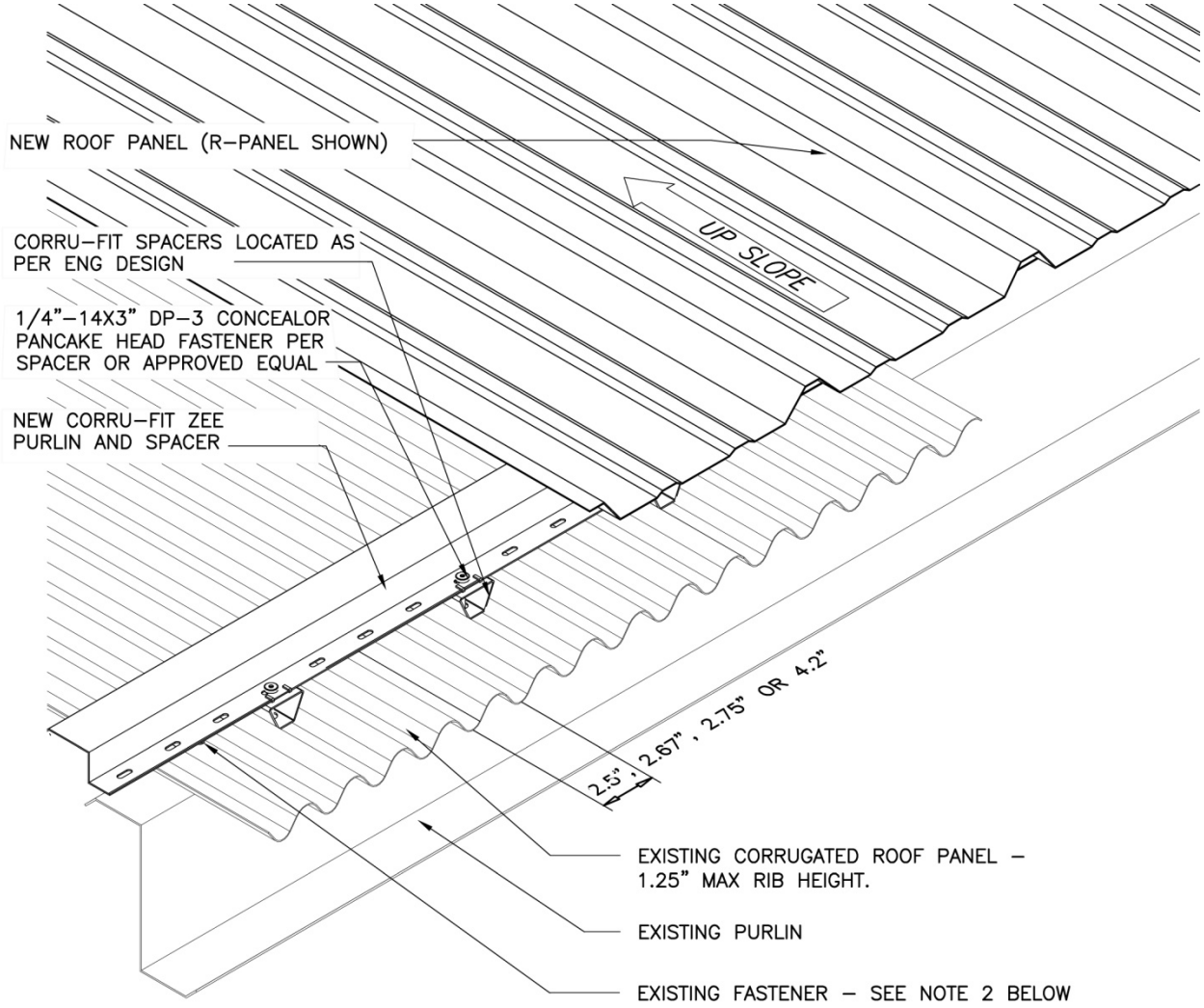
Hugger Attachment – Corru-Fit™



NOTE: We no longer utilize our factory-notched sub-purlins for existing sine-wave corrugated roofs due to their inherent inconsistent corrugation spacing. However, please refer to Our new **Corru-Fit™** product Design Guide for more details and information on this Product. Available on our website at www.roofhugger.com or by requesting information from sales@roofhugger.com

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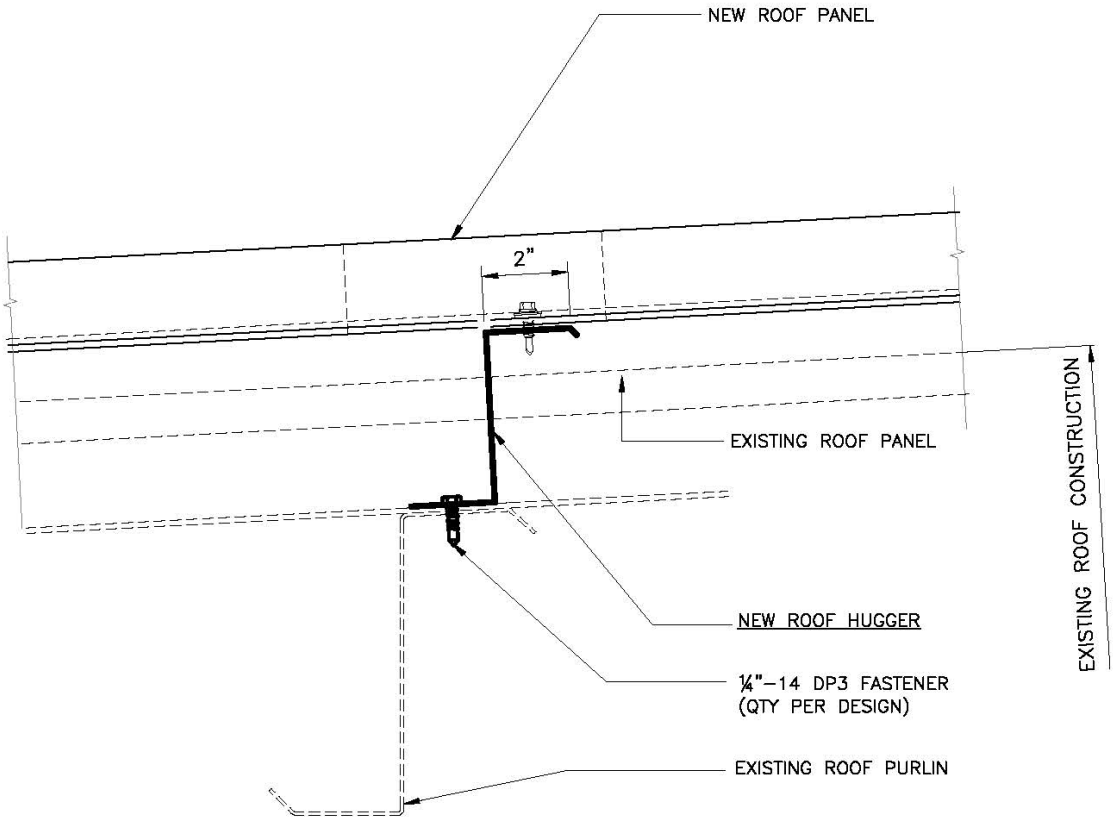
Panel End Lap (EL-02-G)



NOTES:

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2. SPECIAL ENDLAP HUGGER REQUIRED IF MORE THAN 2" FLANGE IS REQUIRED (OPTION: SPECIAL ROOF HUGGER CAN BE PROVIDED IF A MINIMUM OF 2 1/2"–4" IS REQUIRED).
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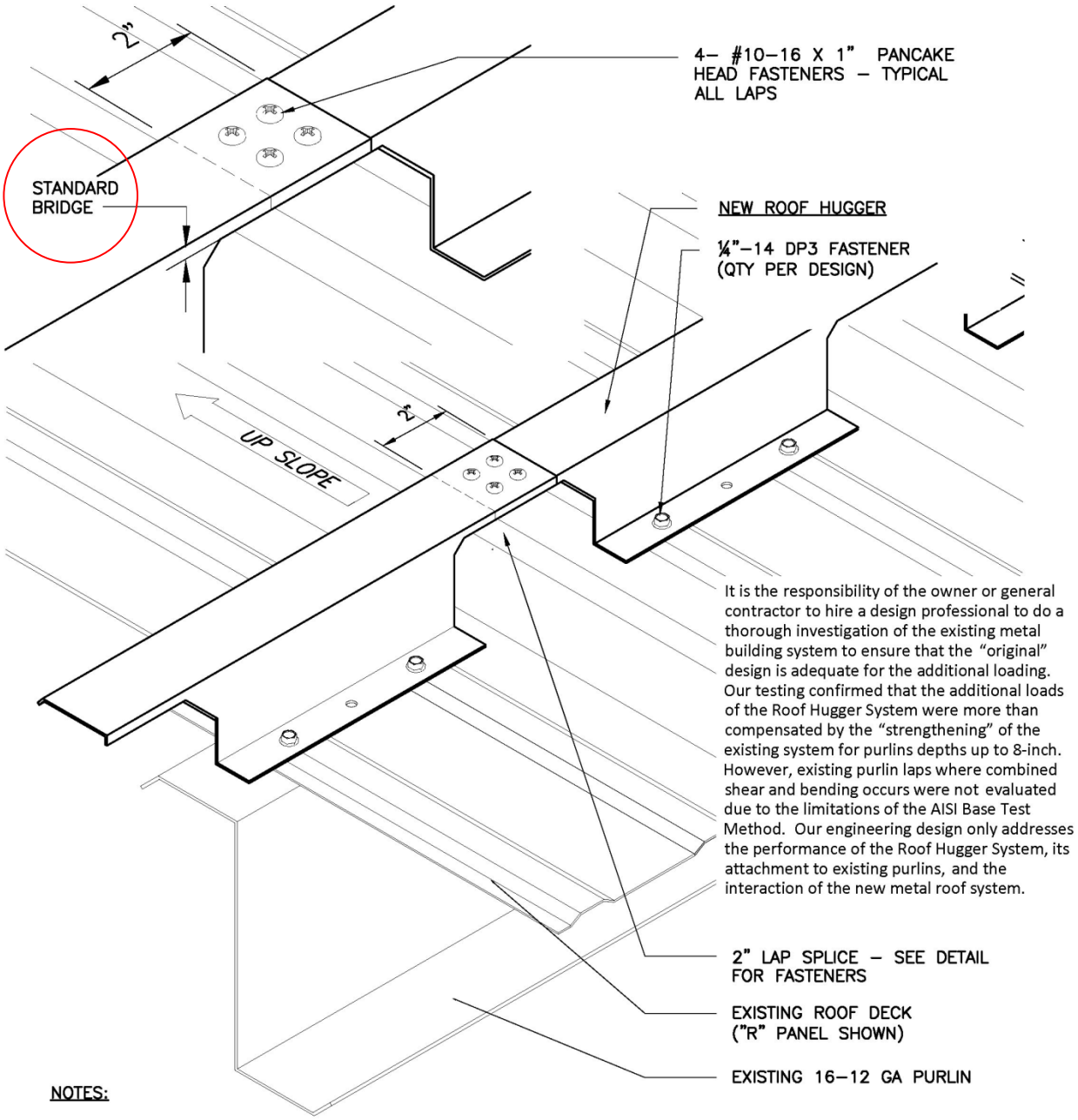
Hugger Lap (HL-01-R)

Huggers for All Gauge Purlins over 12” O.C. “R” Panels



It is the responsibility of the owner or general contractor to hire a design professional to do a thorough investigation of the existing metal building system to ensure that the “original” design is adequate for the additional loading. Our testing confirmed that the additional loads of the Roof Hugger System were more than compensated by the “strengthening” of the existing system for purlins depths up to 8-inch. However, existing purlin laps where combined shear and bending occurs were not evaluated due to the limitations of the AISI Base Test Method. Our engineering design only addresses the performance of the Roof Hugger System, its attachment to existing purlins, and the interaction of the new metal roof system.

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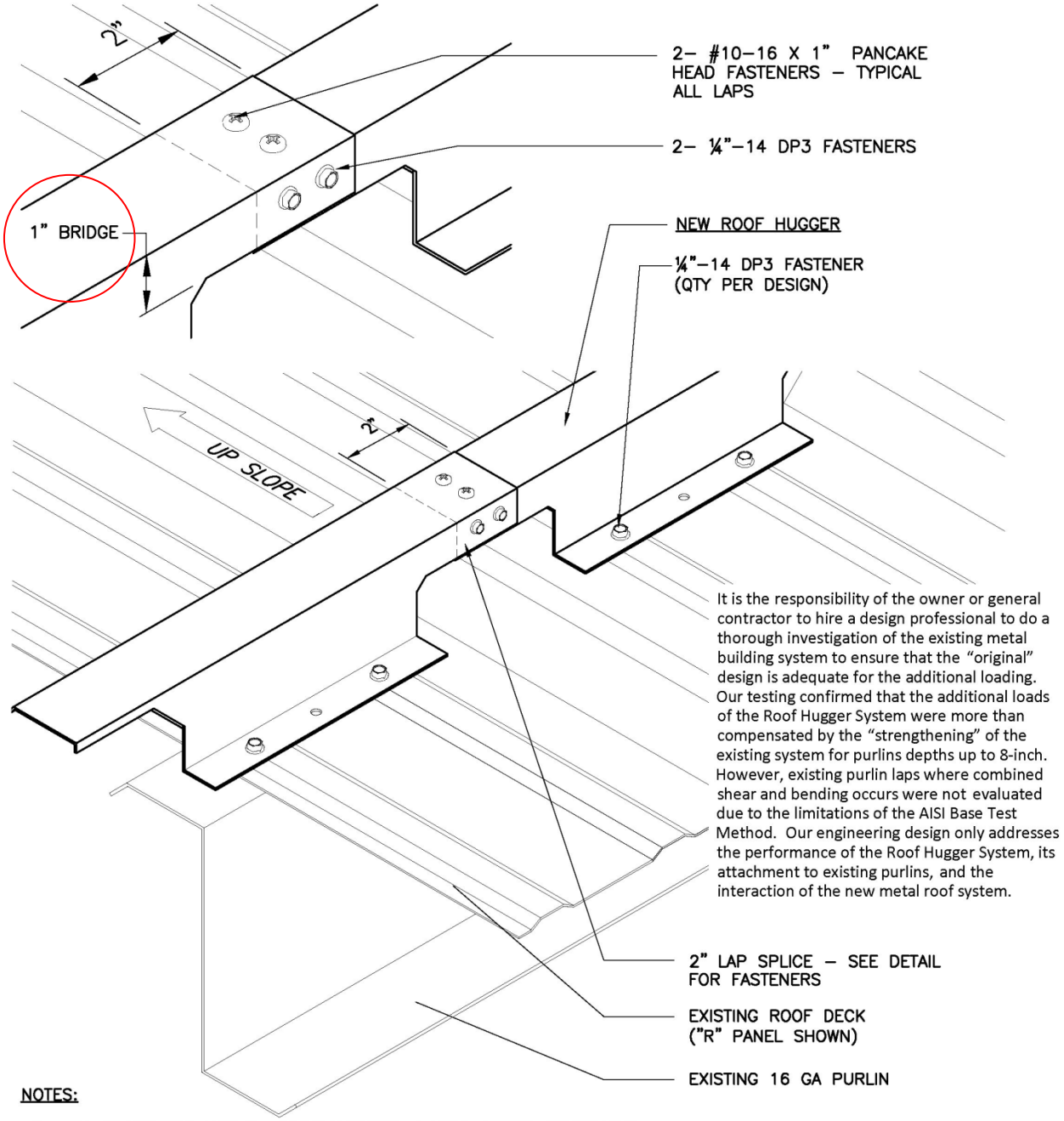
Hugger Lap (HL-02-R/16-14)

Special Huggers for 16 or 14-Gauge Purlins over Ribbed Panels



It is the responsibility of the owner or general contractor to hire a design professional to do a thorough investigation of the existing metal building system to ensure that the "original" design is adequate for the additional loading. Our testing confirmed that the additional loads of the Roof Hugger System were more than compensated by the "strengthening" of the existing system for purlins depths up to 8-inch. However, existing purlin laps where combined shear and bending occurs were not evaluated due to the limitations of the AISI Base Test Method. Our engineering design only addresses the performance of the Roof Hugger System, its attachment to existing purlins, and the interaction of the new metal roof system.

NOTES:

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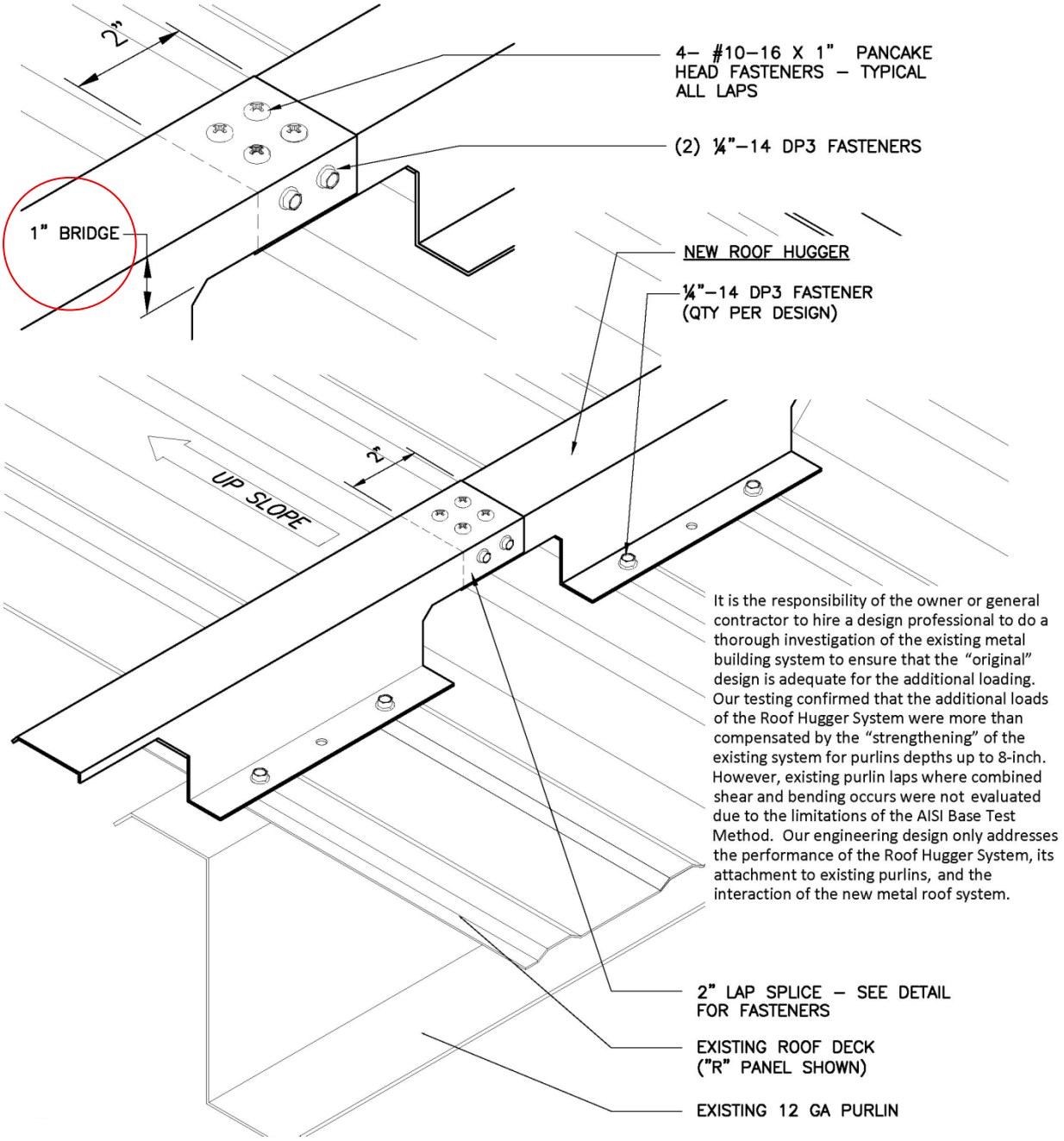
Hugger Lap (HL-03-R/12)

Special Huggers for 12-Gauge Purlins over Ribbed Panels



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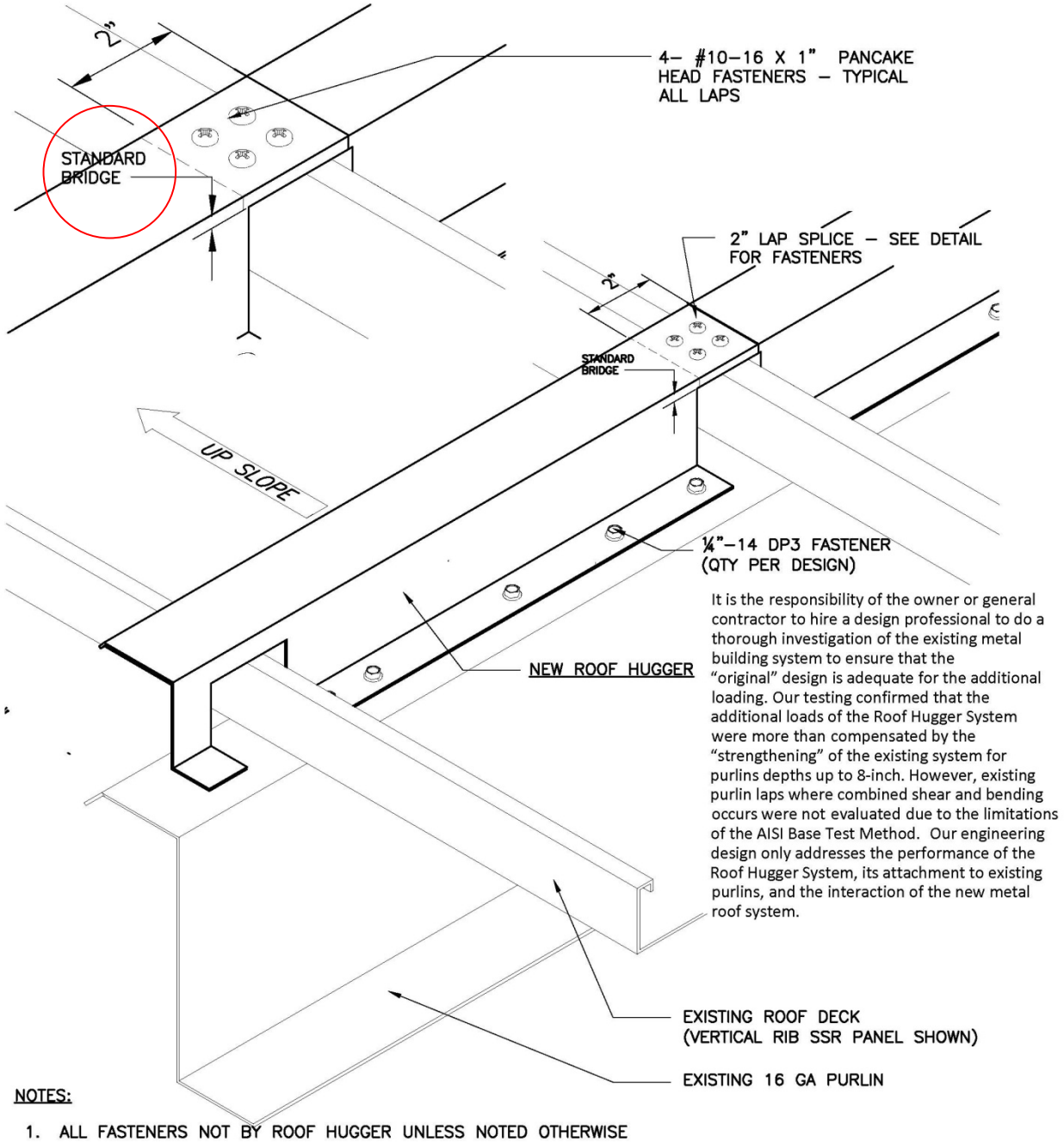
Hugger Lap (HL-04-V)

Vertical Rib SSR Hugger Lap over All Gauge Purlins



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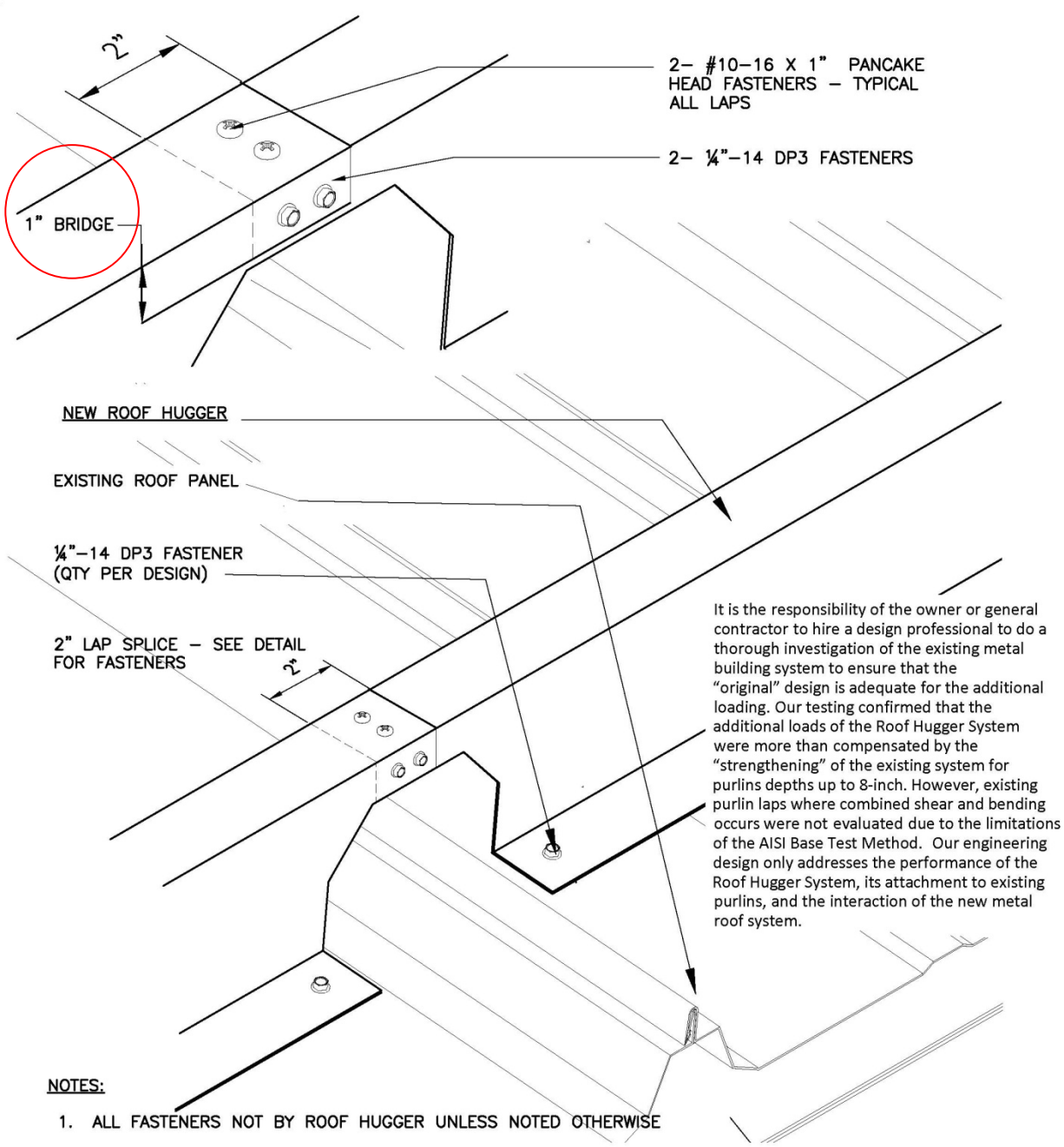
Hugger Lap (HL-05-T)

Trapezoidal SSR Hugger Lap over All Gauge Purlins



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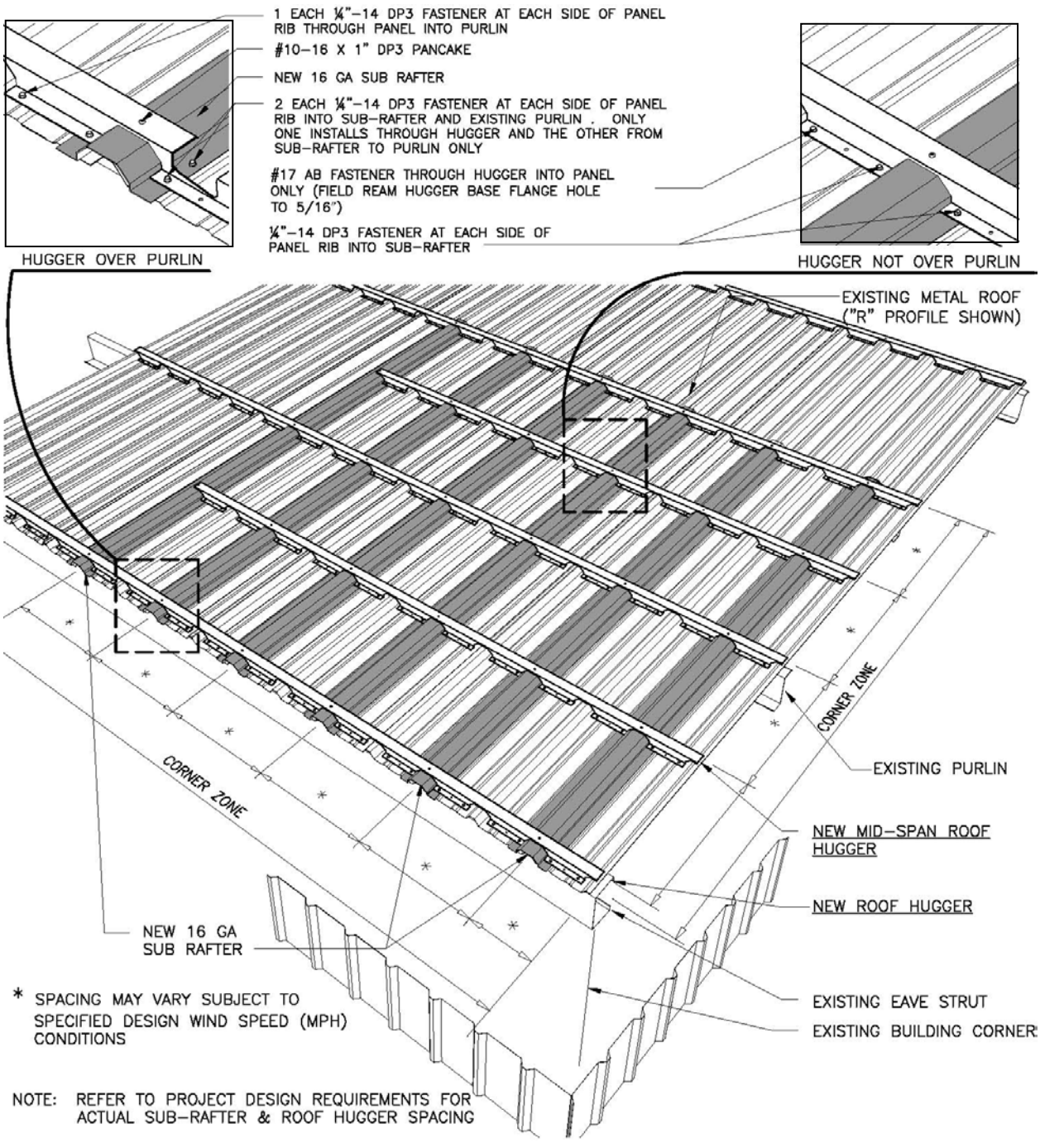
Wind Zone Framing (ZF-01-R)

Corner & Edge Zone Framing Over Ribbed Panel Roofs



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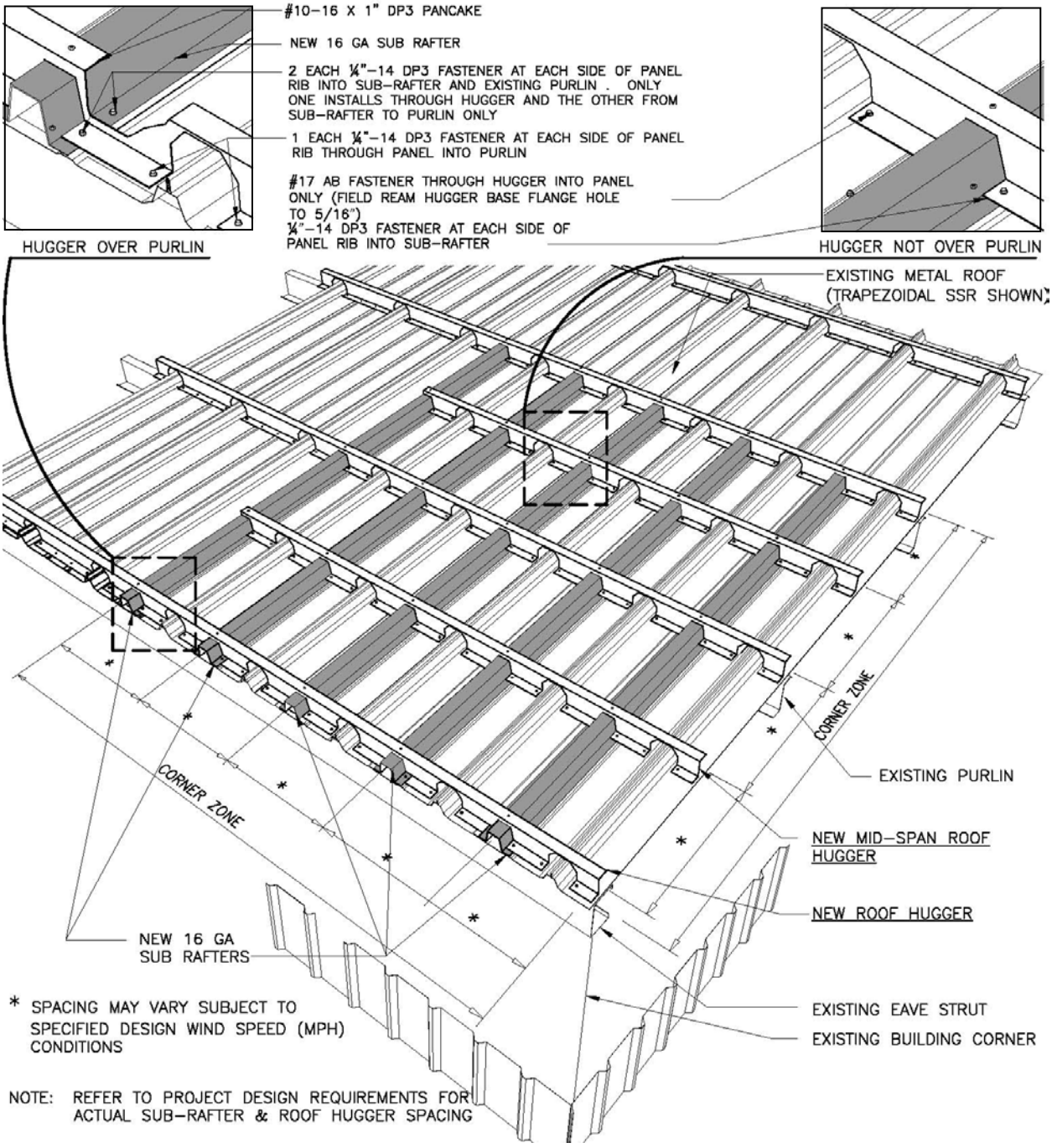
Wind Zone Framing (ZF-02-T)

Corner & Edge Zone Framing Over Trapezoidal SSR Roofs



Testing on this system is pending

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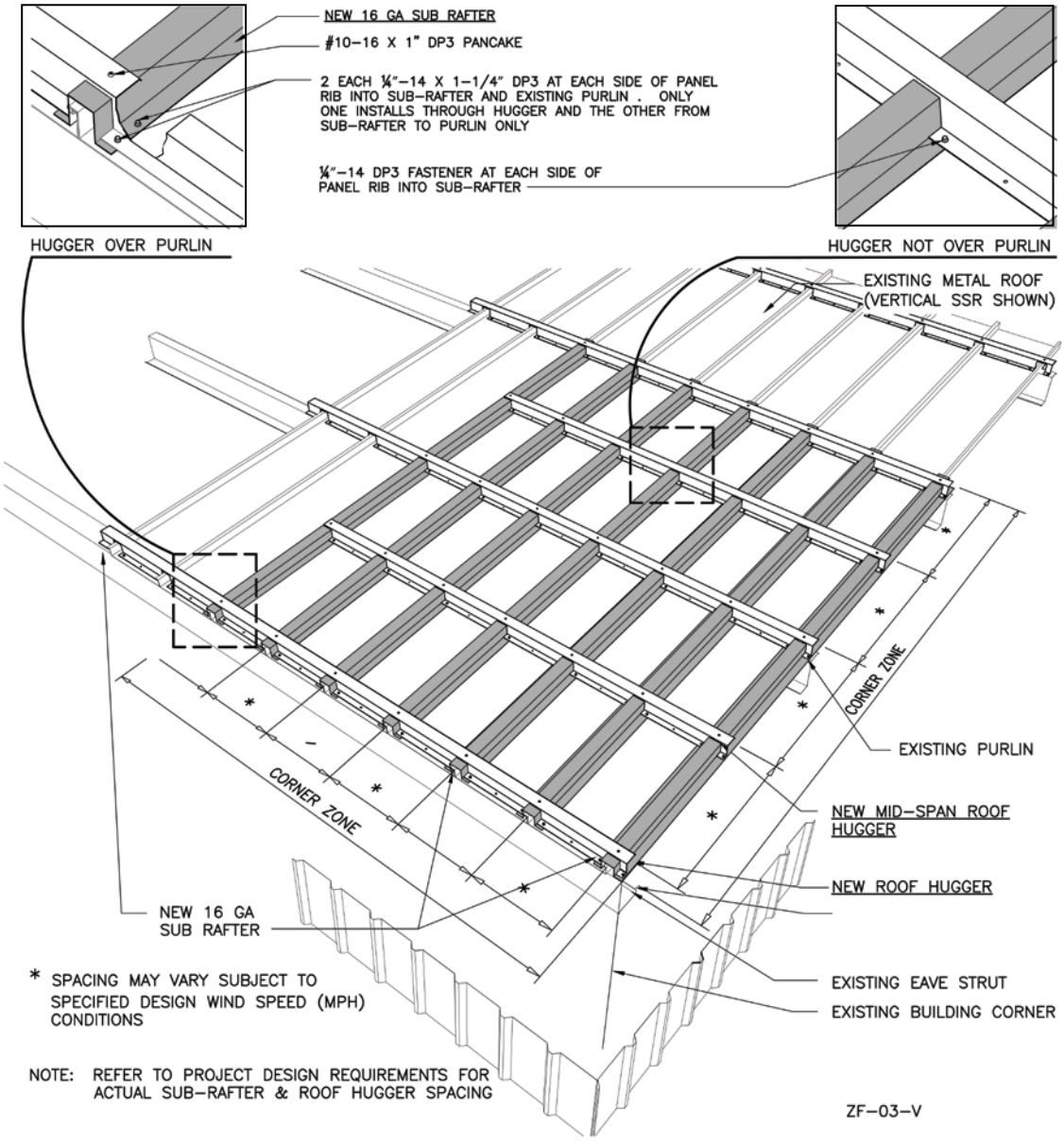
Wind Zone Framing (ZF-03-V)

Corner & Edge Zone Framing Over Vertical Rib SSR Roofs



Testing on this system is pending

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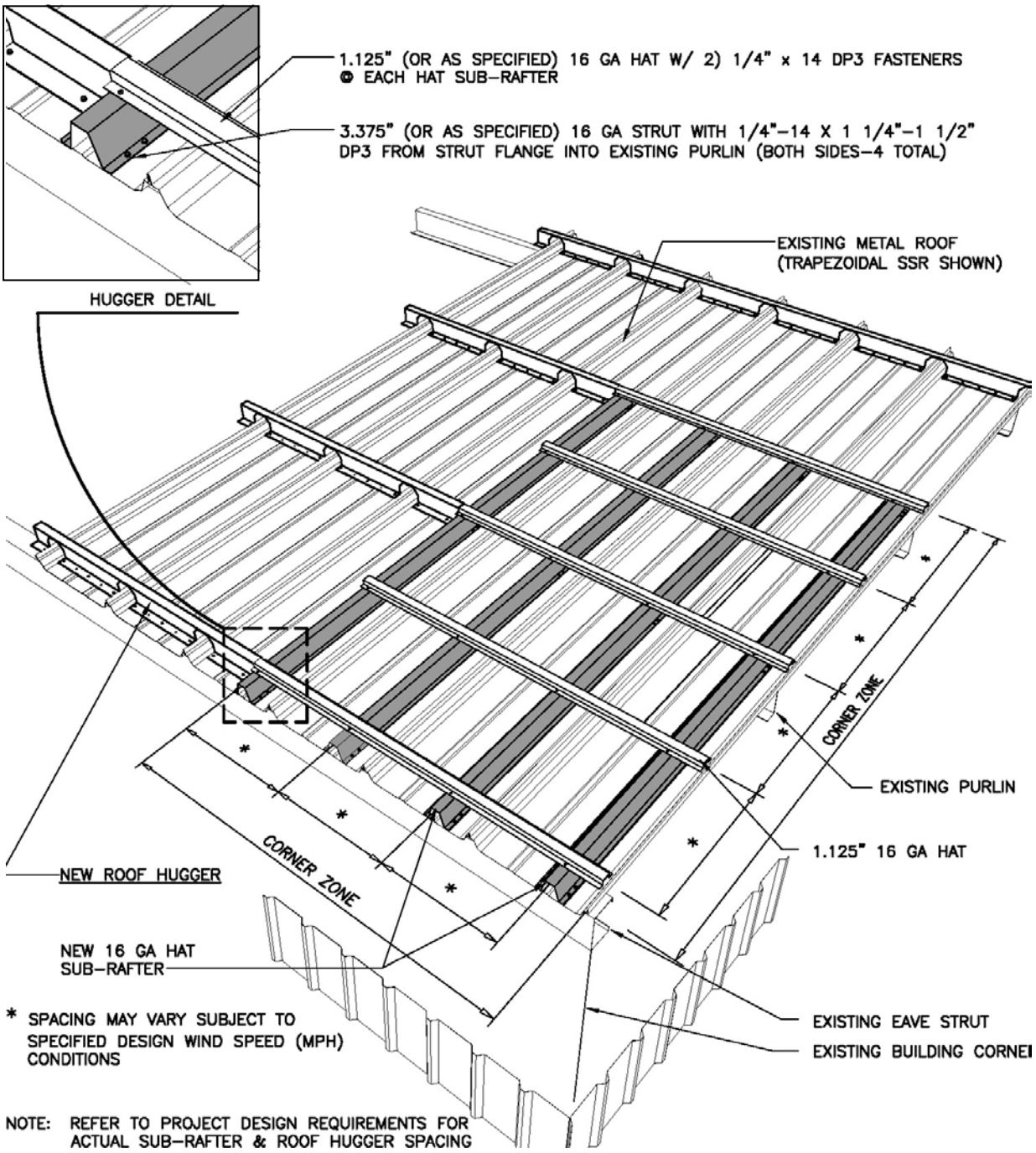
Wind Zone Hat Framing (ZF-04-R)

Corner & Edge Zone “Hat Grid” Framing



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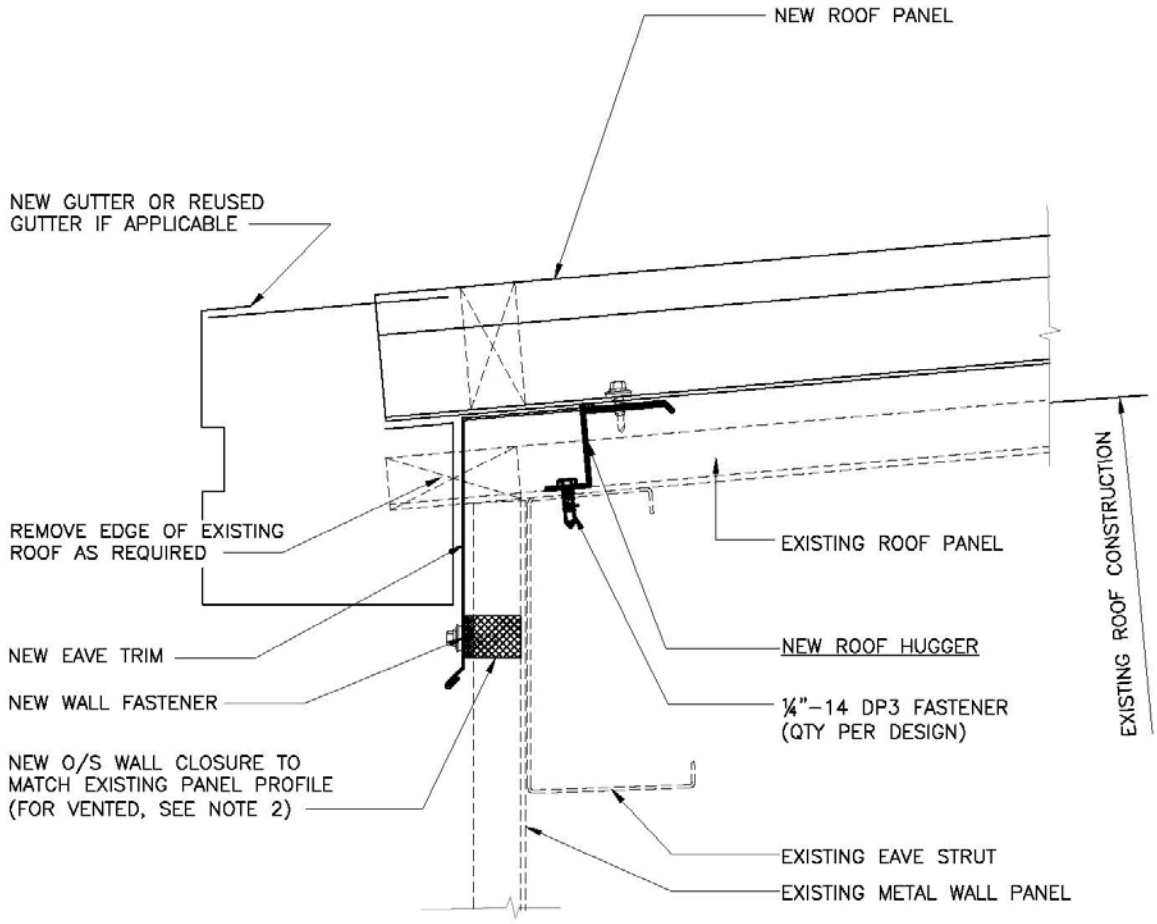
Low Eave (LE-01-G)



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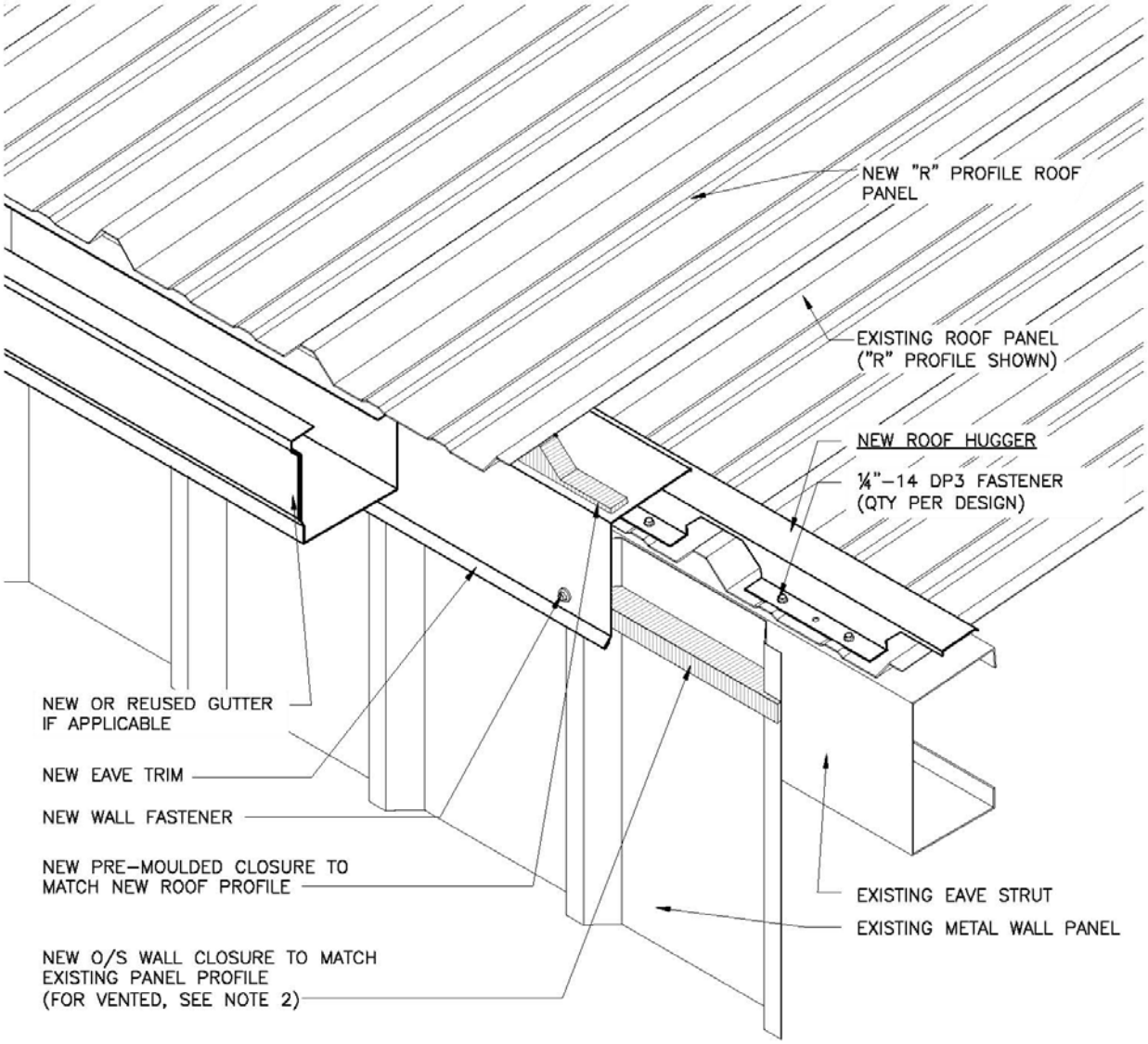
Low Eave (LE-02-R/R)



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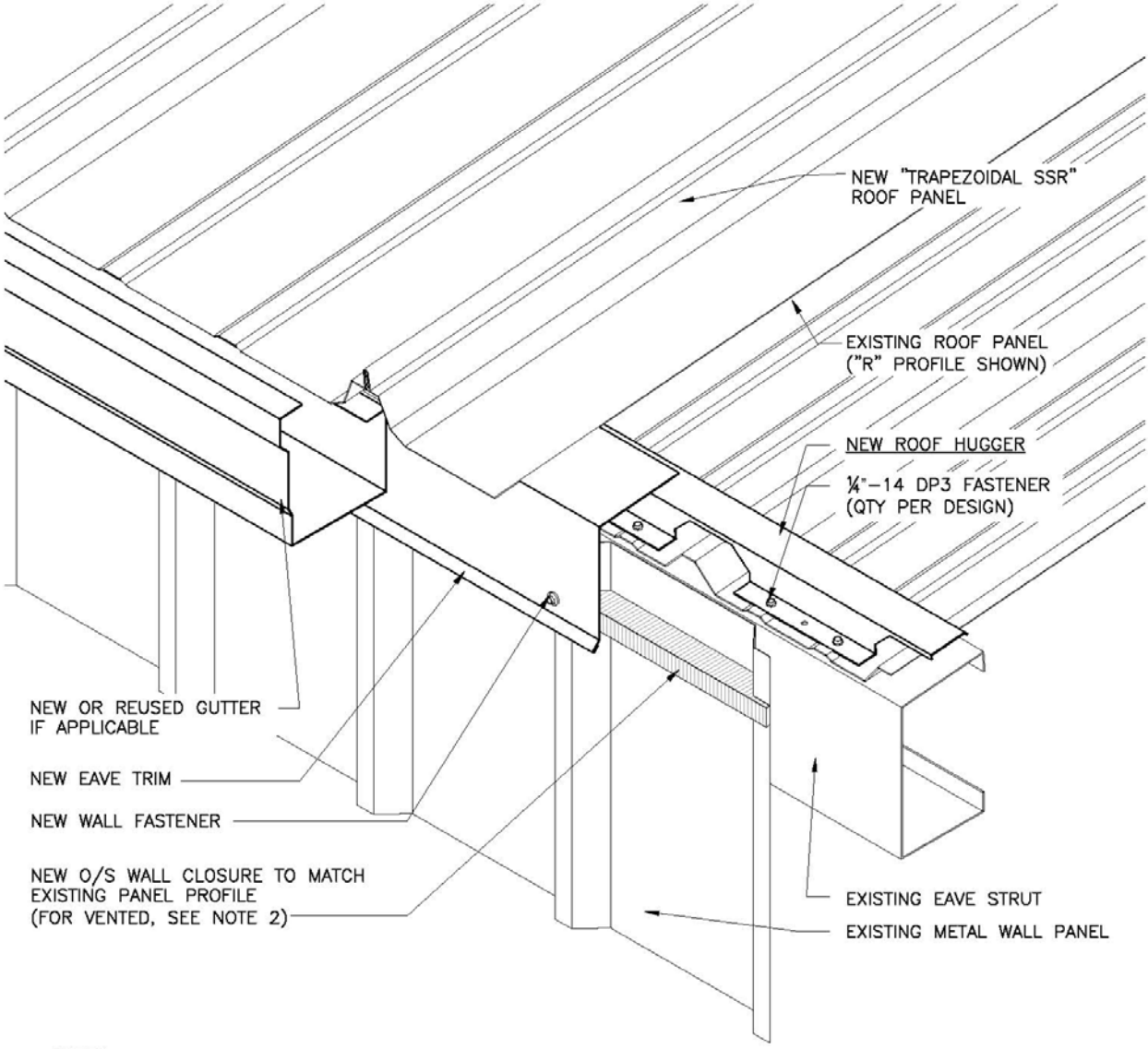
Low Eave (LE-02-T/R)



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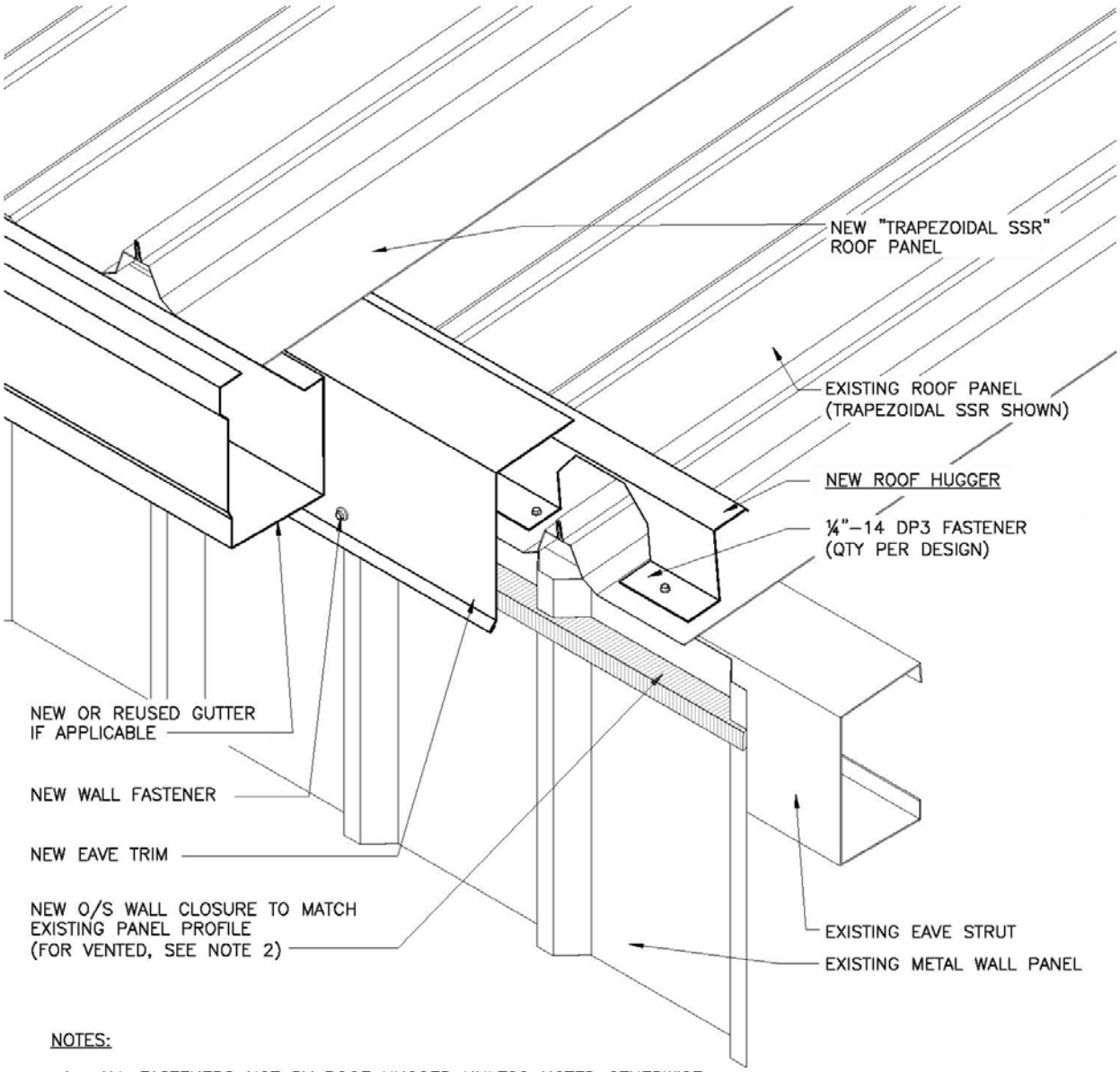
Low Eave (LE-03-T/T)



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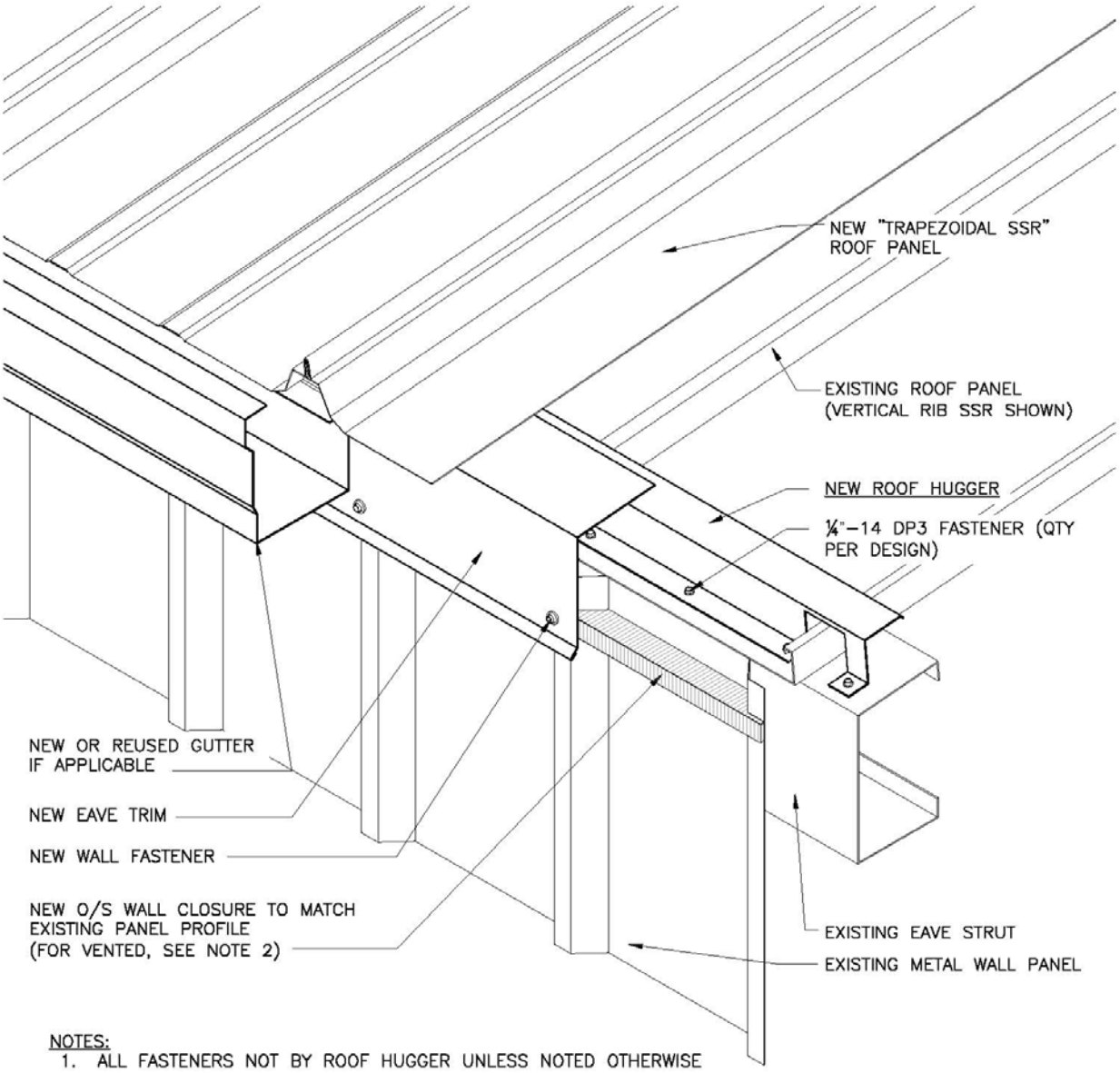
Low Eave (LE-04-T/V)



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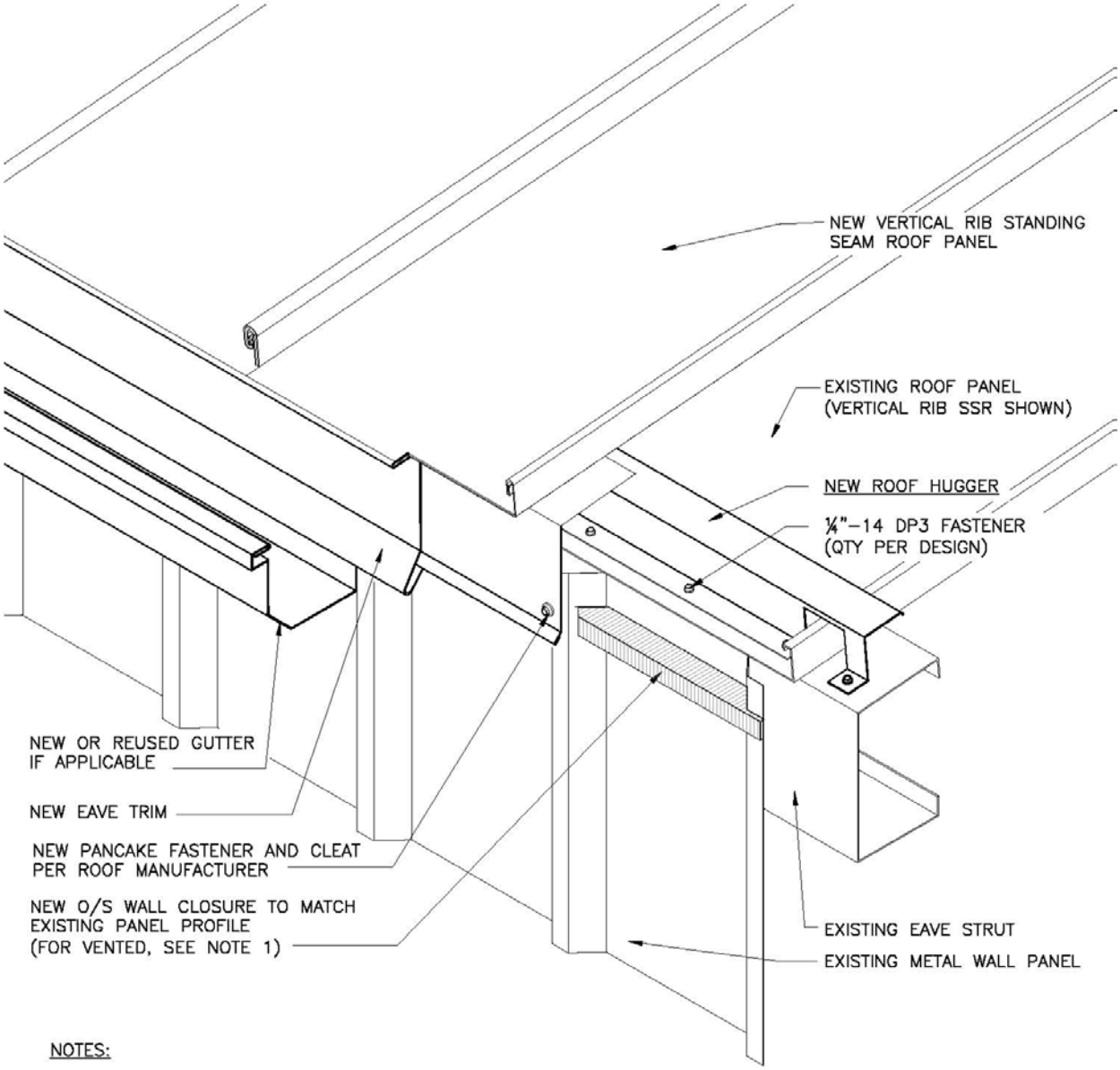
Low Eave (LE-05-V/V)



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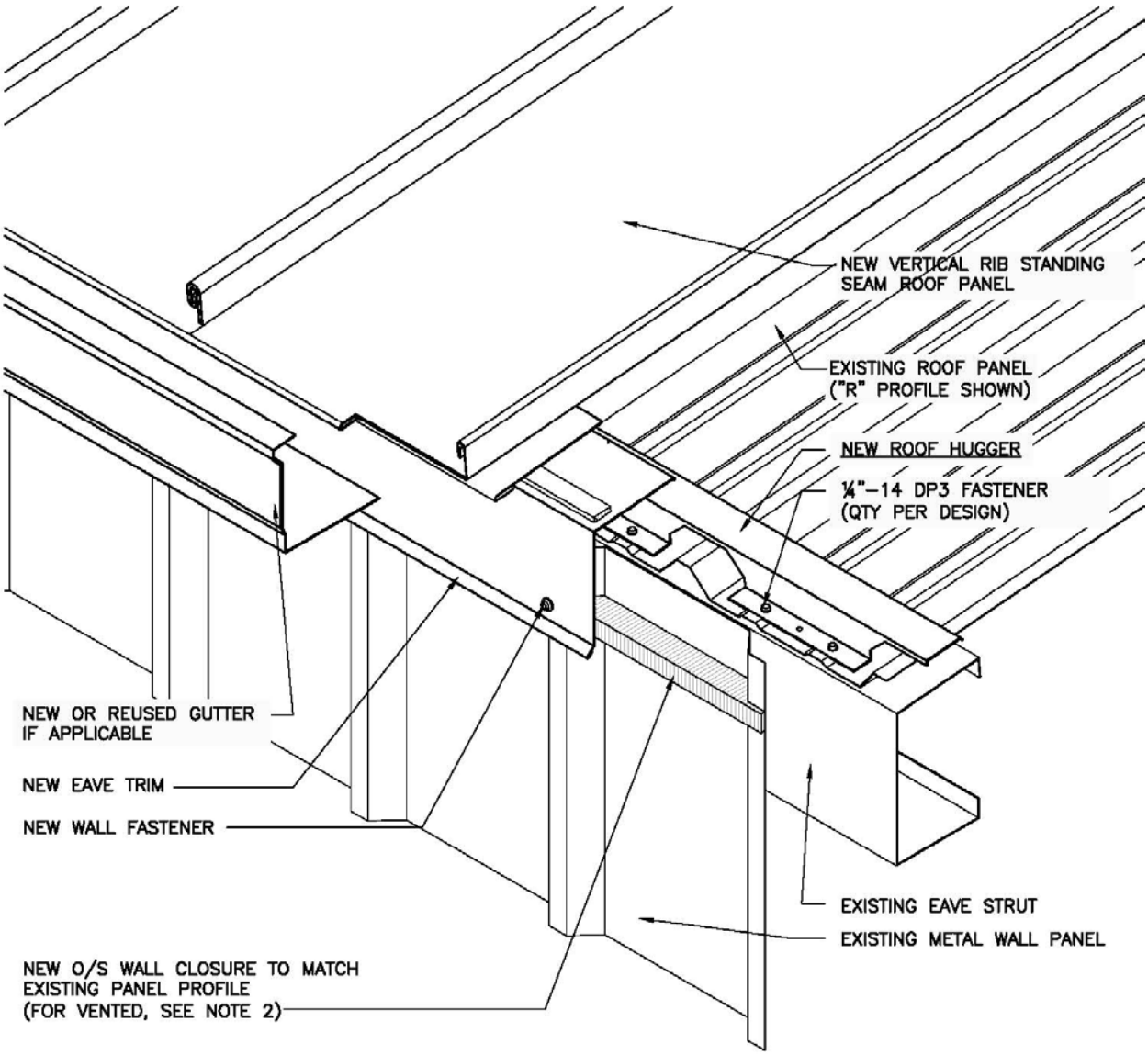
Low Eave (LE-06-V/R)



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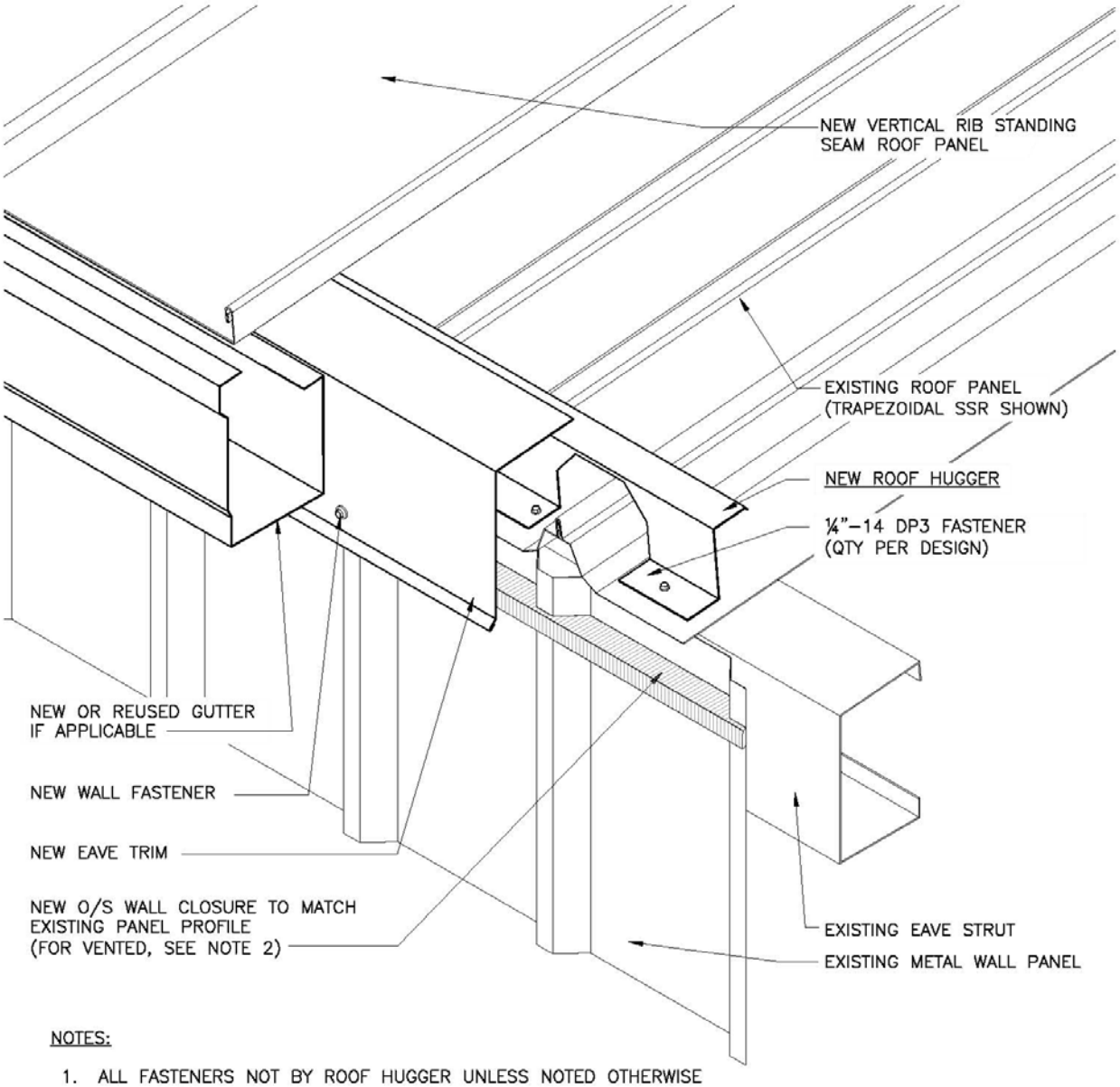
Low Eave (LE-07-T/T)



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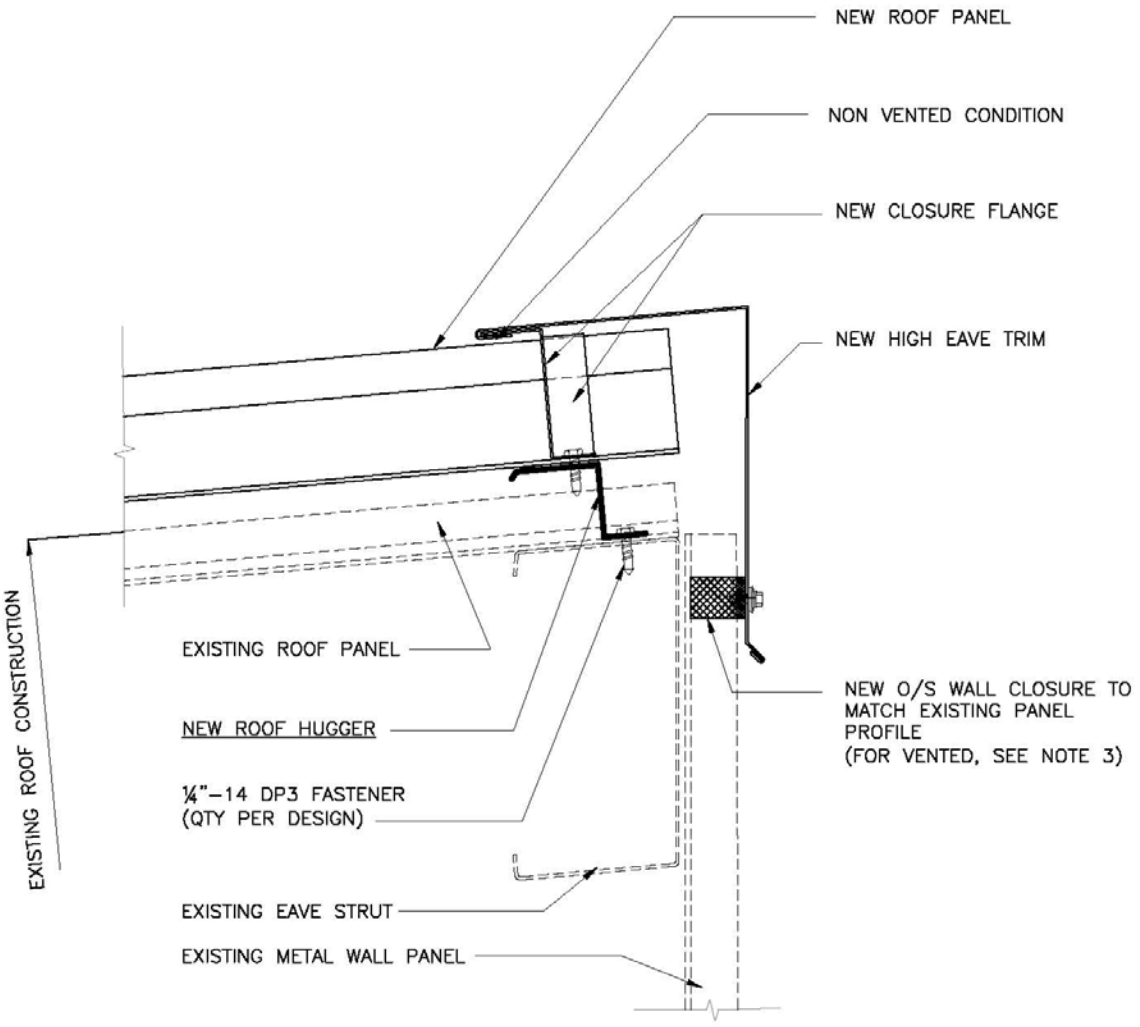
High Eave Non-Vented (HE-01-G)



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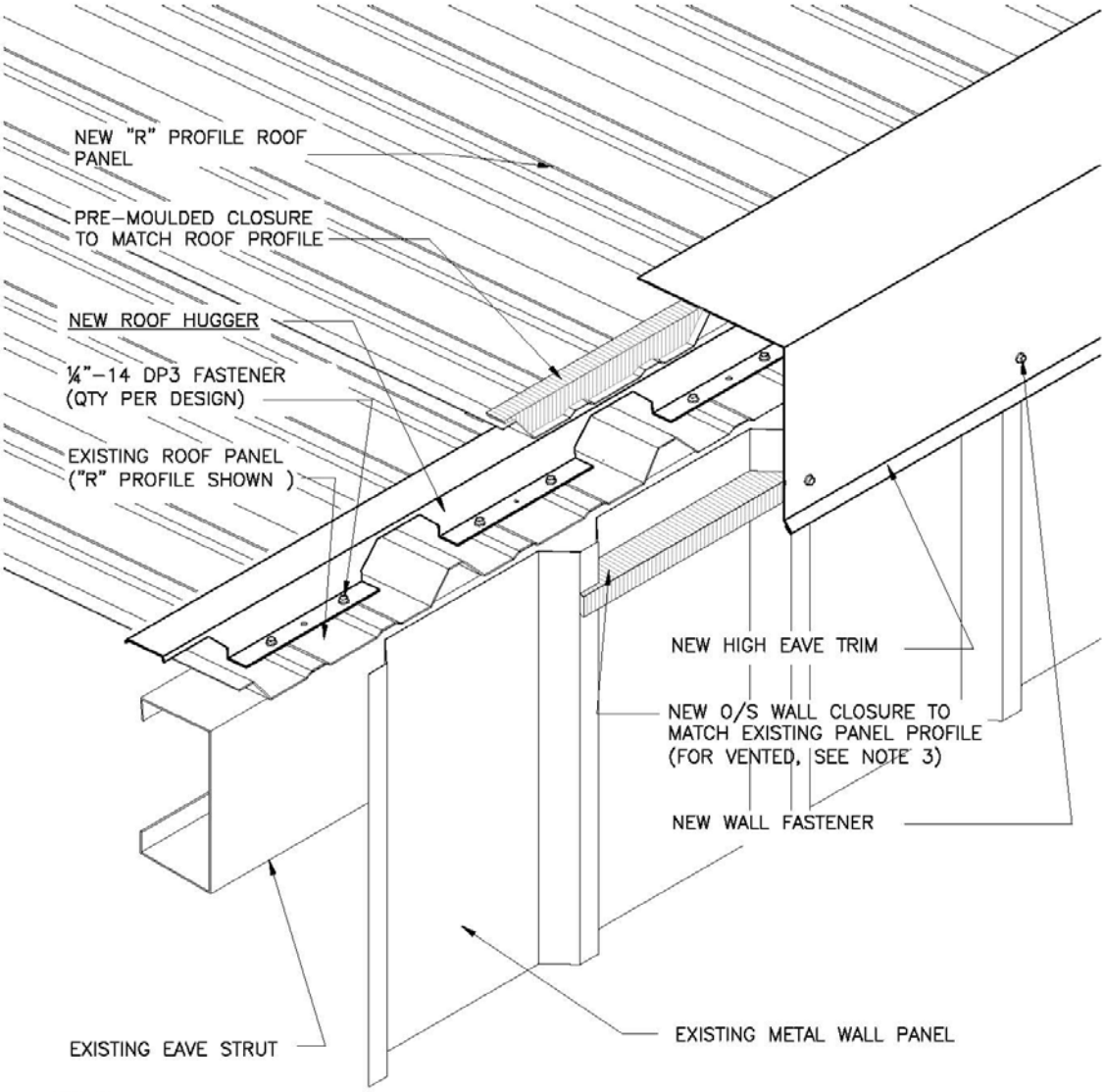
High Eave (HE-02-R/R)



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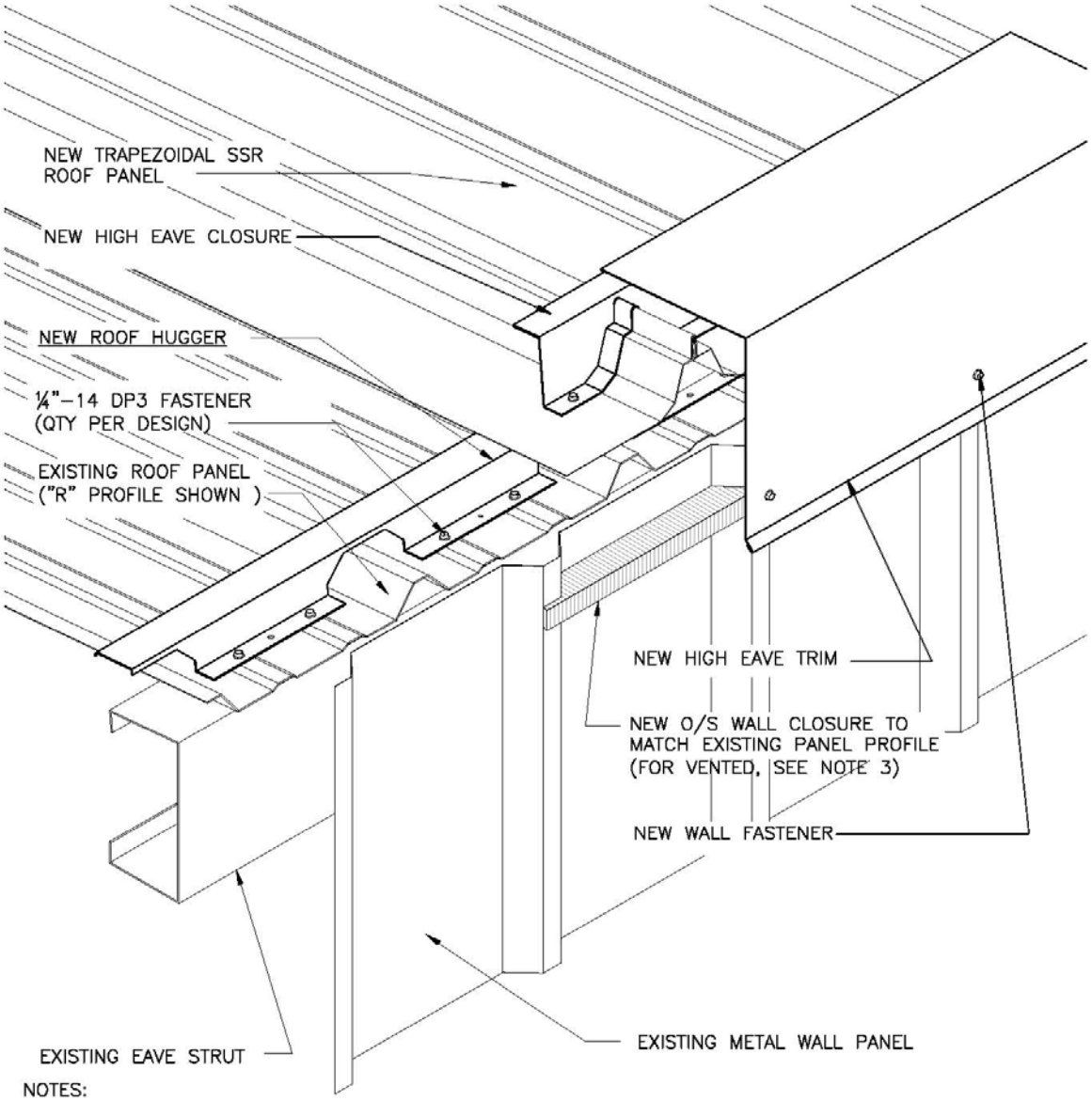

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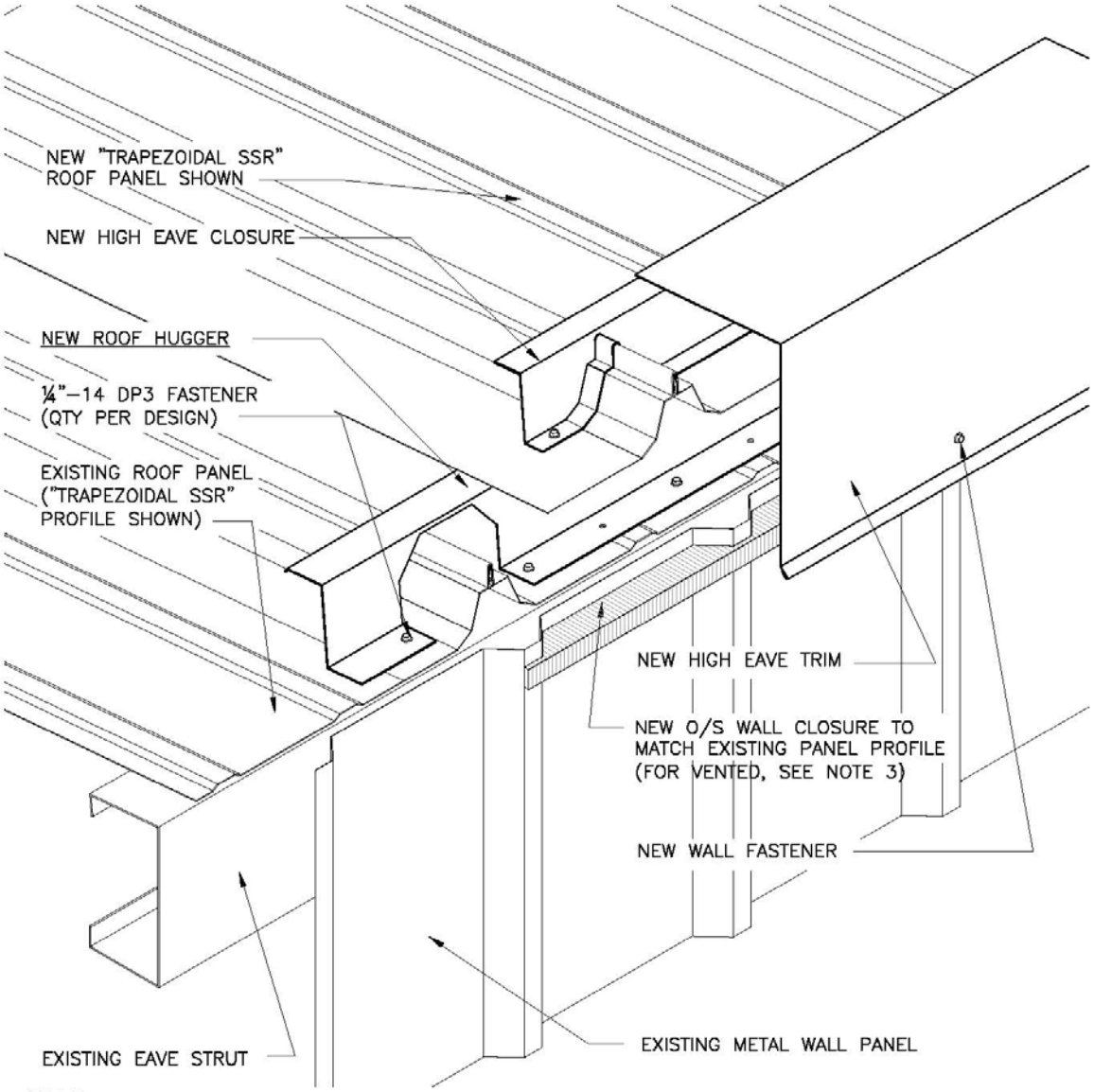
High Eave (HE-03-T/T)



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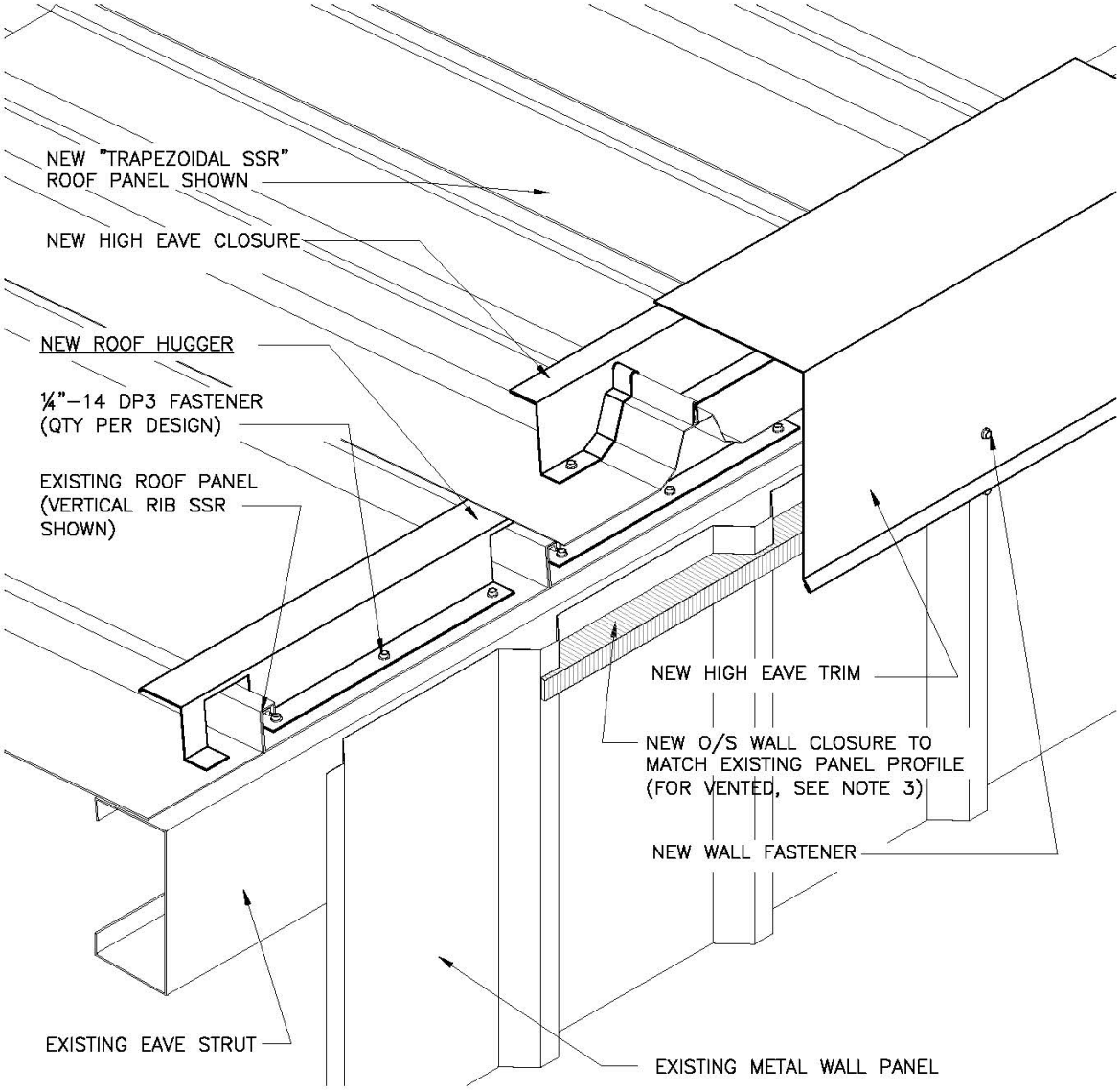
High Eave (HE-04-T/V)



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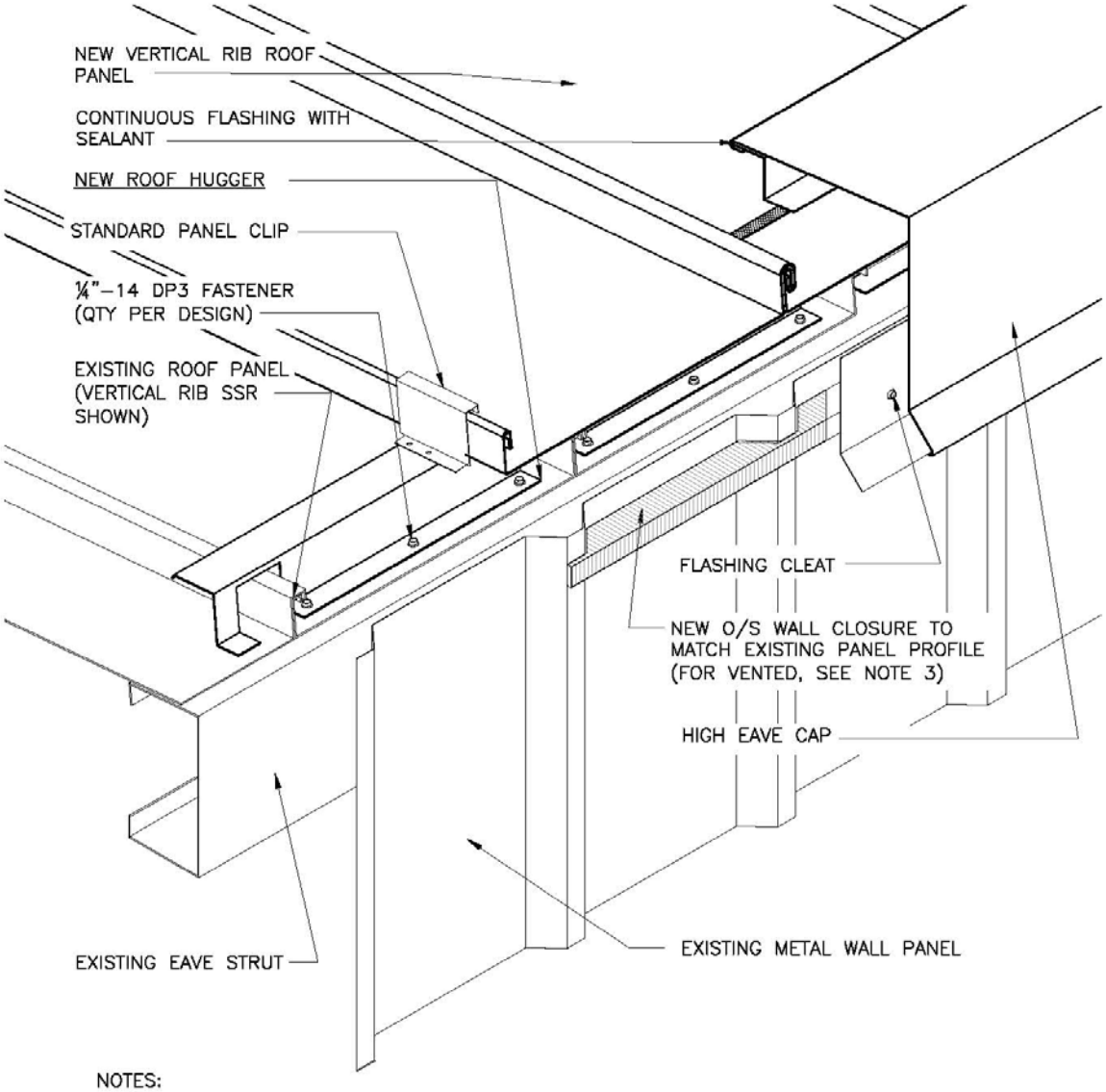
High Eave (HE-05-V/V)



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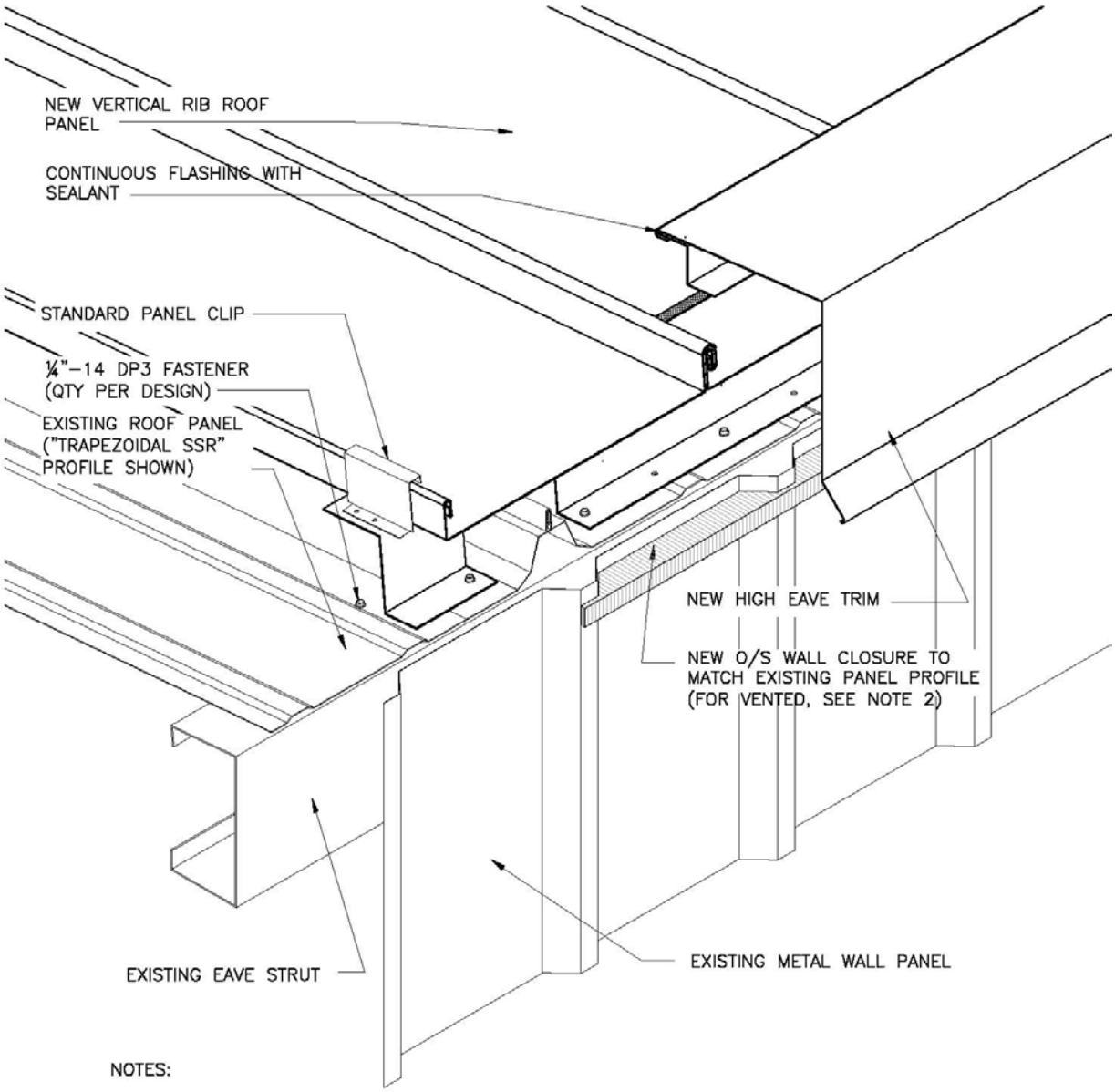
High Eave Vented (HE-06-V/T)



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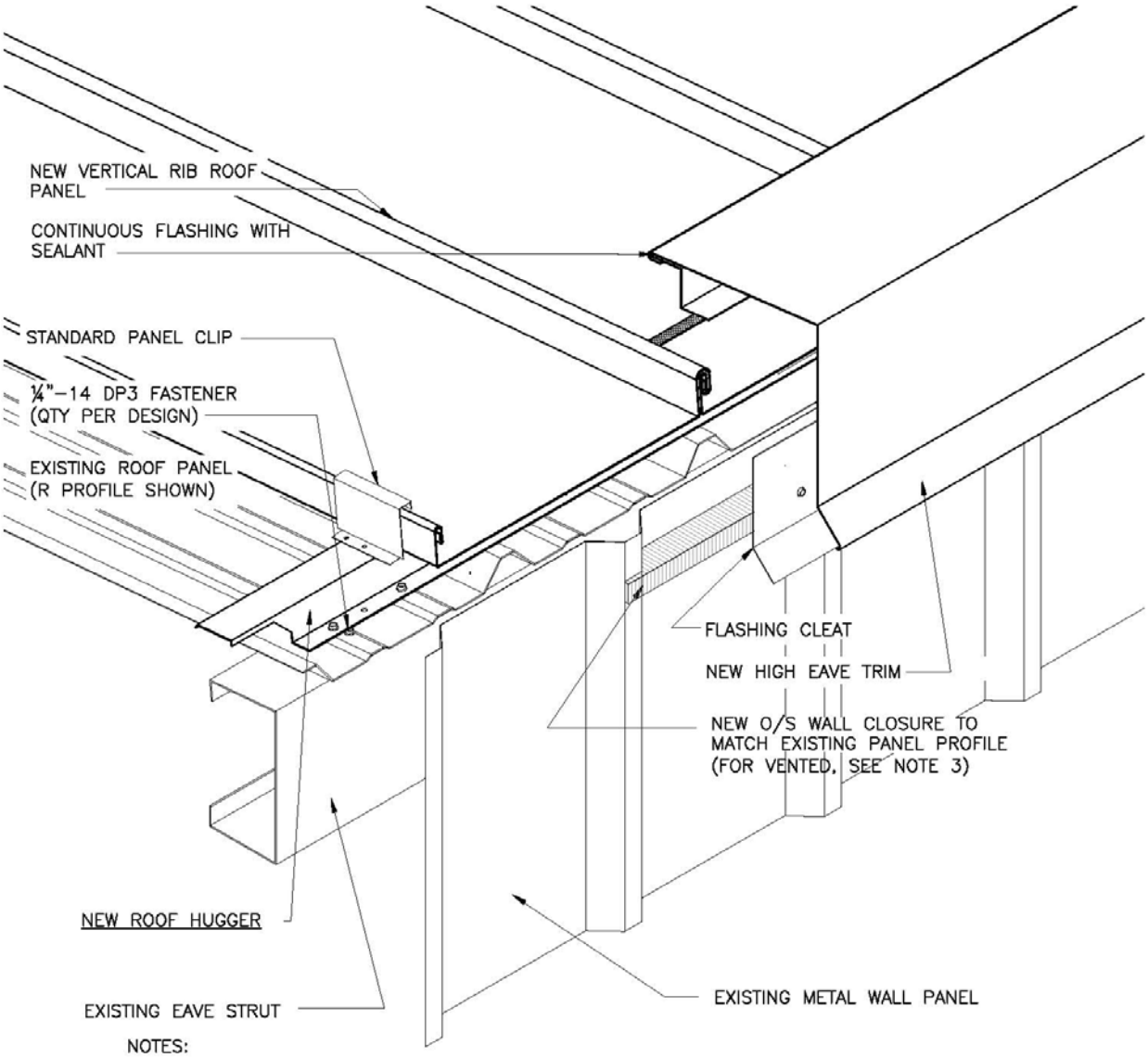
High Eave Vented (HE-07-V/R)



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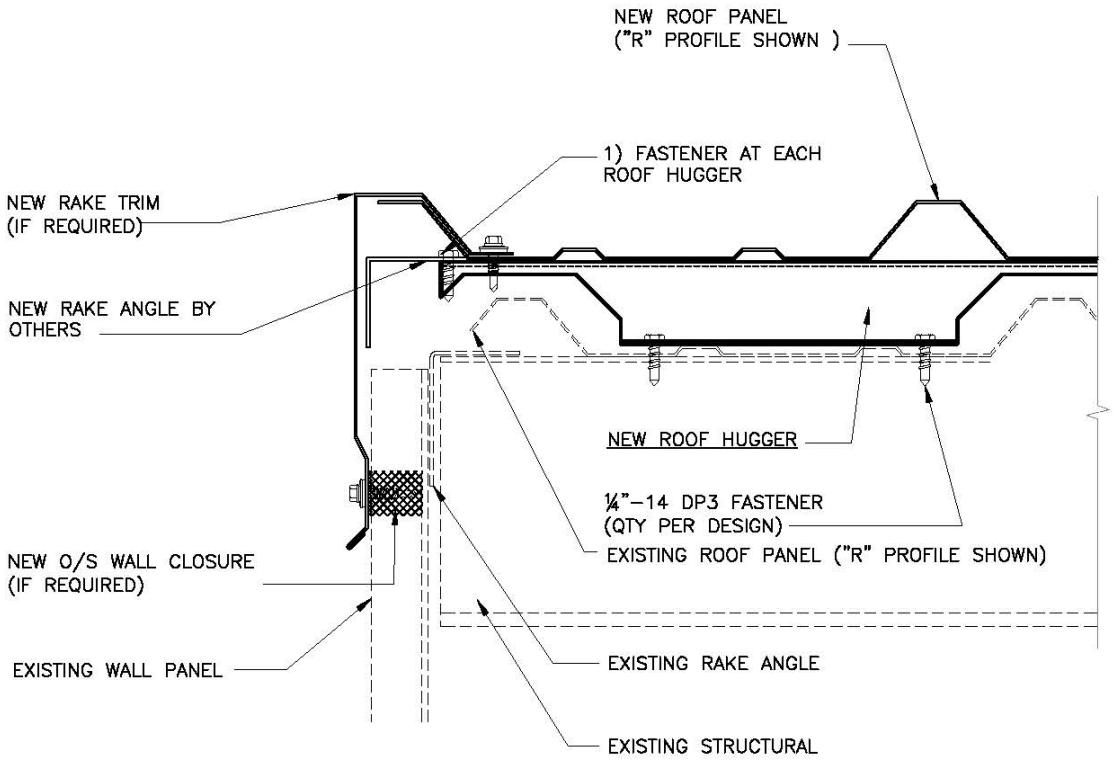
Rake/Endwall (RE-01-R/R)



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3. IF OLD RAKE TRIM IS REMOVED, NEW RAKE TRIM MAY NEED TO EXTEND TO OLD TRIM LINE DUE TO WALL PANEL COLOR FADE.

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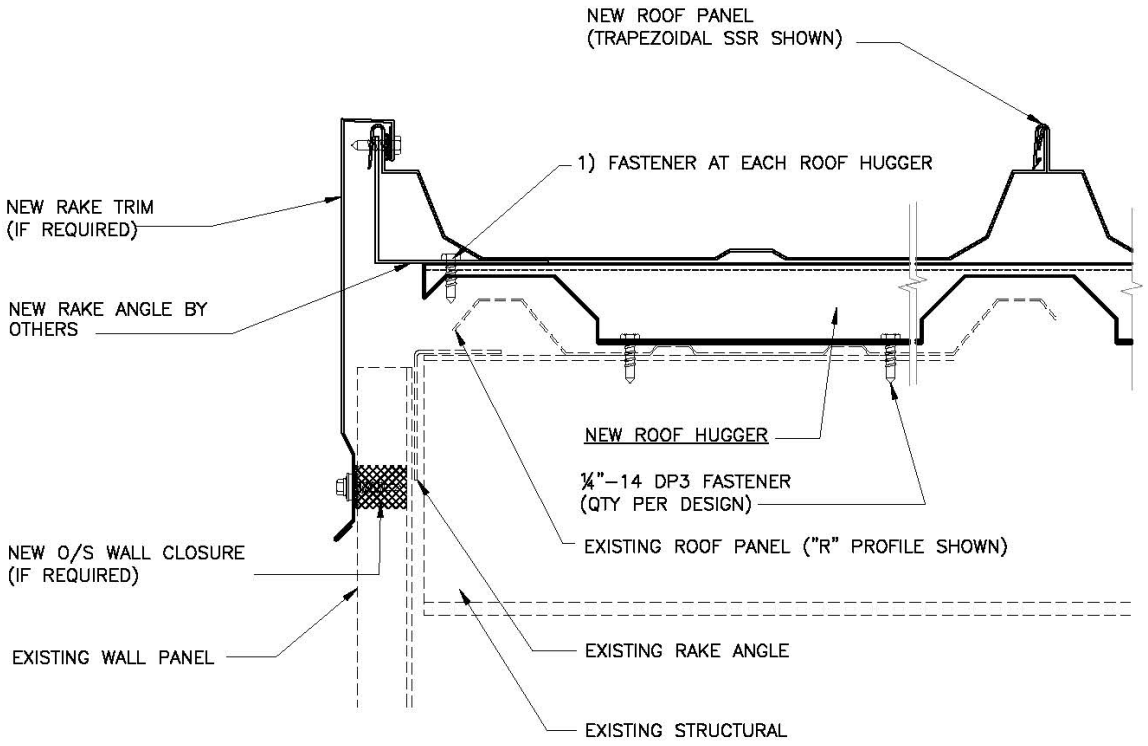
Rake/Endwall (RE-02-T/R)



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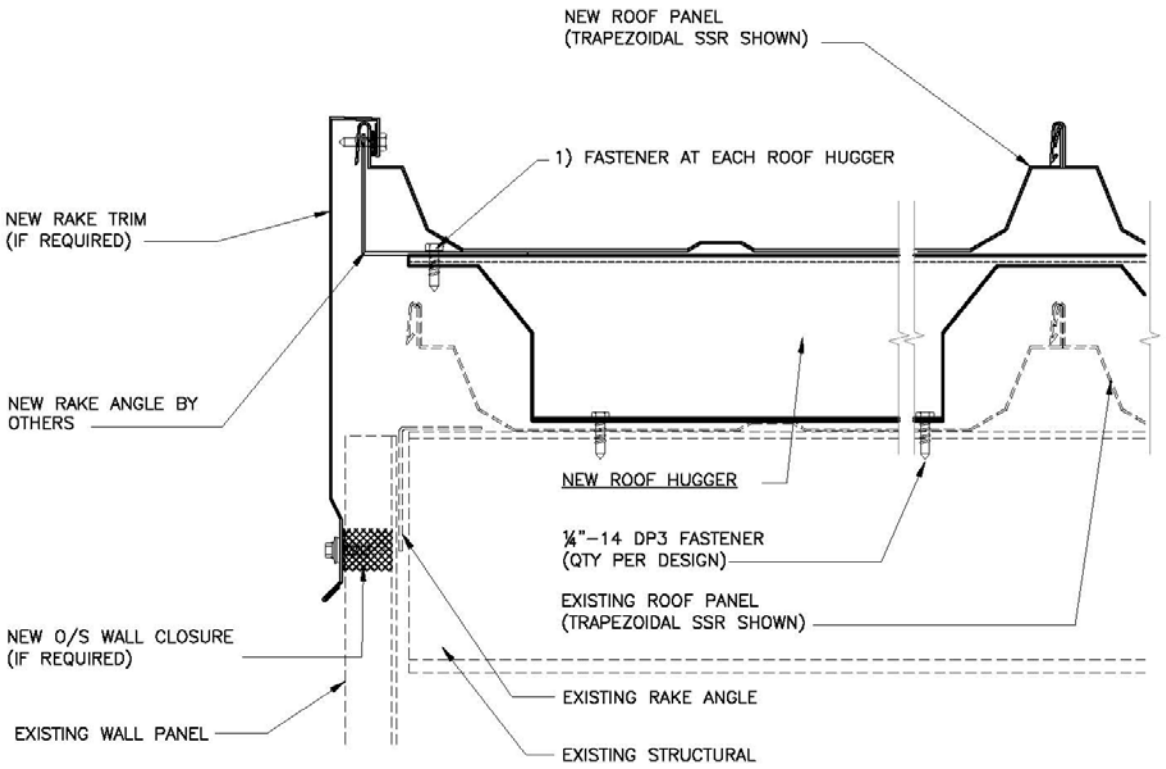
Rake/Endwall (RE-03-T/T)



NOTES:

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2. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.
3. IF OLD RAKE TRIM IS REMOVED, NEW RAKE TRIM MAY NEED TO EXTEND TO OLD TRIM LINE DUE TO WALL PANEL COLOR FADE.

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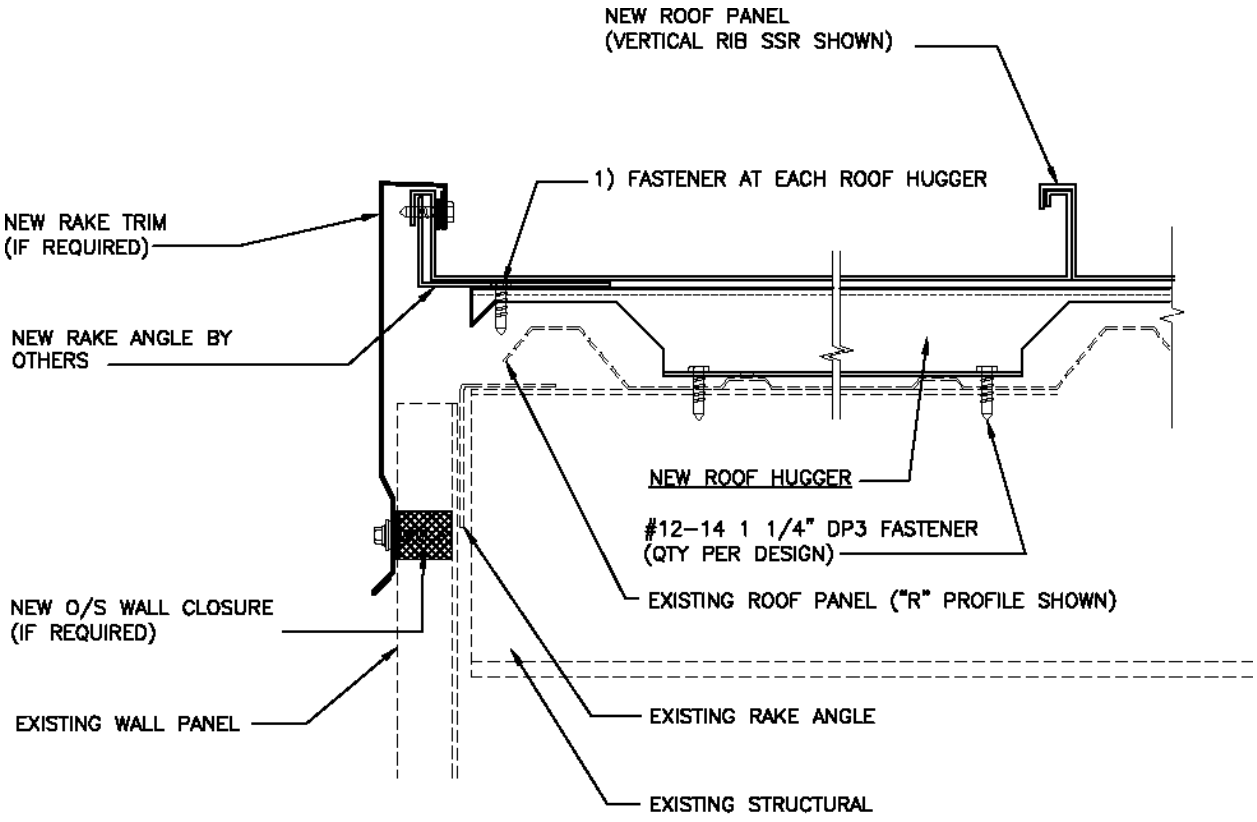
Rake/Endwall (RE-04-V/R)



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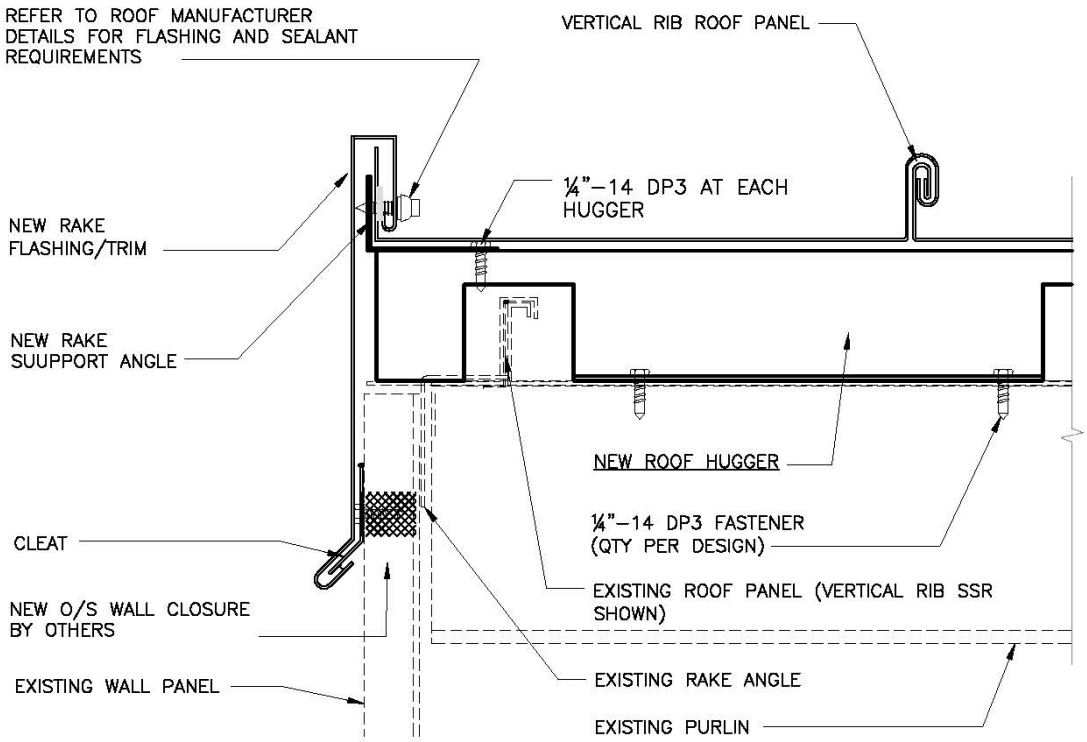
Rake/Endwall (RE-05-V/V)



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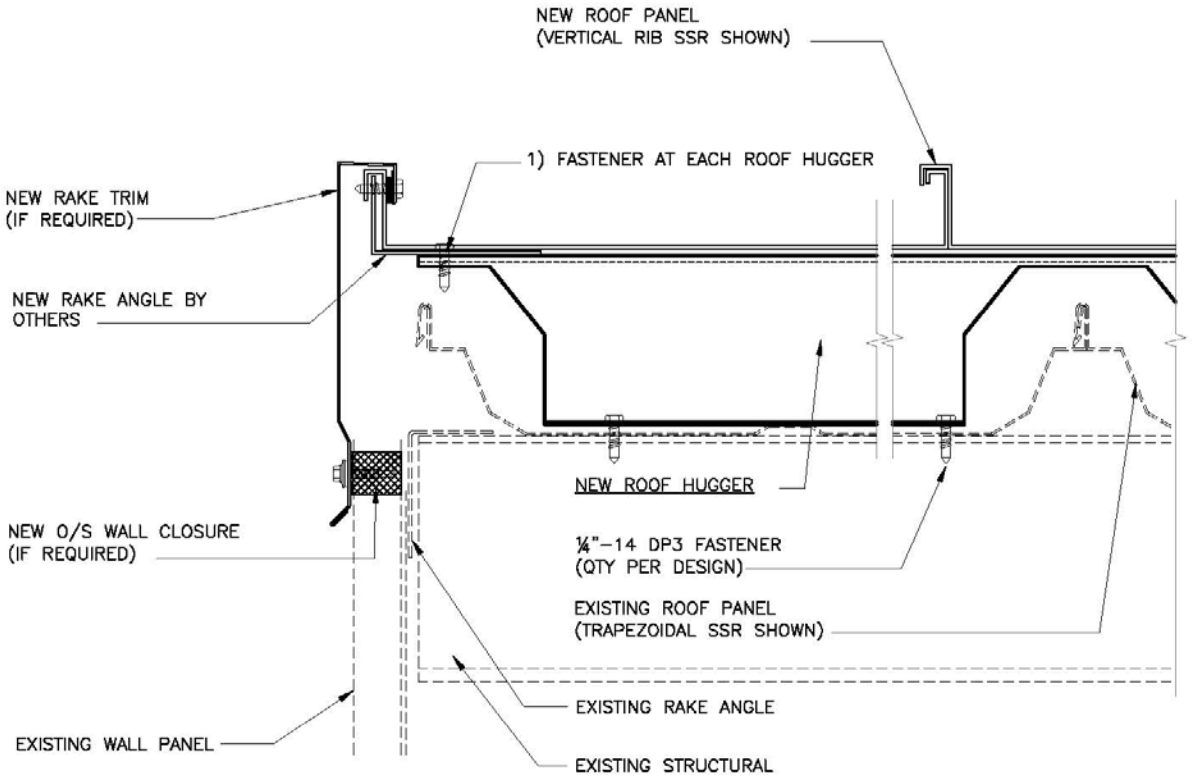
Rake/Endwall (RE-06-V/T)



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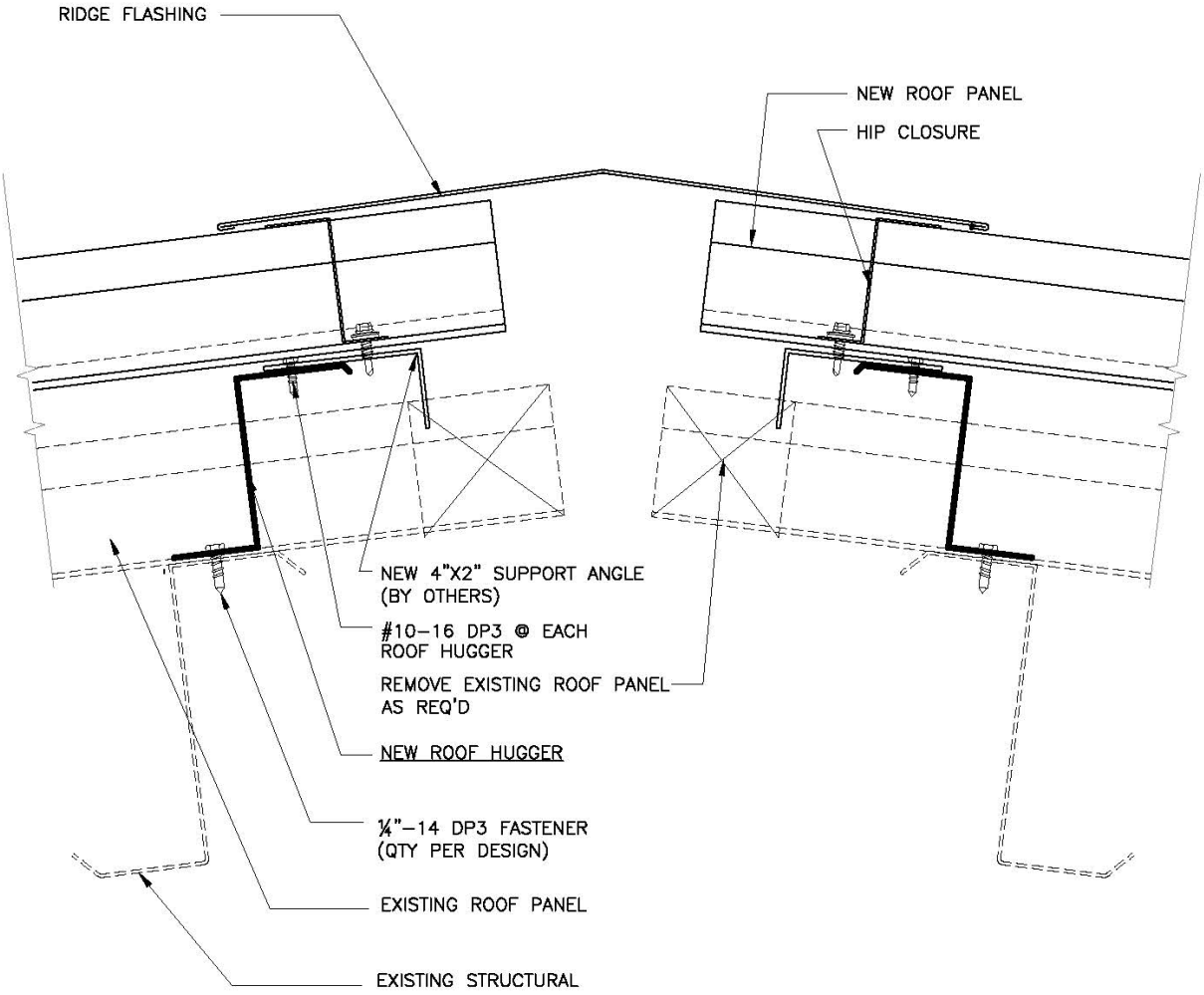
Ridge (RD-01-G)



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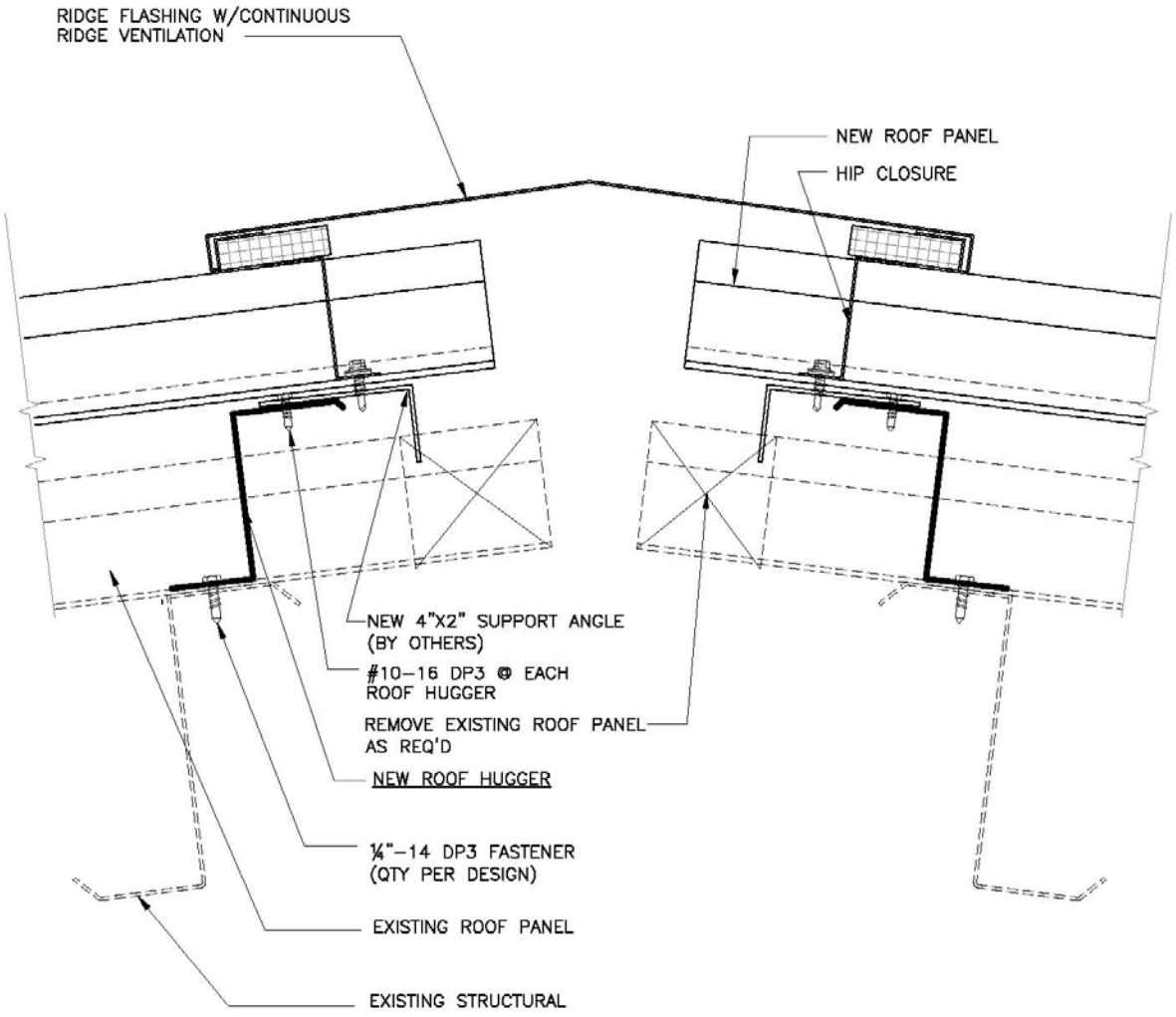
Ridge – Vented (RD-02-GV)



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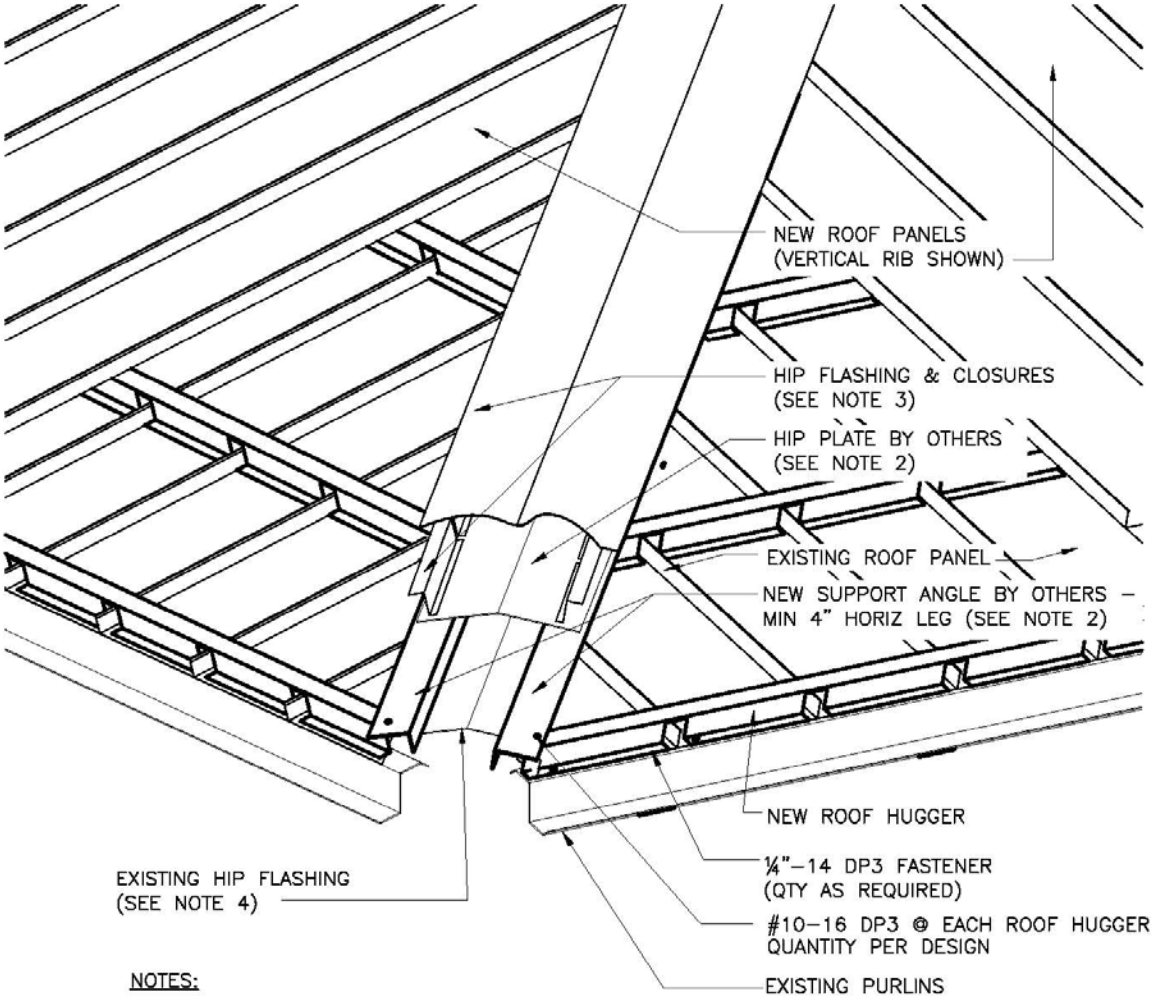
Hip (HP-01-G)



NOTES:

1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE
2. ROOF HUGGER SETBACK SUBJECT TO NEW ROOF PANEL REQUIREMENTS, CHECK WITH PANEL MANUFACTURER.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.
4. REMOVE EXISTING HIP FLASHING AND ROOF PANEL TO INSTALL ANGLES AS REQUIRED
5. SEE HP–02–G FOR CROSS SECTION VIEW

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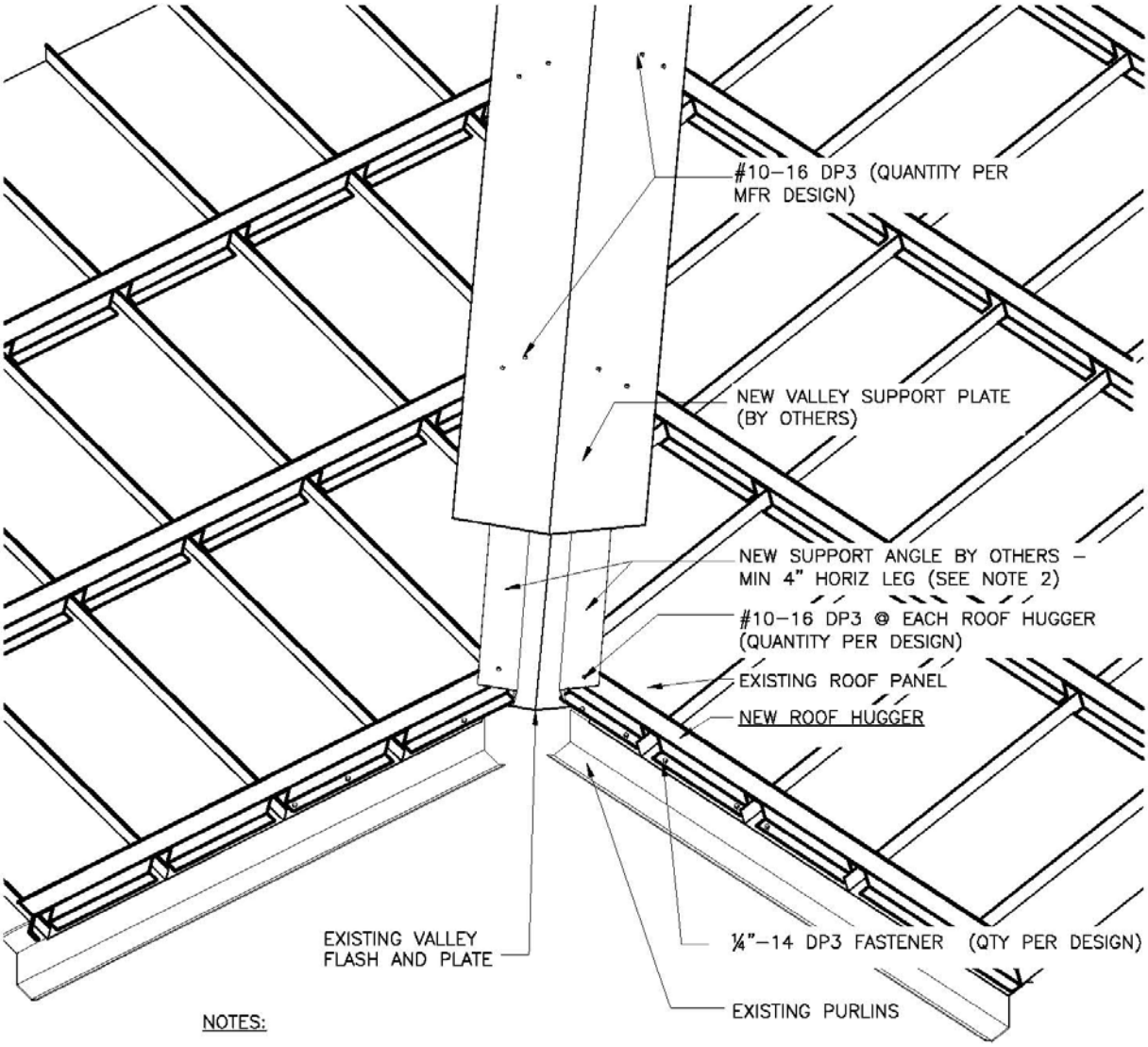
Valley (VL-01-G)



NOTES:

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2. ROOF HUGGER SETBACK SUBJECT TO NEW ROOF PANEL REQUIREMENTS, CHECK WITH MANUFACTURER.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.
4. NEW ROOF PANELS NOT SHOWN FOR CLARITY.
5. SEE VL–02–G FOR CROSS SECTION VIEW

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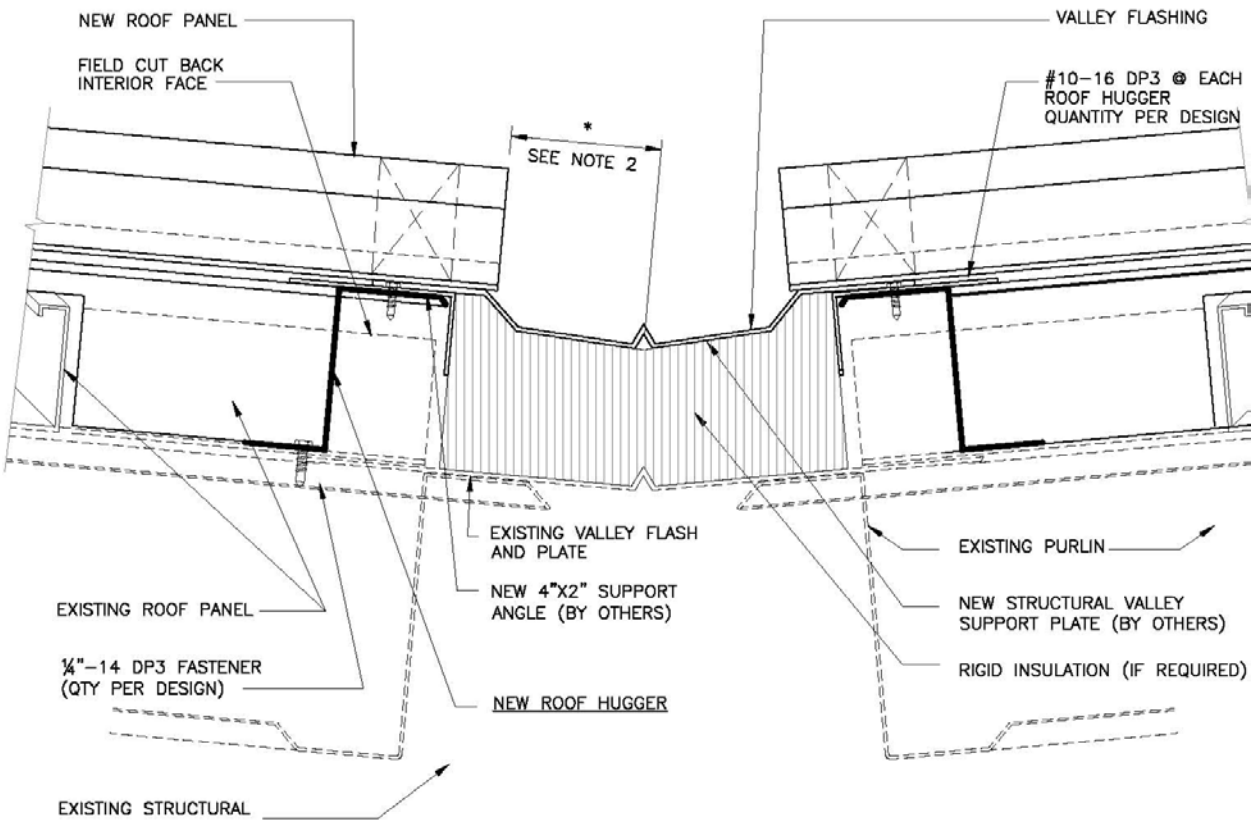
Valley (VL-02-G)



NOTES:

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2. ROOF HUGGER SETBACK SUBJECT TO NEW ROOF PANEL REQUIREMENTS, CHECK WITH MANUFACTURER.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.
4. SEE VL-01-G FOR ISOMETRIC VIEW.

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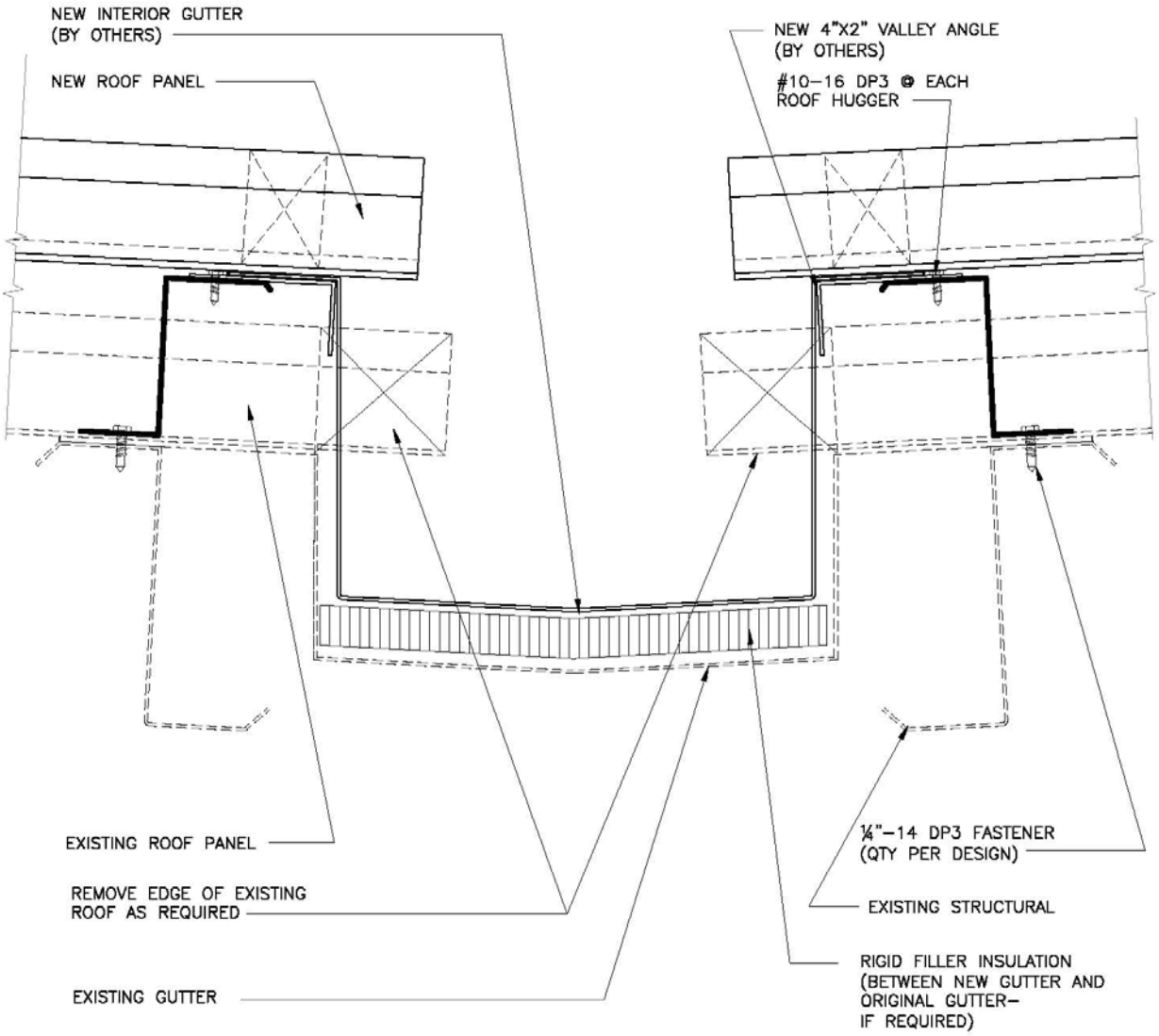
Valley Gutter (VG-01-G)



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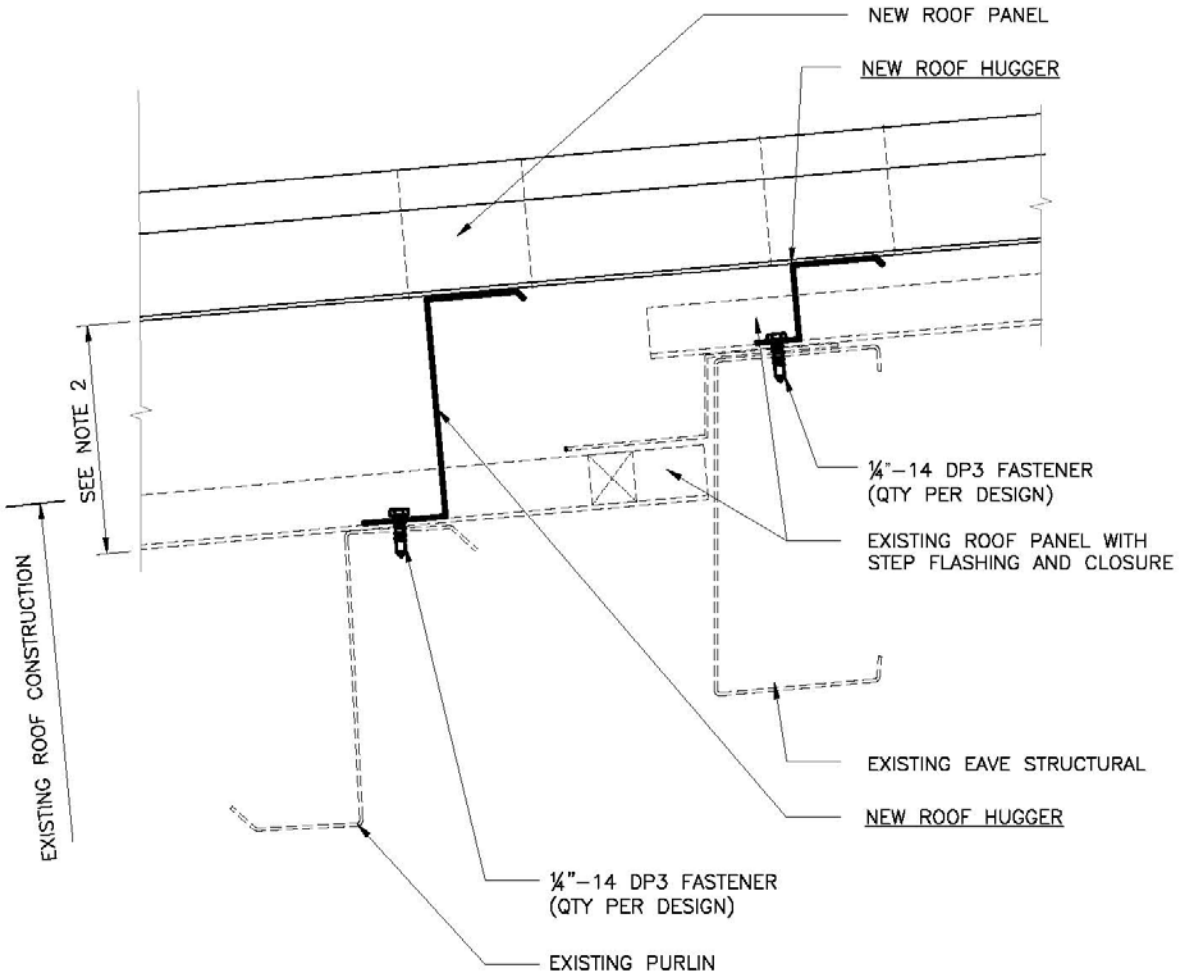
Lean-to Step (LT-01-G)



NOTES:

1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE
2. CONSULT WITH ROOF HUGGER FOR MAXIMUM HEIGHT.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.

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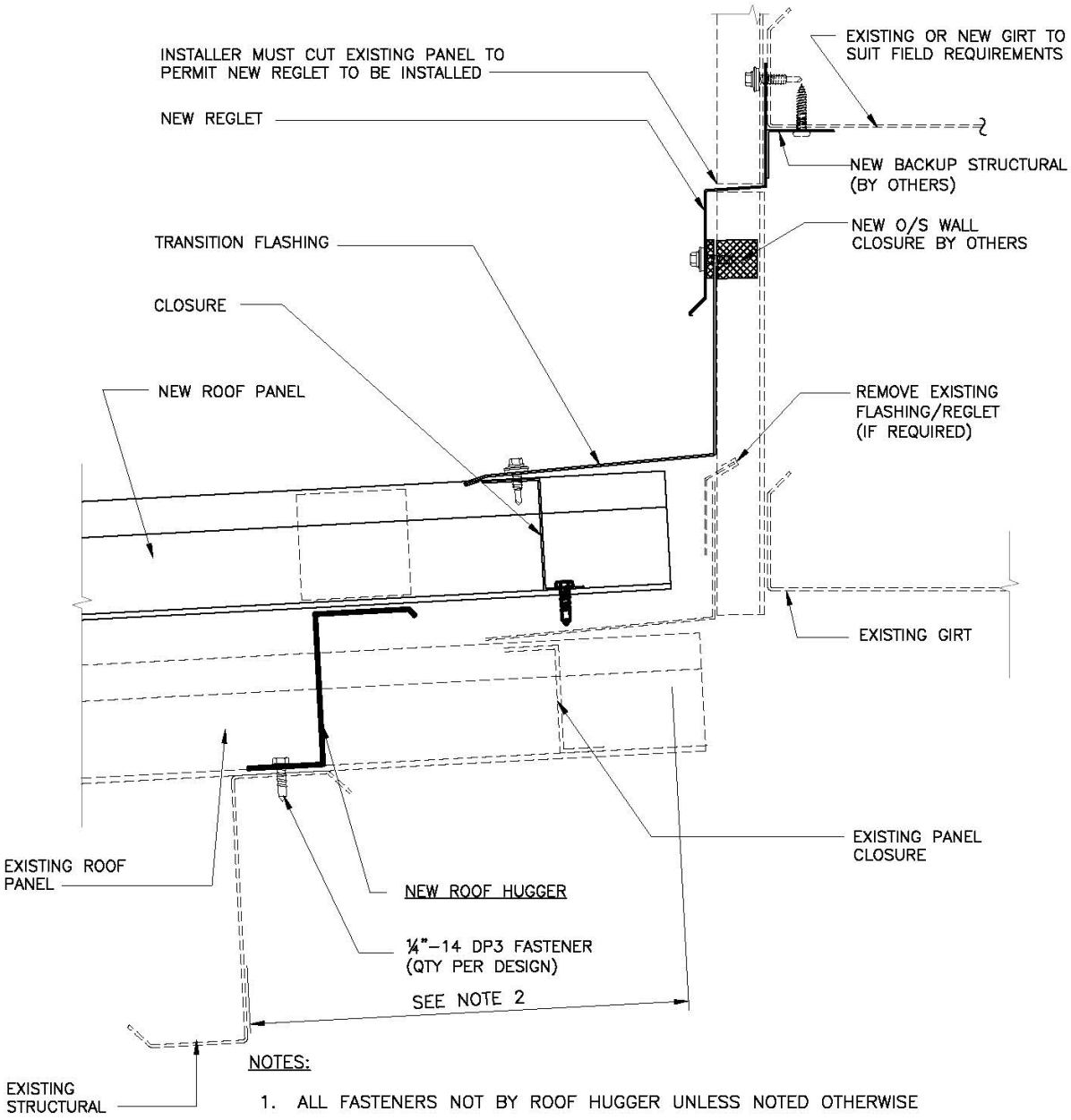
Pitchbreak/Roof-to-Wall (PB-01-G)



NOTES:

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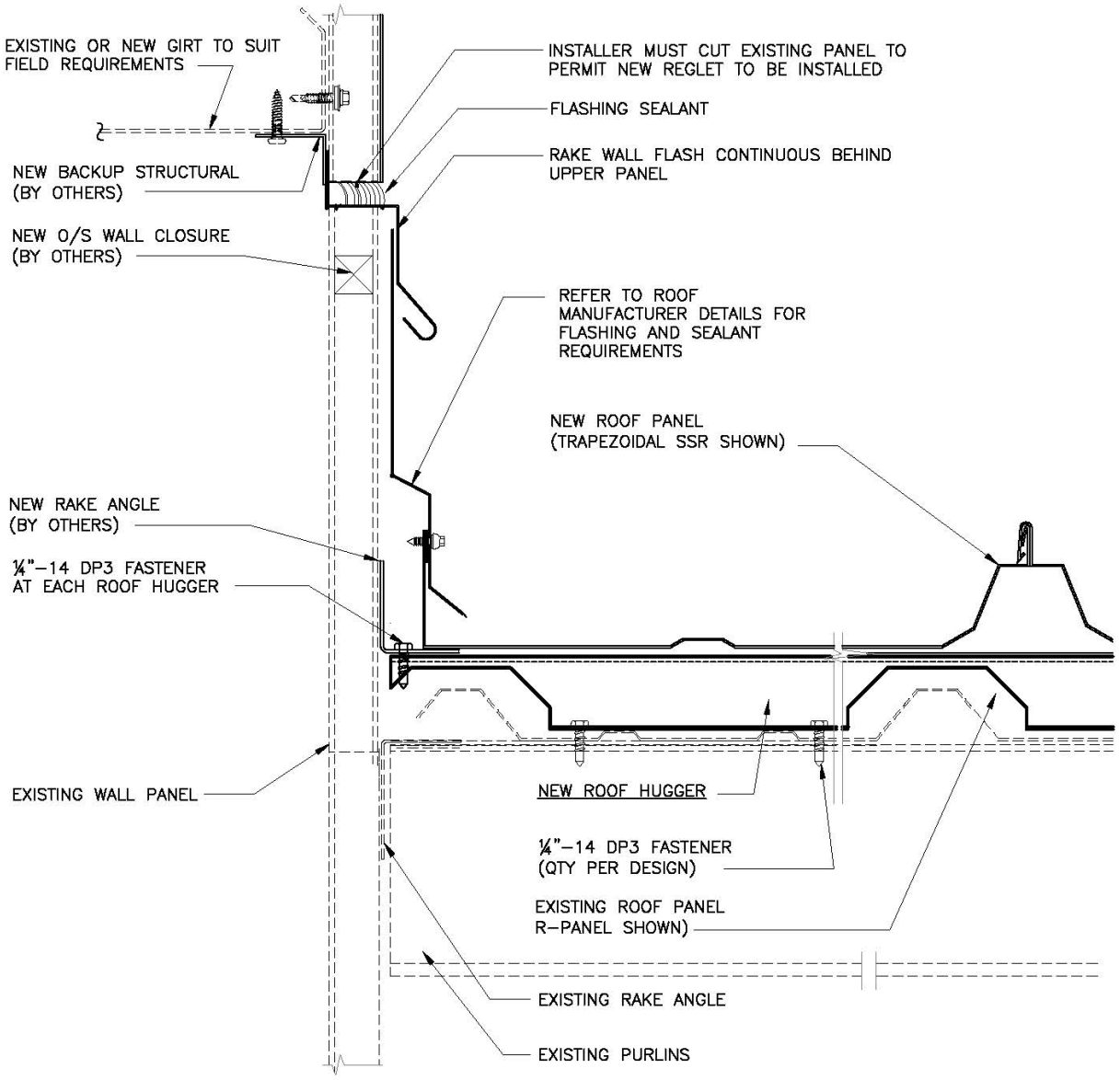
Rake-to-Wall (RW-01-T/R)



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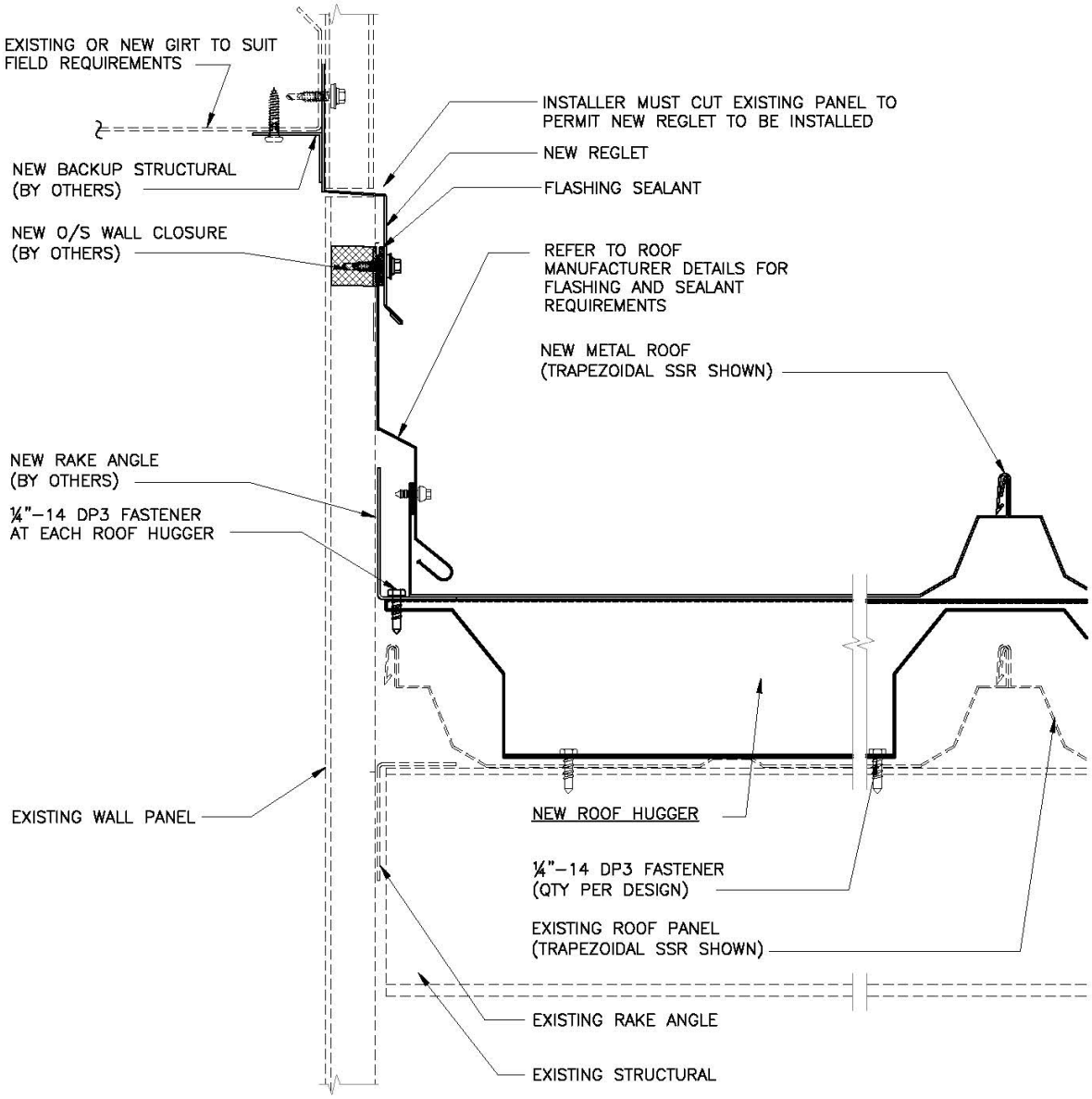
Rake-to-Wall (RW-02-T/T)



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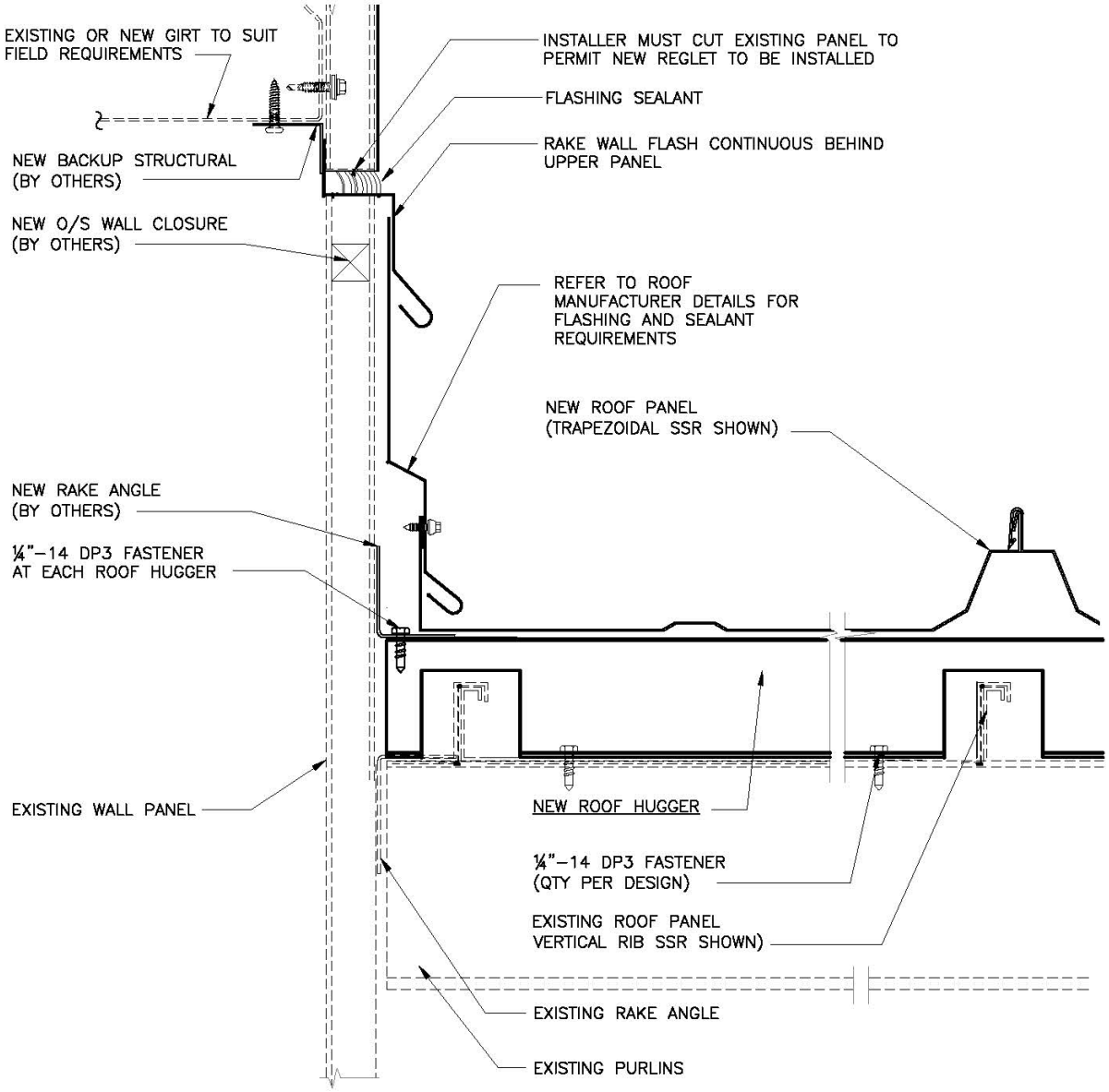
Rake-to-Wall (RW-03-T/V)



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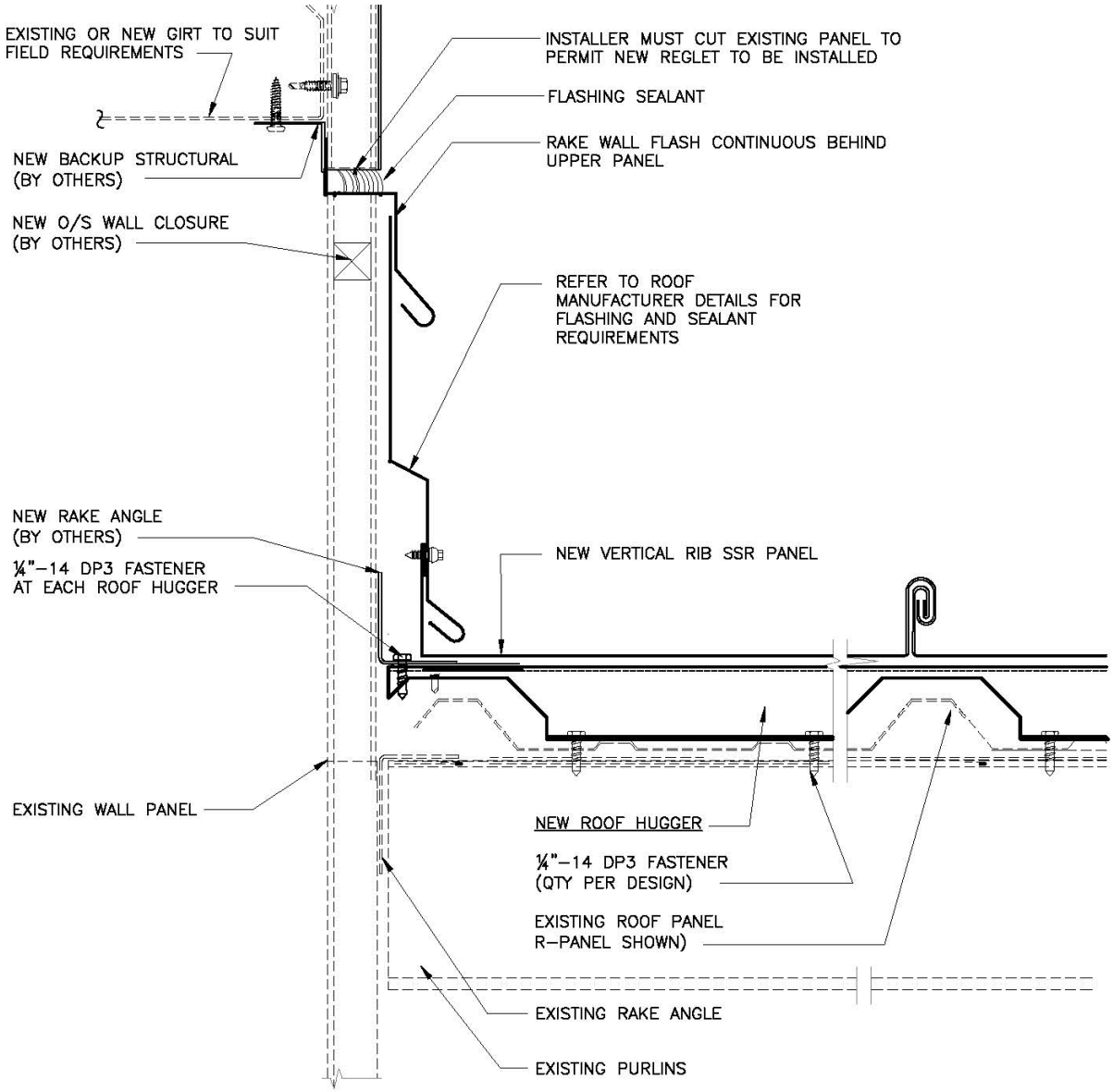
Rake-to-Wall (RW-04-V/R)



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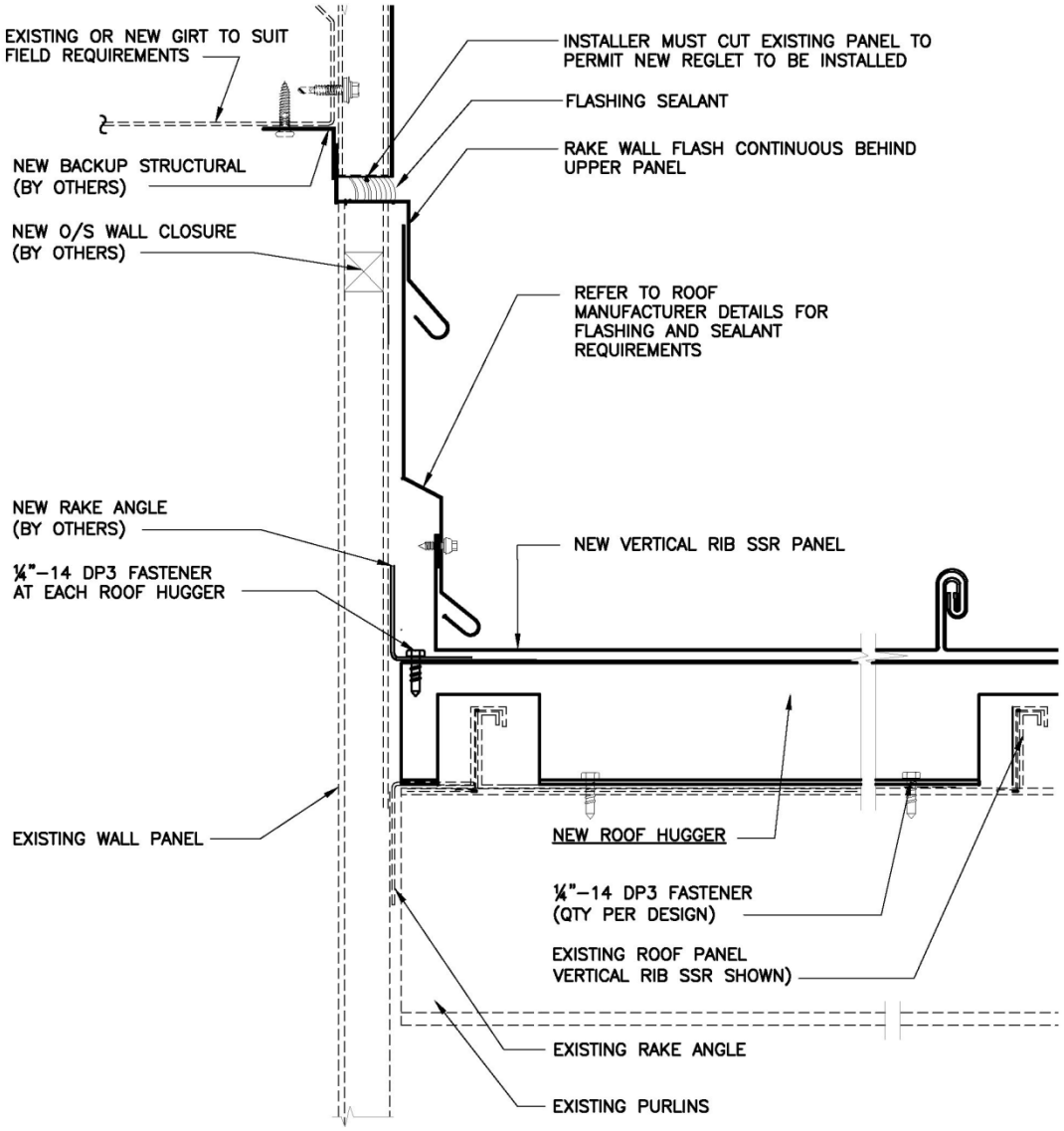
Rake-to-Wall (RW-05-V/V)



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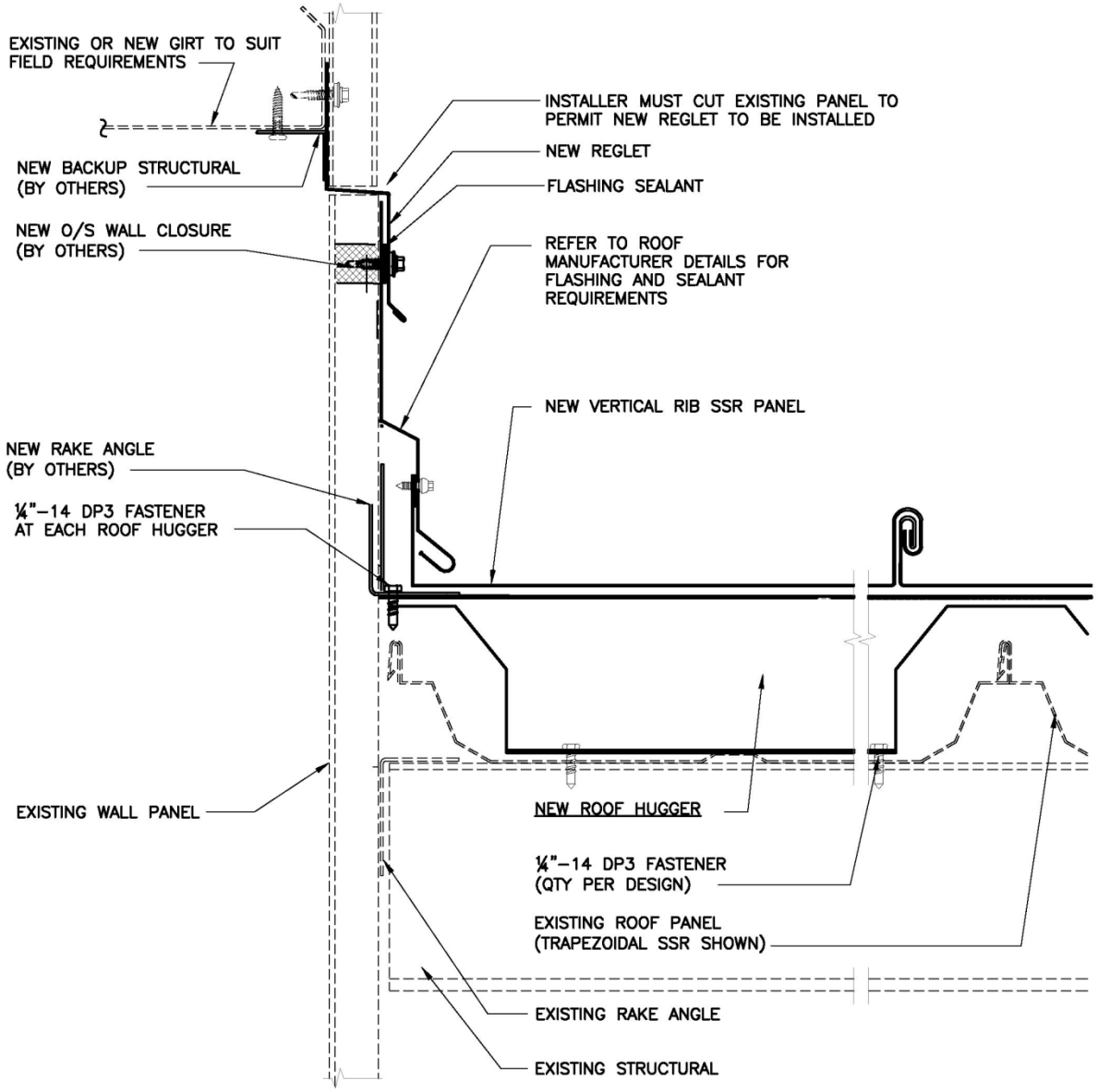
Rake-to-Wall (RW-06-V/T)



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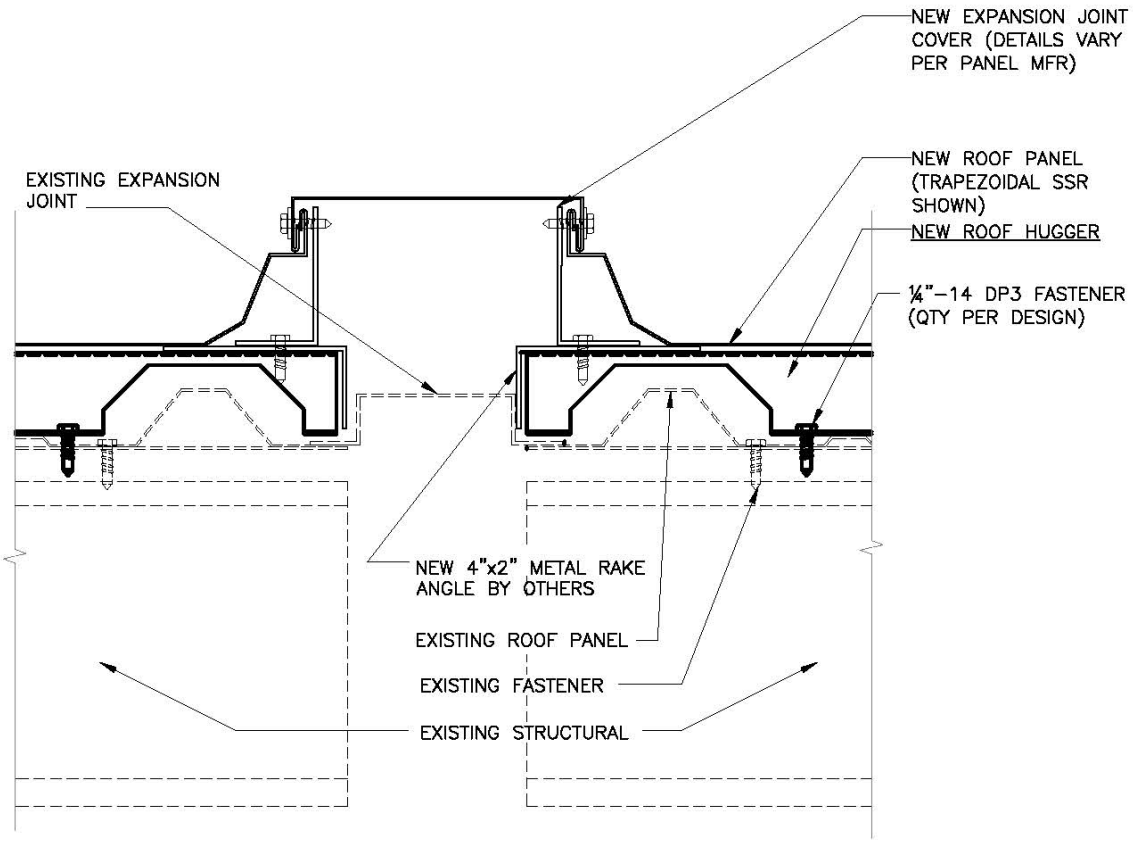
Panel Expansion Joint (EJ-01-T/R)



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