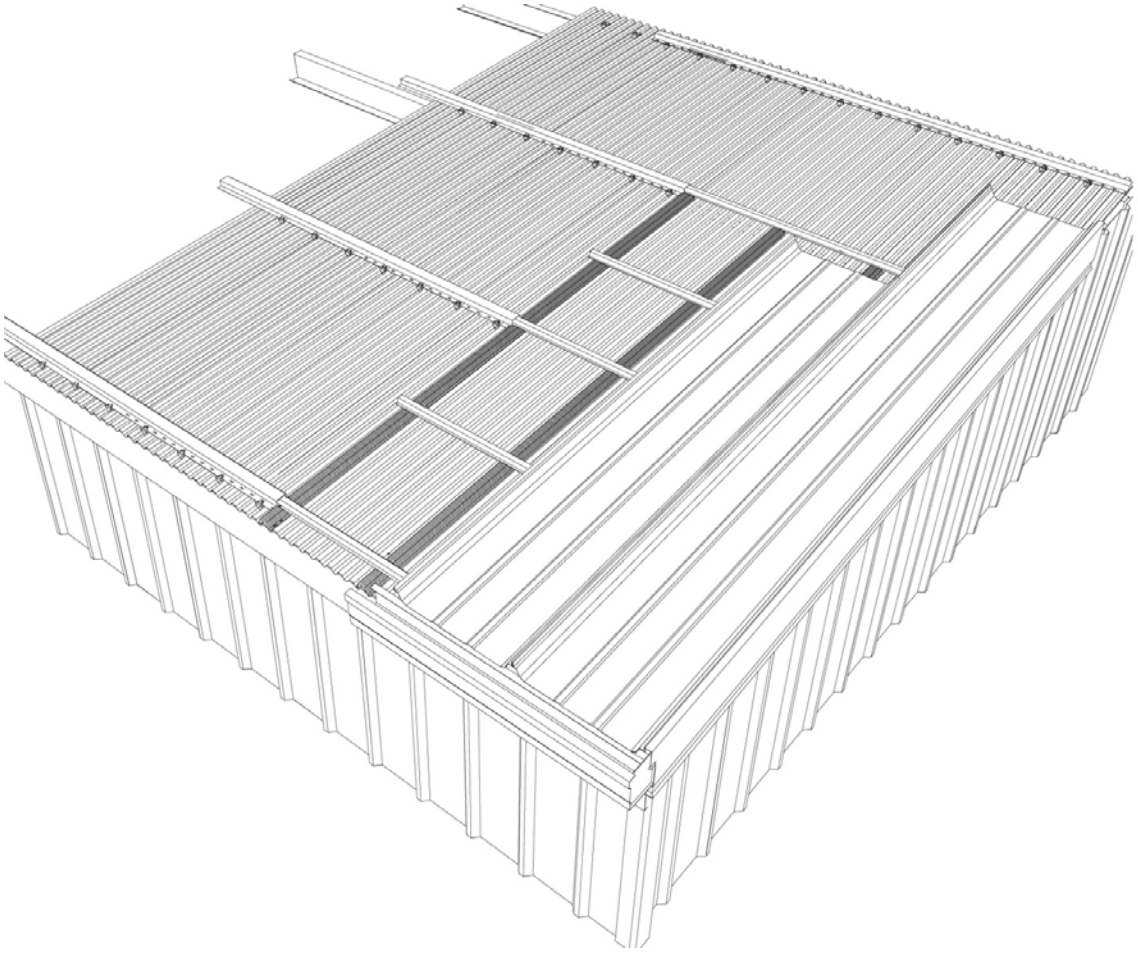
ROOF HUGGER®

Corru-Fit™ Design Guide

Exclusively for Existing Corrugated Metal Roofs



The Most Recognized and Tested

Metal-over-Metal Retrofit Re-roofing Solutions

Roof Hugger, LLC
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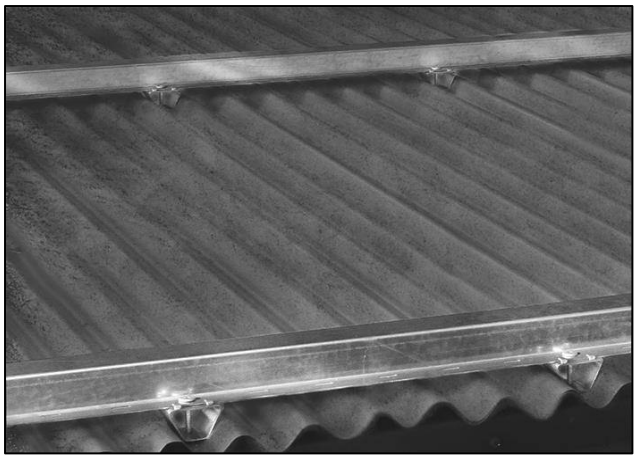
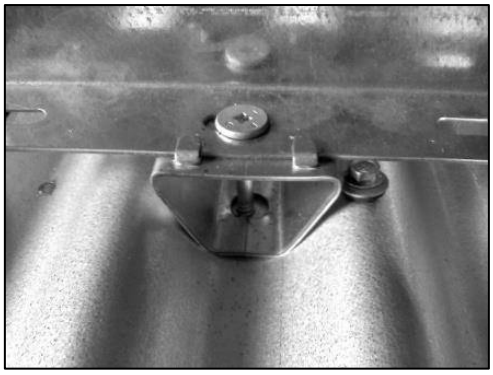
Corru-Fit™ Retrofit Systems



Introduction - Roof Hugger's product for retrofitting old sine-wave corrugated metal roofs is the Corru-Fit™ sub-framing system. This product is specifically designed to be installed over all corrugated metal panels having a maximum corrugation depth of 1-1/2" " and rib spacing of 2.5", 2.67", 2.75" and 4.25". There are billions of square feet of these roofs out there having been constructed for the past 60-plus years. They are more commonly found on wood and steel framed structures used in utilitarian applications from agricultural and storage facilities to small service businesses. To make these roofs even more problematic to retrofit, occasionally you will find other rib spacing that hasn't been manufactured for decades, which Roof Hugger has considered this in the Corru-Fit™ design concept as well.

The problem with corrugated roofs is they are notorious for inconsistent rib spacing, making it very difficult to install a structurally correct Metal-over-Metal retrofit sub-framing system. To do it right, it is necessary to install a sub-purlin that attaches in the low corrugation directly into the existing roof purlins. A hat or zee-shaped sub-purlin placed over the corrugations is not structurally correct. Roof Hugger, Inc. knows this because we have been manufacturing retrofit sub-framing systems for these problematic old metal roofs over 20-years.



Product Description - The application of a Corru-Fit™ sub-framing system eliminates the issues related to inconsistent corrugation spacing. Using a simple factory-formed and punched upside-down trapezoidal-shaped "Spacer" that seats down in the low of the corrugation, there is no problems with inconsistent rib spacing. This is made possible with Corru-Fit's special "Zee Purlin" that has a pre-punched base flange with slotted screw holes that allow for inconsistencies in the rib spacing as well as various profiles mentioned above. To assist with the Zee Purlin alignment, the Spacer also has two retainer tabs that the Zee's base flange fits snugly into and to comply with varying building code required wind speeds, the Spacers can be installed from 5" to 18" on center. For attachment to the existing roof structure, a specially designed stand-off fastener is installed through the slot in the Zee's base flange, then through the hole in the Spacer and directly into the existing purlins or joists.

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The overall height of the standard Corru-Fit™ assembly is 2¾" that permits three-inches of fiberglass insulation to be included between the old and new roofs. By decreasing or increasing the zee purlin's web depth, the assembly height can vary from 2¼" to 8", which can assist in installing thicker insulation.

Design and Testing - The International Building code adopted by all U.S. states requires the roofs to be analyzed by zones located at the corners, edges and field or interior area. Each zone will have a different wind uplift load (negative pressure) requirement. Most older metal buildings were designed with uniform roof loading as a result, the 5' purlin spacing typically found in these buildings may not be adequate for the new metal roof panels to meet current code requirements in higher wind zone areas. Snow loadings are also analyzed differently and may also require additional framing for proper panel support. Corru-Fit™ is the ONLY factory manufactured system available in the market today having passed independent laboratory ASTM E-1592 wind uplift testing.

Roof Hugger recommends consulting a qualified design professional to determine the loads, a compliant roof panel and the proper sub-frame spacing. Roof Hugger will run a free preliminary load estimate if requested (subject to final engineering confirmation by others). The new Roof Hugger sub-purlin type and spacing will be based on specified and/or required, snow loads, wind speeds and resulting loads, the existing roof purlin spacing, type of existing roof panel, and the tested maximum capacity of the proposed new roof panel. Different new roof systems may require different framing solutions.

Energy Efficiency - Retrofitting an existing metal roof will create a cavity between the new and existing roofs. Consideration for ventilating and/or insulating this cavity is recommended. Many benefits including reduced heating/cooling energy consumption and Federal/State and local tax incentives can be realized. Third party, heat recovery systems built within this cavity are available, as are various insulating and ventilating systems. Each system has its own sub-framing design considerations.

Summary - Today, Roof Hugger has become the re-roofing sub-purlin system of choice by Design Professionals, Contractors, Facility Managers and Roof Consultants throughout the Nation. With the Corru-Fit™ product offer, Roof Hugger has gone that extra step again to provide proven and tested Metal-over-Metal retrofit sub-framing systems that can receive your choice of a new metal roof with the assurance that the retrofit assembly has been engineered to meet the demands of today's building code requirements.

This manual is a supplement to Roof Hugger's Design & Installation Guide for factory-notched & nesting "Hugger" sub-purlin systems. They are both available for download on our website at www.roofhugger.com. If you should have any questions that this manual does not answer, please feel free to call us at 1-800-771-1711.

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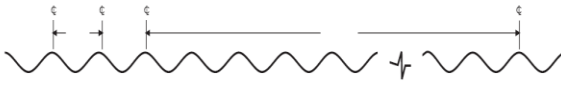
Measuring Existing Corrugated Panels – Corrugated panels are very difficult to determine the existing rib spacing because of the inconsistency. As simple as it may sound, this can be largely due to where the Installer was standing when the panel was originally installed. Even though the Corru-Fit™ product is designed to deal with these inconsistencies, Roof Hugger will ask that you measure the rib spacing to prevent any problems that may be unforeseen prior to placing an order. Below is a method that can be used to assist this process.

When measuring, be sure to measure a distance of more than 10'-0"+/- to determine what the rib spacing is and if the corrugations are consistent. It is recommended to measure in several locations over the total roof area.



If corrugated panel is 2.67", then 9 ribs = 24"
If corrugated panel is 2.50", then 8 ribs = 20"
If corrugated panel is 2.75", then 8 ribs = 22"
If corrugated panel is 4.20", then 5 ribs = 21"

For illustrative purposes only, *existing "R" Panel shown*

In order to assist you in the process, Roof Hugger has a specially designed cardboard "Template" that will help identify if the roof is one of the four most standard profiles shown above. You can obtain a template at no charge from Roof Hugger, Inc. by calling 1-800-771-1711.

Standard Details of Construction – The following details are provided for your review to identify what your specific application insofar as type of new metal roof. They can be downloaded in AutoCAD or PDF format at www.roofhugger.com. If you do not find what you need, please contact us at 1-800-771-1711.

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Corru-Fit™ 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 13145 (13 34 21)

RETROFIT STEEL SUB-PURLINS FOR SINEWAVE TYPE CORRUGATED METAL PANELS

SECTION 13145 (13 34 21) - SPECIFICATIONS FOR STRUCTURAL RETROFIT ROOF SUB-FRAMING SYSTEM

PART 1 - GENERAL

1.10 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 the specified code and design loading and shall transfer positive acting loads at each attachment location into an existing structural member.
B. 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.
C. Completely coordinate work with of other trades.
D. Although such work is not specifically indicated, the contractor/installer shall coordinate with the metal roof panel supplier to furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
E. See Division 1 for General Requirements

1.20 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.
I. Section 26 05 00 – Electrical Demolition and Modifications.

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1.30 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 - Structural Performance Test for Metal Panel 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].

1.40 SUBMITTALS

A. Comply with Section 01330 (01 33 00) - Submittal Procedures.
B. Product Data: Submit manufacturer's product data, including installation instructions.
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.

1.50 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.
C. Handling: Protect materials during handling and installation from corrosion, deformation, and other damage.

1.60 EXISTING ROOF SYSTEM AND PRE-CONSTRUCTION INSPECTION

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A. The existing roof is a [Insert existing roof description here per instructions 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.

1.70 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.
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]*

1. Occupancy Group: *[Assembly-A, Business-B, Educational-E, Factory Industrial-F, High-Hazard-H, Institutional/Industrial-I, Mercantile-M, Storage-S, Etc.]*.
2. Occupancy Category: *[I (Low Hazard), II (General), III (300+Occupancy), IV (Essential)]*.
3. Importance Factor: *[0.87, 1.0, 1.15] (IBC 2009 or earlier only)*
4. Minimum Roof Snow Load: *[XXX]* PSF.
5. Ground Snow Load: *[XXX]* PSF.
6. Wind Speed: *[XXX]* MPH, 3 Second Gust.

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7. Exposure Category*: [B, C, D]*.
8. Enclosure: *[Enclosed, Partially Enclosed, Open]*.

PART 2 - PRODUCTS

2.10 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
    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.

2.20 RETROFIT STEEL SUB-PURLINS

A. "Roof Hugger" Corru-Fit Retrofit Sub-Purlins:
B. Description:
    1. 2-piece system, consisting of a fixed height spacer and a custom-punched continuous, Z-shaped purlin.
    2. Pre-punched Zee to align with the existing panel rib valleys.
    3. Pre-punched spacer with attachment hole for fasteners.
    4. Fastens directly into existing purlins or joists with special fasteners.

C. Material:
    1. Galvanized steel, ASTM A 653 or A 1011, G-90, yield strength 50 KSI.
    2. Thickness: [0.060" minimum, 16-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 2" with 0.25" minimum stiffening lip unless otherwise specified.

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6. Length: Nominally 10'-0" long, plus an additional +/- 1" top flange extension for part lap or per manufacturer's recommendations.

D. Attachment Fasteners/Anchorage

1. Roof Hugger "Corru-fit" Sub-Purlin assembly:
2. Attachment to Existing Purlins: ¼"-14 x 3" Concealor, DP3 self- drilling fastener as manufactured by Triangle Fasteners, square drive;
3. Lap Fastening: #10-16 DP3 pancake head through Hugger top flange as indicated when joining Hugger sub-purlin end-laps to form a continuous Zee.
4. Length: Required to penetrate existing purlins in accordance with fastener attachment standards.
5. Sub-Rafter Hat Channels:
    a. Attachment to Existing Purlins, Trusses, Rafters or Joist: #1/4"-14 threads per inch DP3 self-drilling fasteners or equal.
    b. Length as required for minimum required penetration into truss, rafter or joist.
6. Sub-Purlin Hat Channels:
    a. Attachment to installed sub-rafters: ¼"-14 threads per inch, DP3 self-drilling fasteners.

PART 3 - EXECUTION

3.10 EXAMINATION

A. Examine existing roof areas to receive sub-purlins. Notify Architect 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.
    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.

3.20 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.

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C. Install 1 spacer and fastener per [XX-inches] in Zone 1, Install 1 spacer and fastener per [XX-inches] in Zone 2, Install 1 spacer and fastener per [XX-inches] in Zone 3 or as directed by Manufacturer.

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

E. Removal of Existing Roof Fasteners:

1. For existing panels with fasteners in the panel high ribs do not remove existing roof fasteners unless installation of sub-purlins over fasteners causes sub-purlins to "roll" or "porpoise". For existing panels with fasteners in the rib valleys do not remove the existing roof fasteners, if there is a conflict with an existing fastener reduce the Hugger fastener/spacer layout by one corrugation and adjust the subsequent spacer so not to exceed the maximum allowed spacing.

A. Skylights:

a. Install sub-purlins over existing skylights prior to removal of the old skylight.
b. Cut out the existing skylight as required.
c. Trim openings so as to minimize the infiltration of air within the building into the newly created roof cavity.

F. 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.

G. New Equipment within the New Roof Cavity

1. The contractor shall 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.

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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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Corru-Fit Standard Details with Various New Metal Roof Systems		
Detail Description and Location	New Roof Type	Page No.
Low Eave with Gutter (2D Cross-Section)	Generic	13
Low Eave with Gutter and New Thru-Fastened Roof	"R" Panel	14
Low Eave with Gutter and New Standing Seam (SSR)	Trapezoidal SSR	15
High Eave with Gutter and New Thru-Fastened Roof	"R" Panel	16
High Eave with Gutter and New Standing Seam	Trapezoidal SSR	17
Mid-roof Spacer Attachment to Existing with New Thru-Fastened	"R" Panel	18
Mid-roof Spacer Attachment to Existing with New Standing Seam	Trapezoidal SSR	19
Rake with New Thru-Fastened Roof (2D Cross-Section)	"R" Panel	20
Rake with New Standing Seam (2D Cross-Section)	Trapezoidal SSR	21
Ridge Assembly (2D Cross-Section)	Generic	22
Valley Gutter Condition (2D Cross-Section)	Generic	23
Roof Zone Reinforcement (Wind Uplift Resistance Sub-framing)	Generic	29

PLEASE NOTE: The above listed and following standard Corru-Fit™ assembly details are provided showing the two most likely new metal roof systems for Metal-over-Metal retrofitting over existing corrugated roofs. These standard details can be downloaded at www.roofhugger.com in PDF and editable AutoCAD DWG format. If you do not find the detail that best suits your project, please contact us at 1-800-771-1711 or email us at sales@roofhugger.com.

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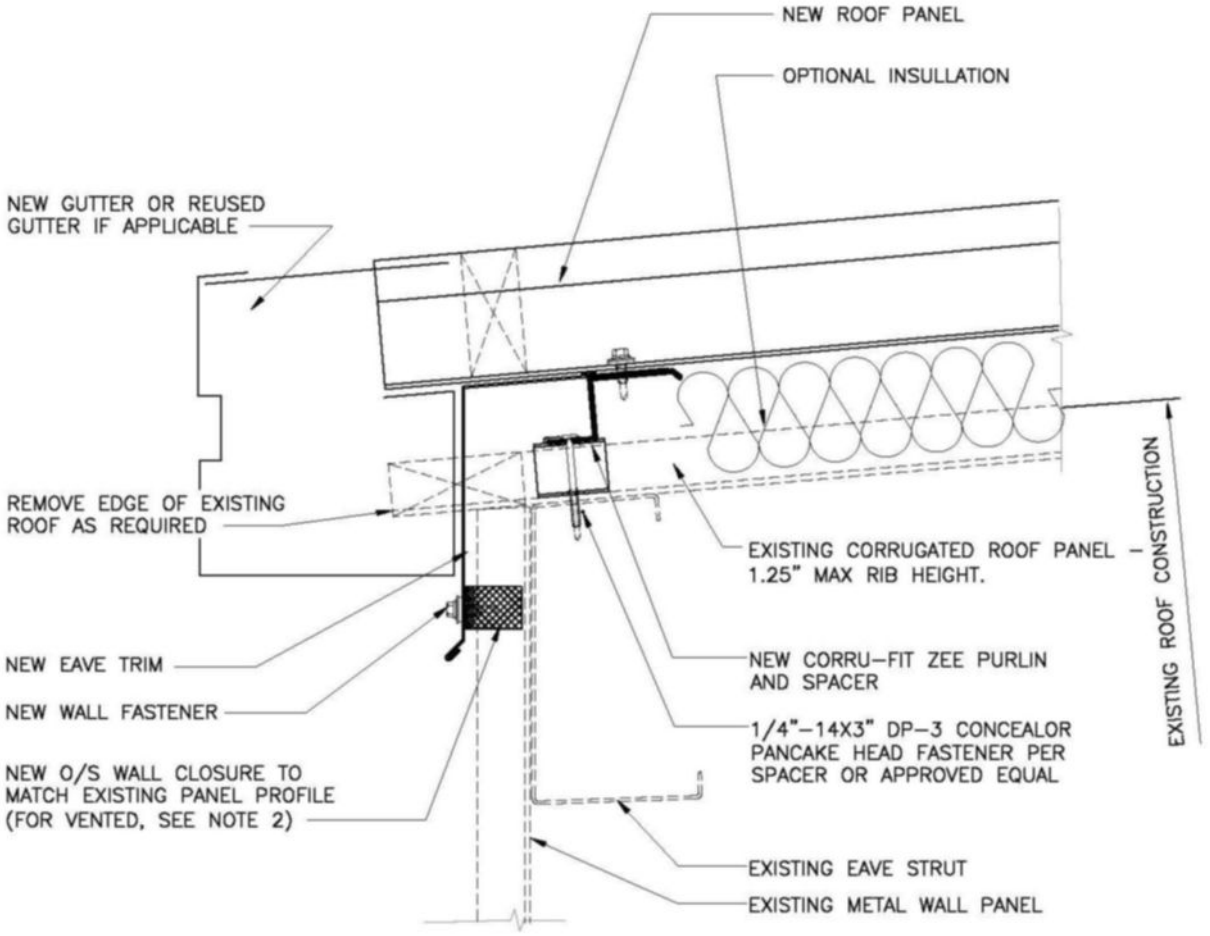
Low Eave - LE-01-CF – Generic Panel



NOTES:

1. ATTACHMENT FASTENERS BY ROOF HUGGER UNLESS NOTED OTHERWISE.
2. SEE ROOF HUGGER INSTALLATION INSTRUCTIONS FOR INFORMATION CONCERNING EXISTING FASTENERS BEING REMOVED OR LEFT IN PLACE.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES ARE BY OTHERS AND ARE TO BE INSTALLED BY THE MANUFACTURER'S STANDARDS.

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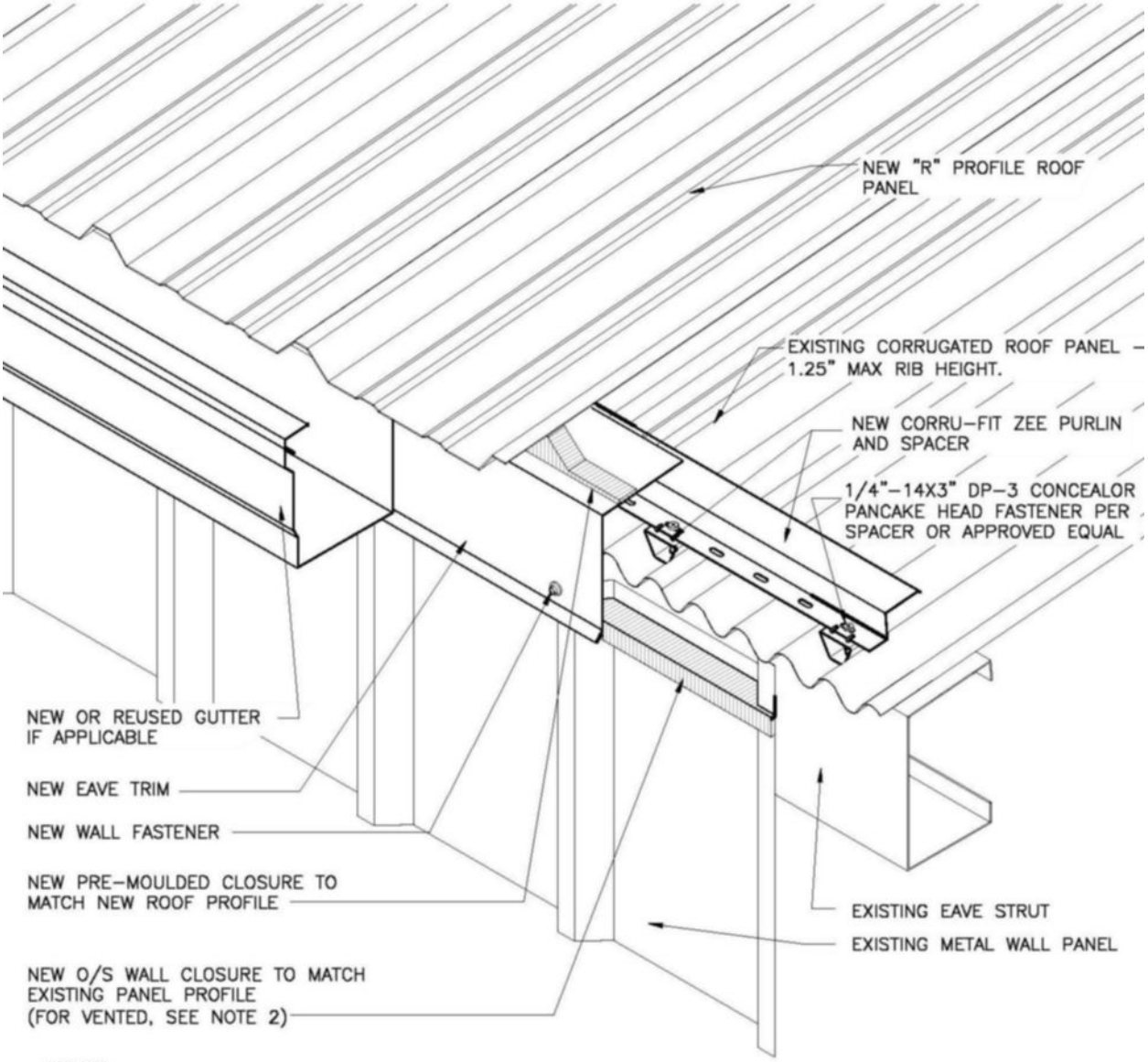
Low Eave - LE-07-R-CF - “R” Panel



NOTES:

1. ATTACHMENT FASTENERS BY ROOF HUGGER UNLESS NOTED OTHERWISE.
2. FOR VENTED LOW EAVE, USE "LP" VENTED CLOSURE AS MANUFACTURED BY MARCO INDUSTRIES – TULSA, OK OR OTHER AS PREFERRED.
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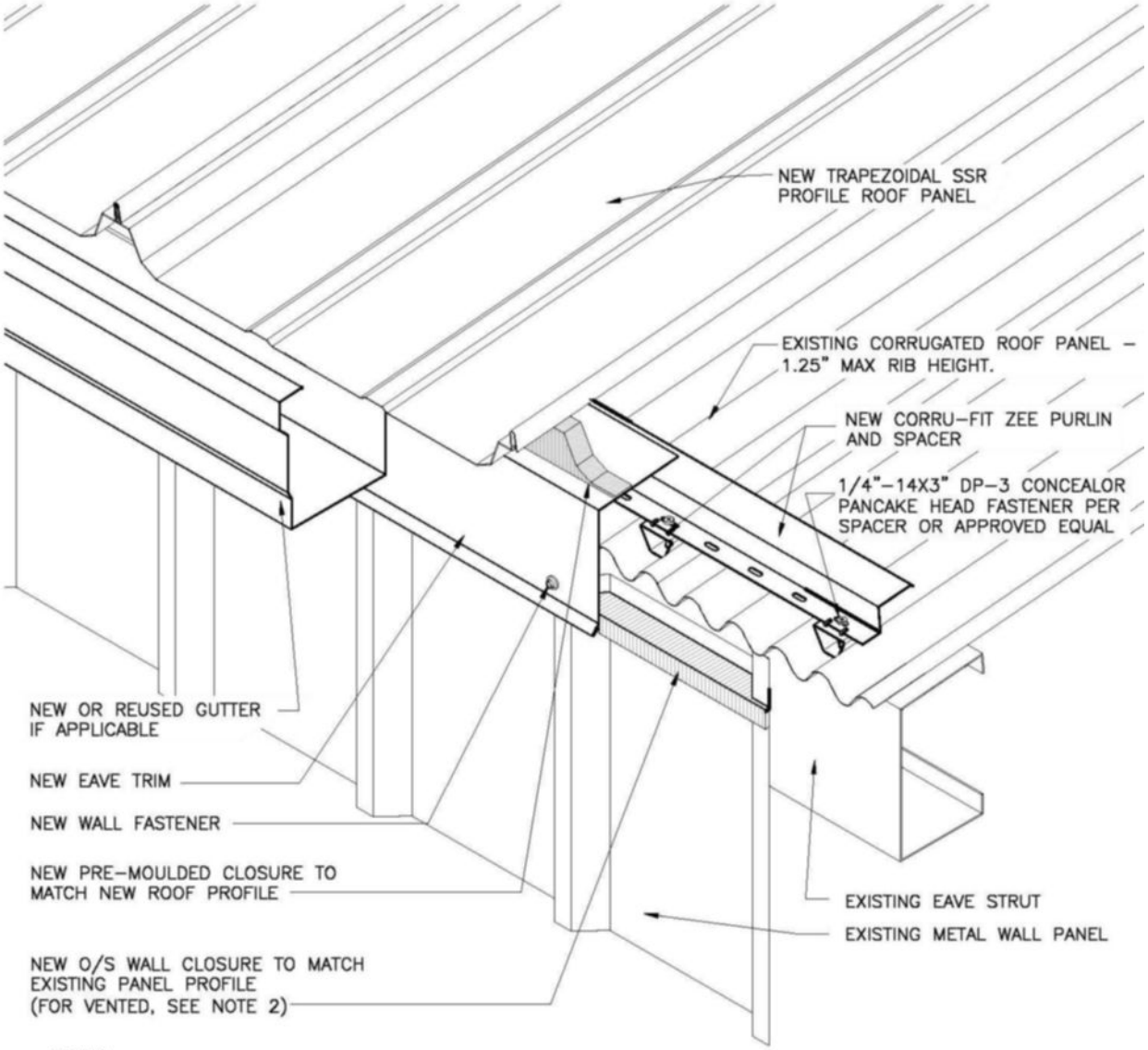
Low Eave - LE-07-T-CF - Trapezoidal



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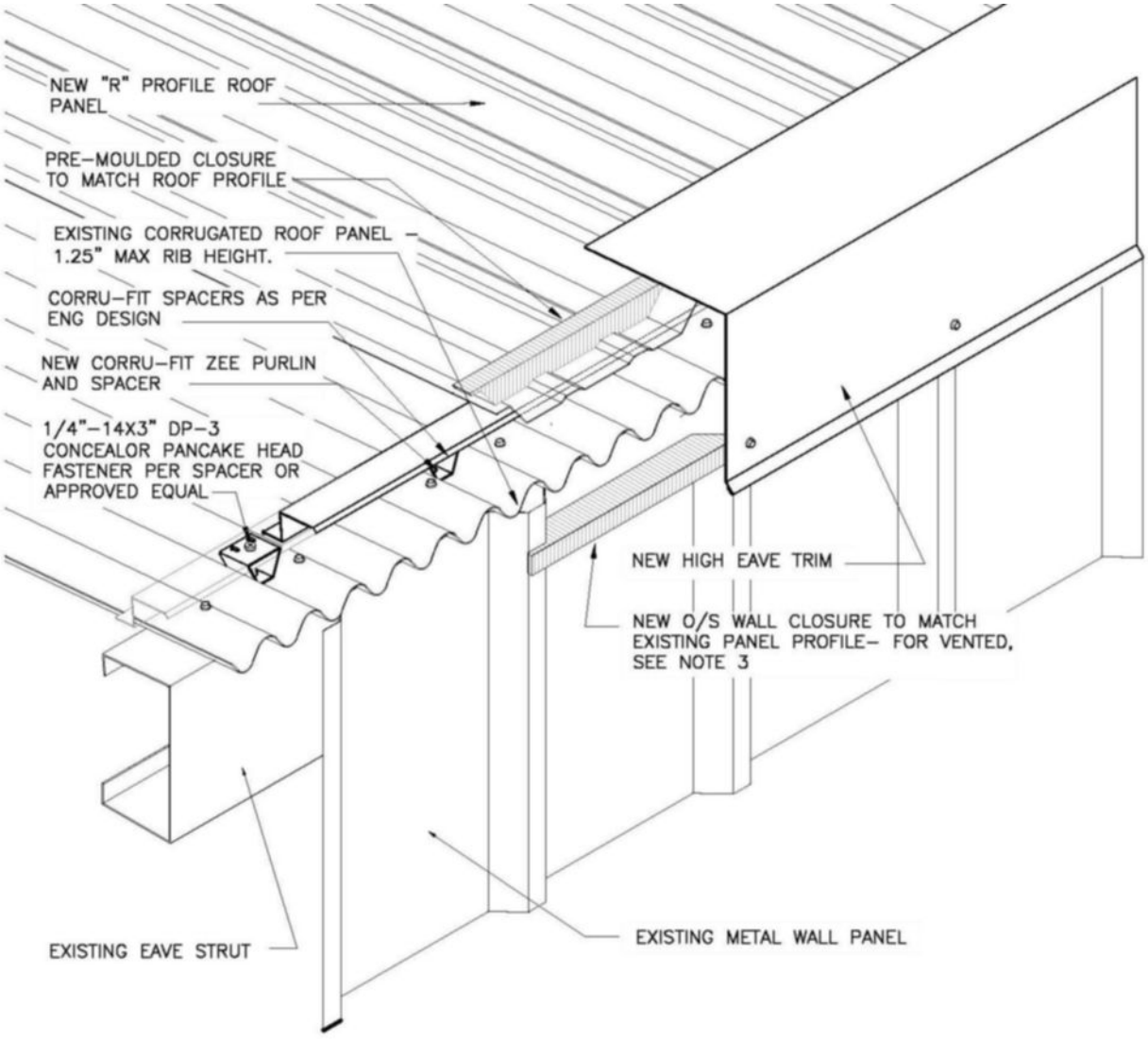
High Eave - HE-01-R-CF - “R” Panel



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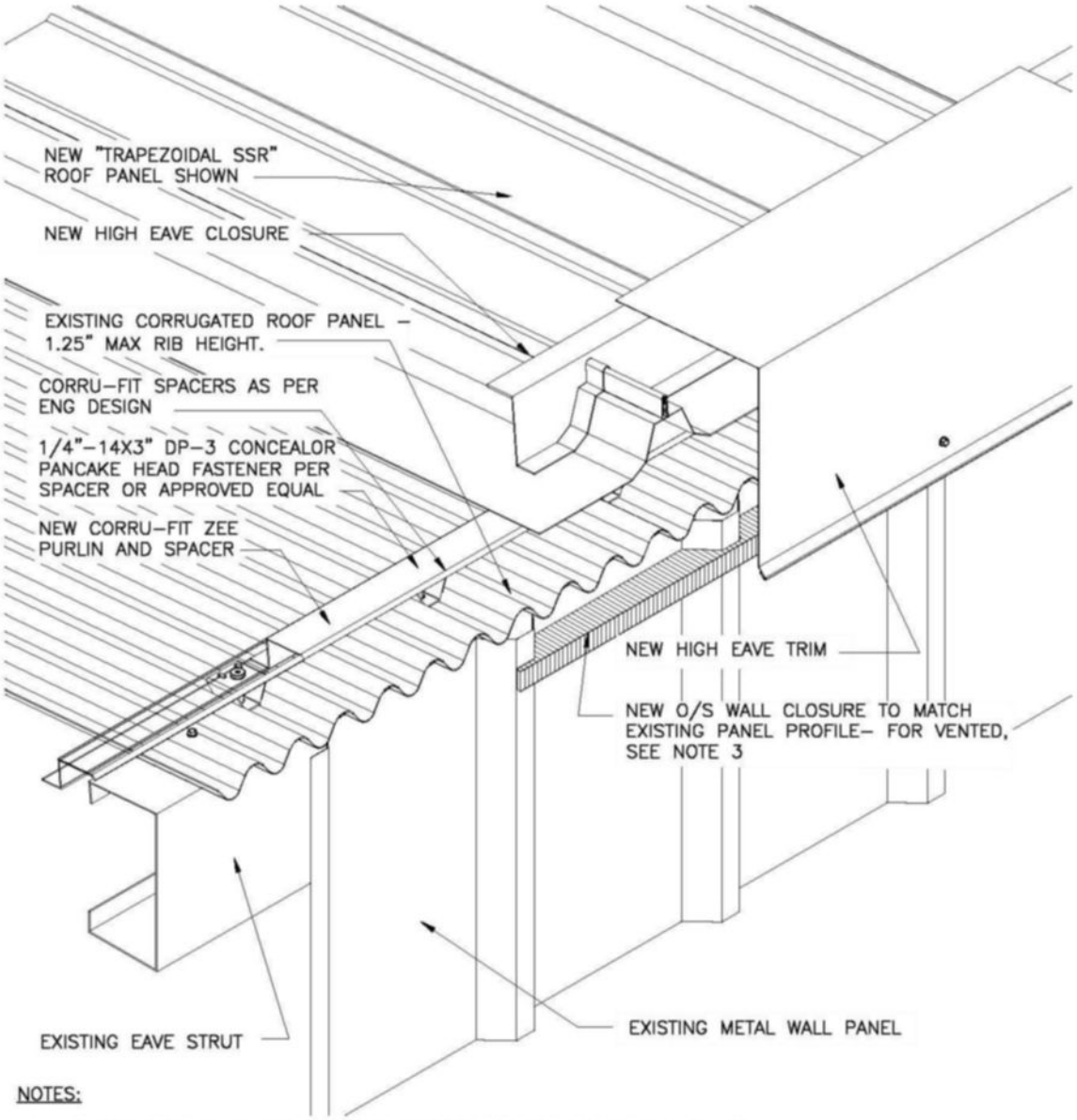
High Eave - HE-07-TC-CF - Trapezoidal



NOTES:

1. ATTACHMENT FASTENERS BY ROOF HUGGER UNLESS NOTED OTHERWISE.
2. SEE ROOF HUGGER INSTALLATION INSTRUCTIONS FOR INFORMATION CONCERNING EXISTING FASTENERS BEING REMOVED OR LEFT IN PLACE.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES ARE BY OTHERS AND ARE TO BE INSTALLED BY THE MANUFACTURER'S STANDARDS.

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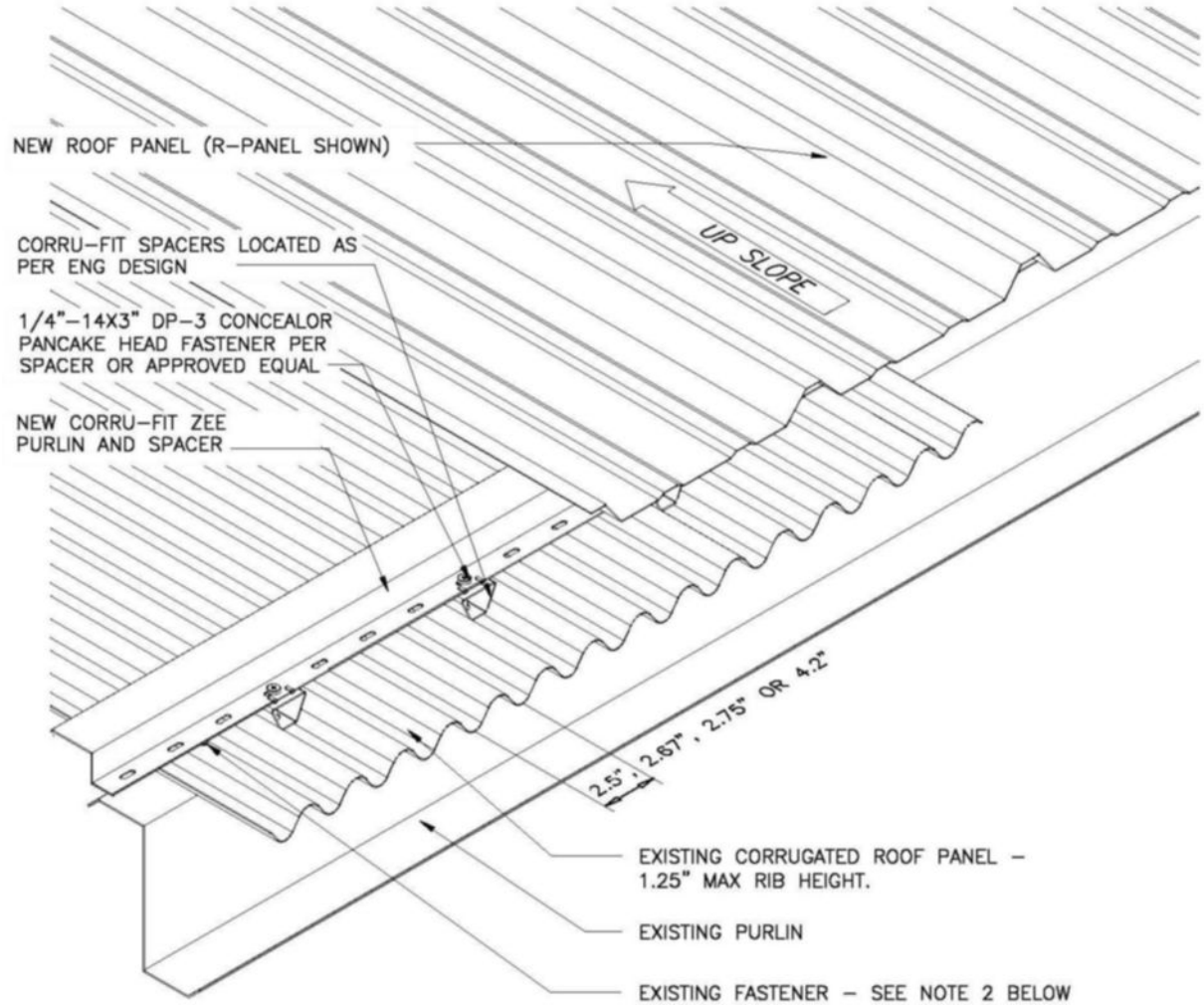
Attachment - HA-13-RC-CF - R" Panel



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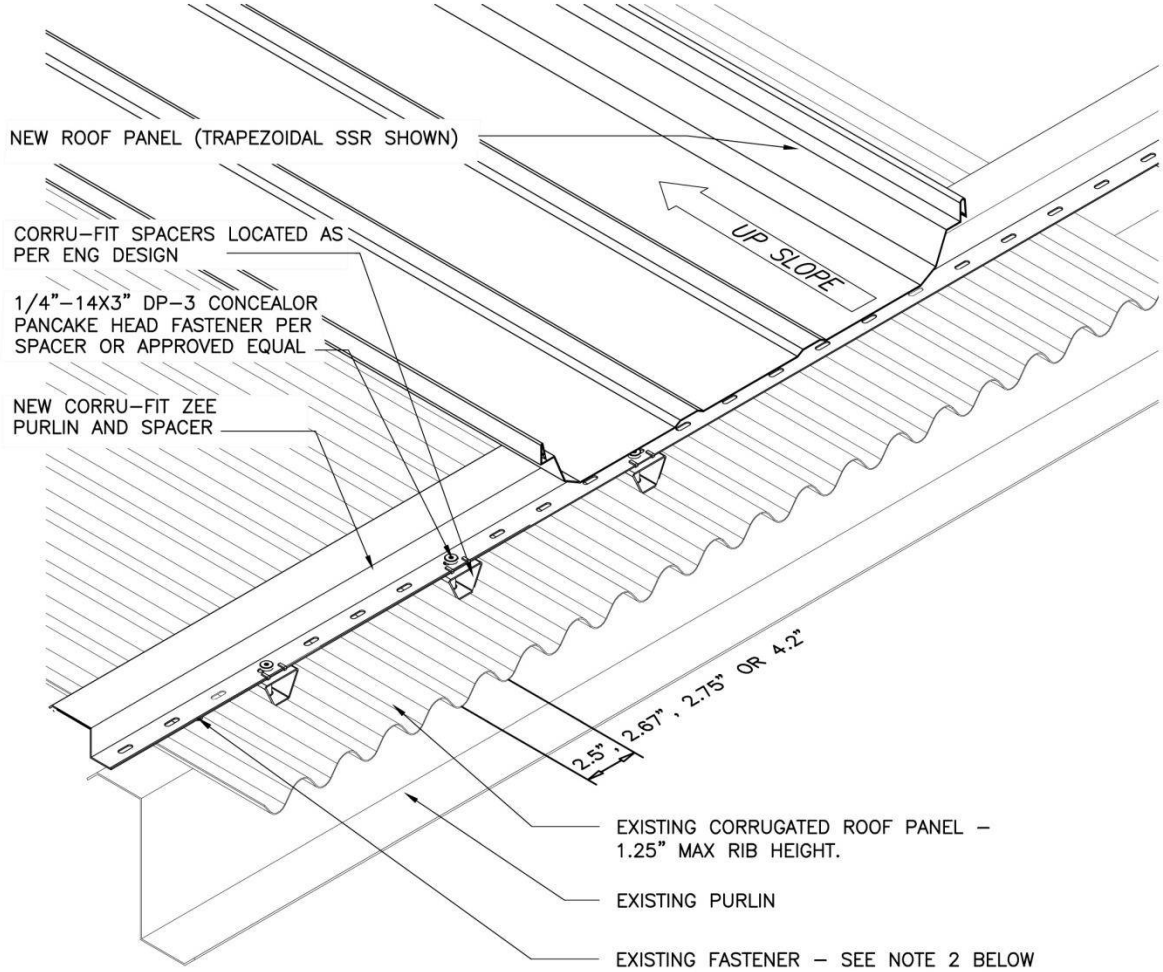
Attachment – HA-13-TC-CF - Trapezoidal



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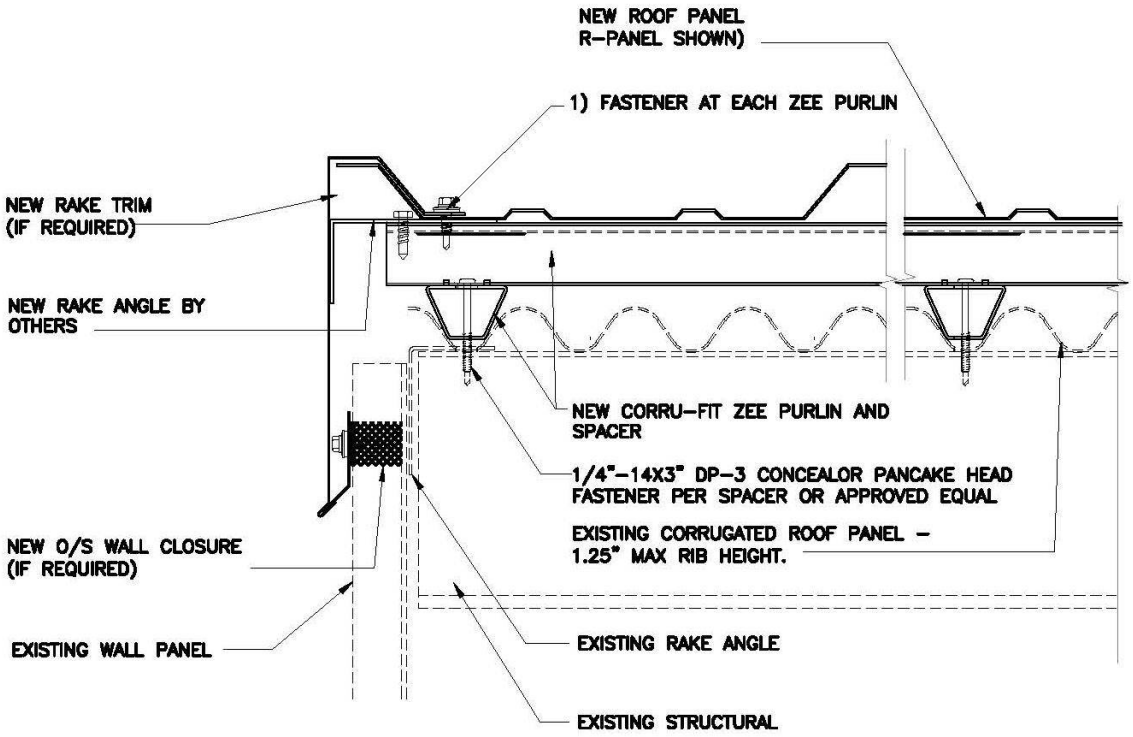
Rake – RE-06-R-CF - “R” Panel



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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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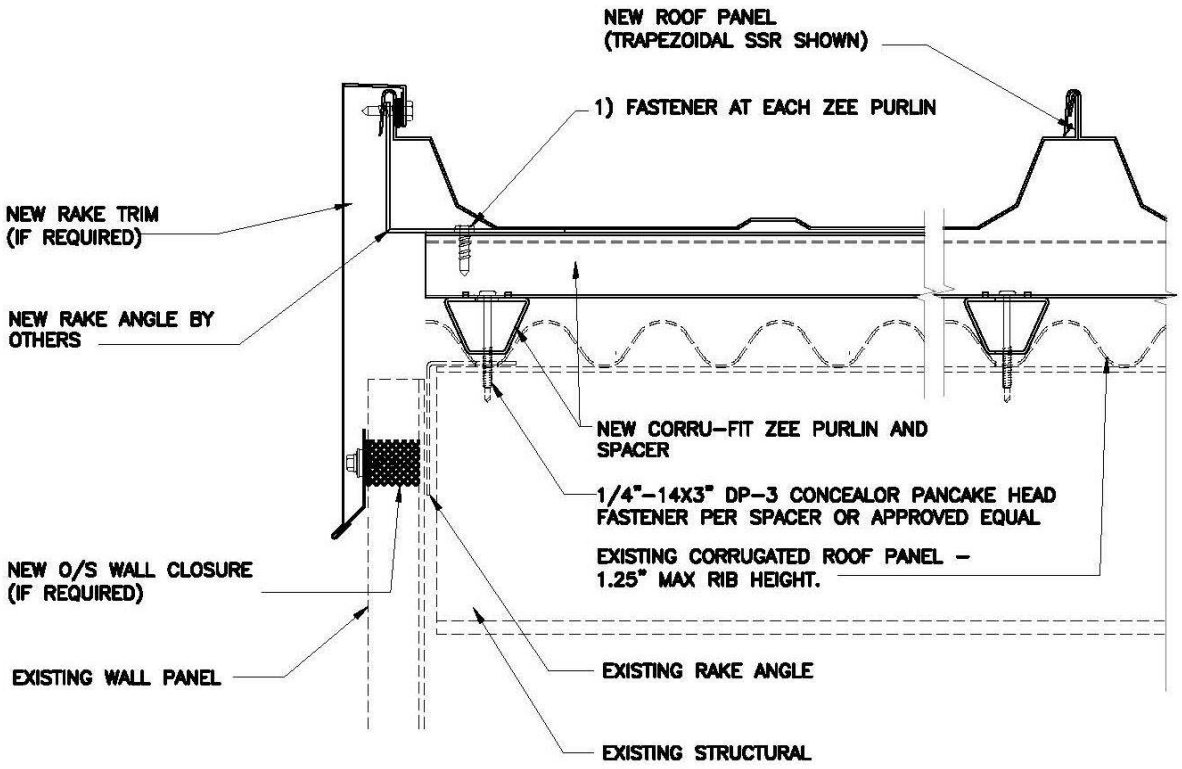
Rake – RE-06-TC-CF - Trapezoidal



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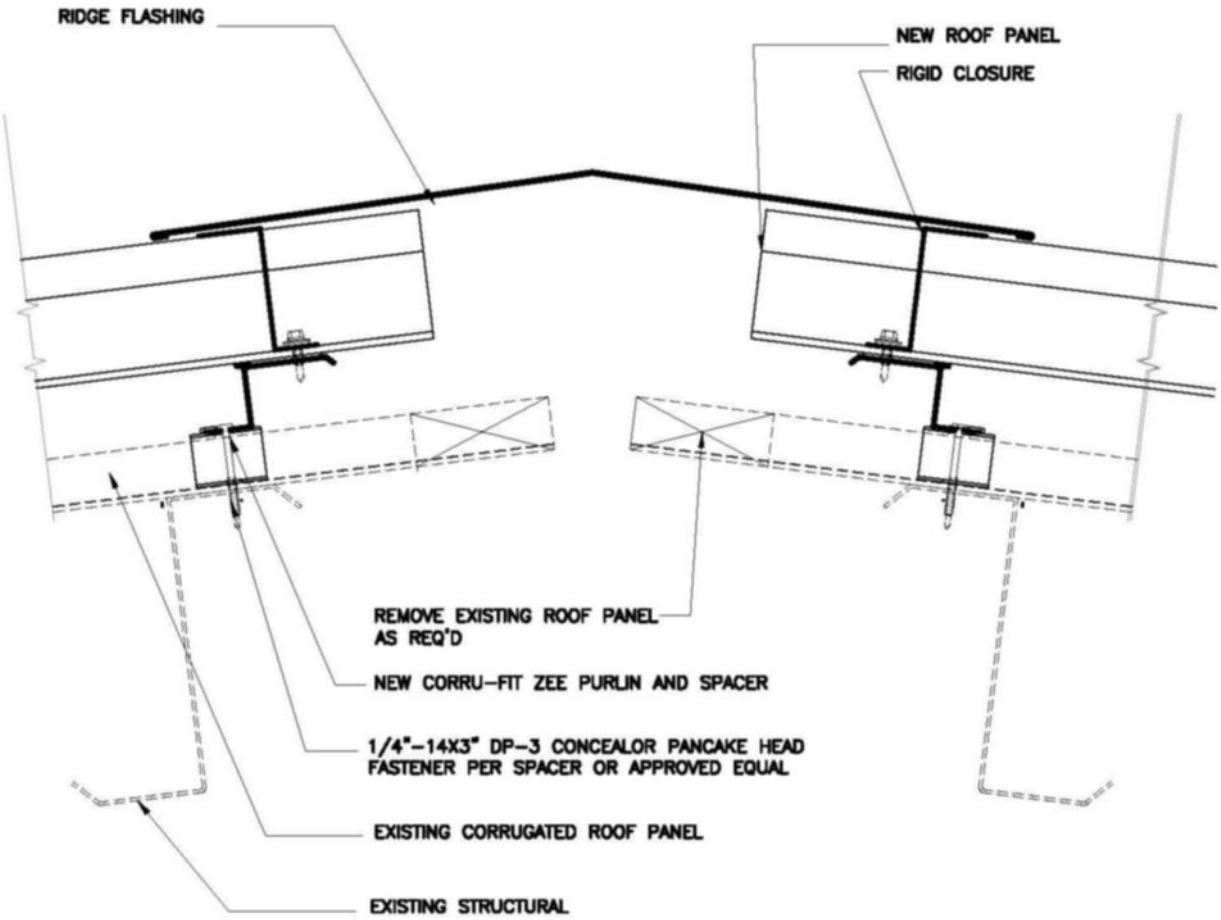
Ridge – RD-03-CF - Generic Panel



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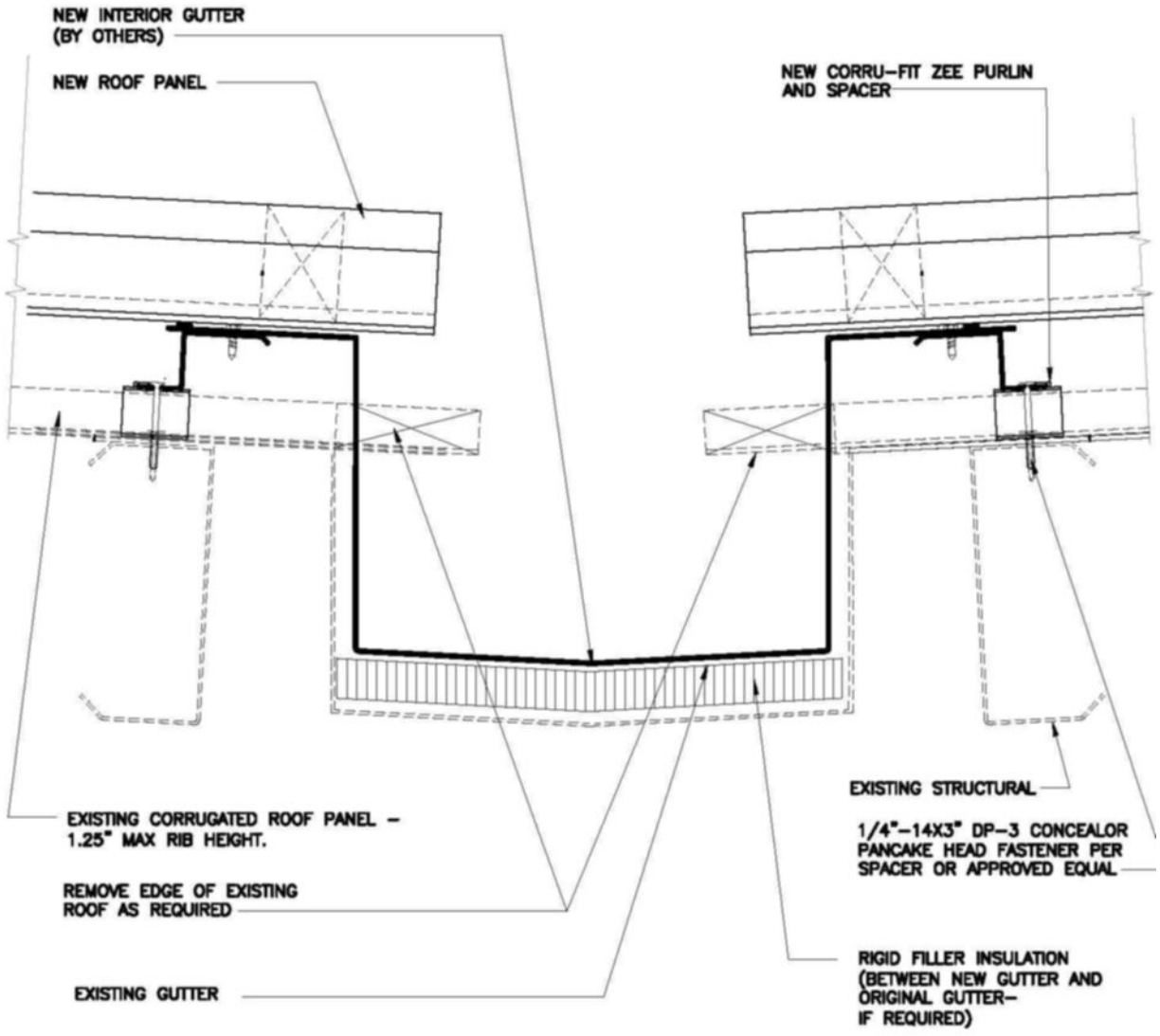
Valley Gutter – VG-02-CF Generic Panel



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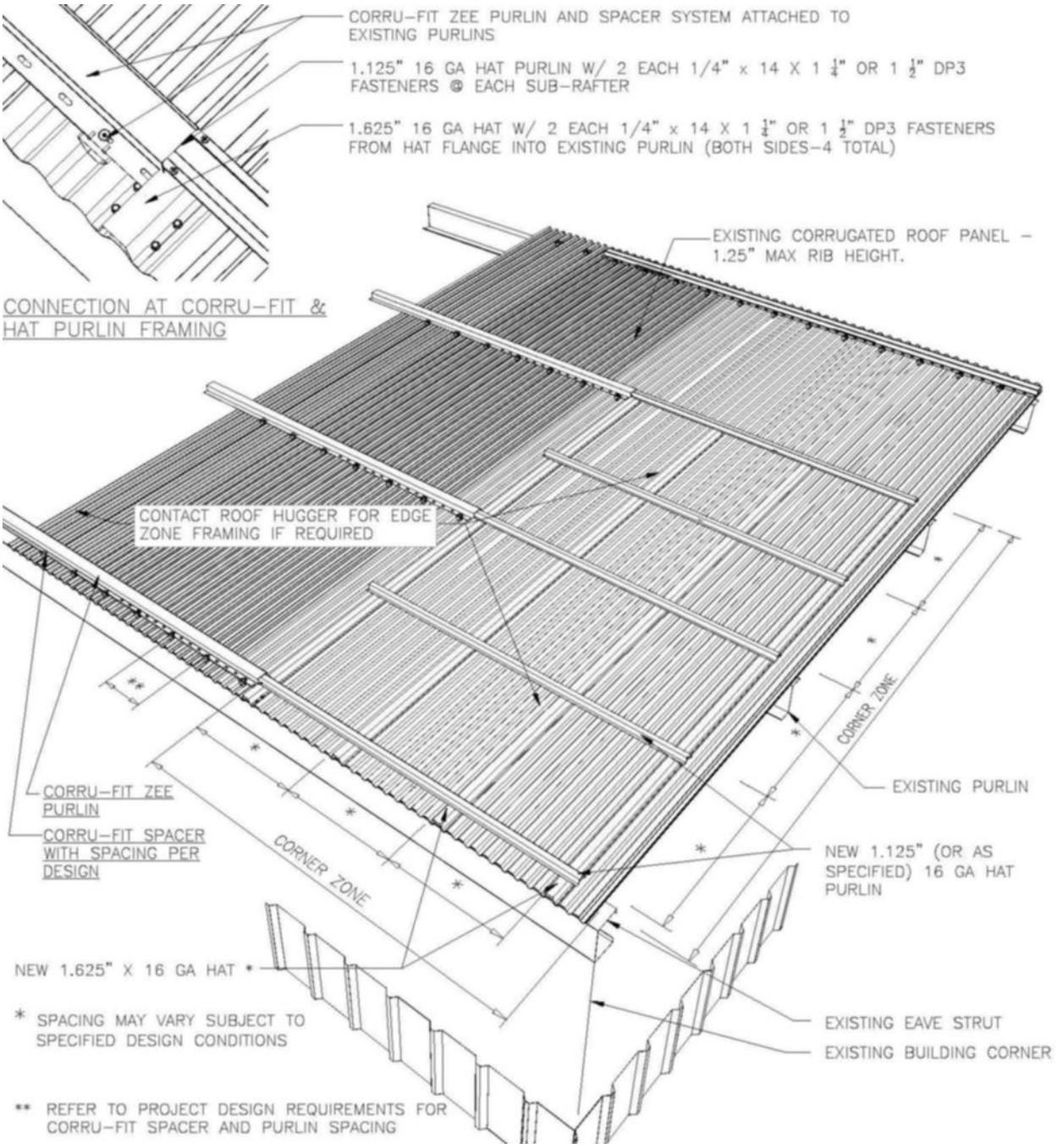
Edge Zone Reinforcement – ZF-05-CF



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