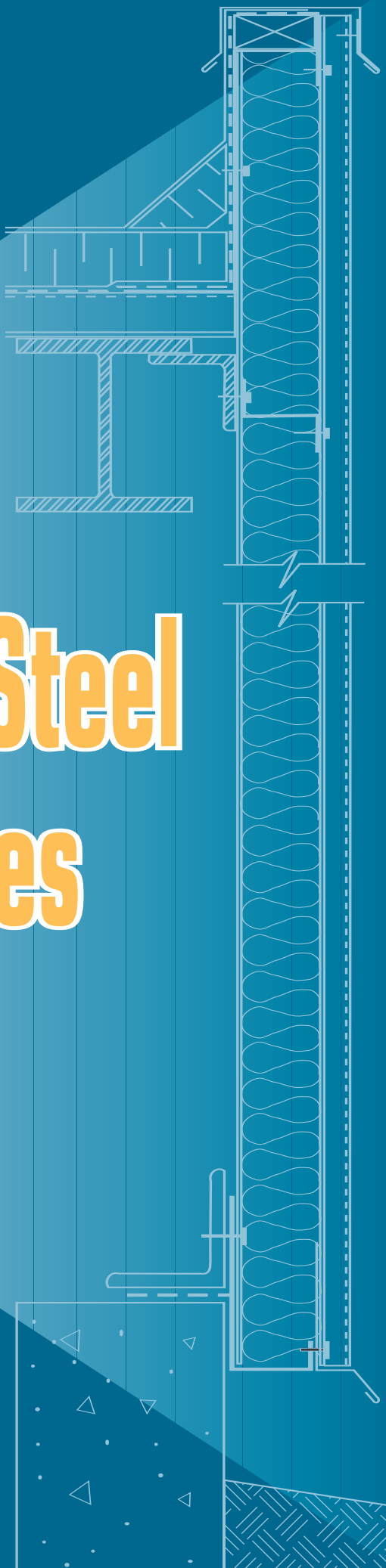
CSSBI

HOW TO SERIES...

Insulated Sheet Steel Wall Assemblies



CSSBI

HOW TO SERIES

Preface

This "How To Series" of publications is an educational tool intended to give guidance to anyone specifying sheet steel building products. This particular publication deals with insulated sheet steel wall assemblies. Such assemblies are made up of exterior cladding, a cavity for insulation, and an interior liner sheet. A wall cannot be inclined more than 20° from the vertical, beyond which it is classified as a roof assembly.

This guide will go through the various stages in the selection of sheet steel wall assembly components, discuss architectural and structural design issues, as well as building science topics and material selection. The purpose is to promote quality construction and effective design solutions. This is a generic guide giving the basic details and should only supplement the specific recommendations or design guidance published by CSSBI Fabricator Members appropriate to their own products. The standard details presented in the Appendix only show the products normally supplied by the sheet steel fabricator. Other suppliers and trades are responsible for collateral material.

The material presented in this publication has been prepared for the general information of the reader. While the material is believed to be technically correct and in accordance with recognized good practice at the time of publication, it should not be used without first securing competent advice with respect to its suitability for any specific application. Neither the Canadian Sheet Steel Building Institute nor its Members warrant or assume liability for the suitability of the material for any general or particular use.

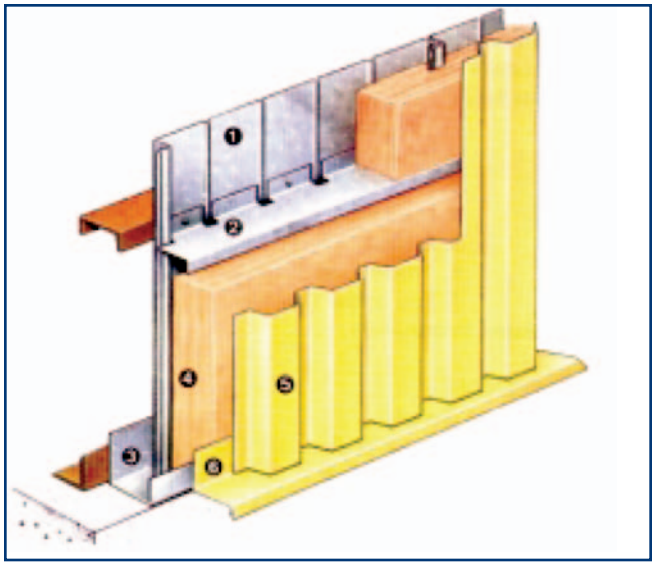
Contents

CSSBI
Canadian Sheet Steel Building Institute

S10-99
ISBN 1-895535-52-2

What is an Insulated
SHEET STEEL WALL ASSEMBLY

Sheet steel is a popular material in many building projects. An insulated sheet steel wall assembly is one that has an interior sheet steel liner①, sub-girts②, base channel③, insulation④, exterior sheet steel cladding⑤ and flashings⑥.



Why Use
SHEET STEEL WALL ASSEMBLIES

Sheet steel is a material that is exceptionally durable, yet has the versatility to fulfill the most original and innovative designs.

Prepainted sheet steel is versatile. Steel is available in a wide range of thicknesses and shapes - ranging from shallow corrugated to hidden fasteners, curved and foam filled to flat faced profiles. Steel is easily integrated with other building materials and available in curved, angled or flat surfaces, shaped to meet the load requirements of any building.

Prepainted sheet steel is durable. Coating systems have been developed and proven over the past 30 years in a diverse range of environmental conditions. Steel has been successfully incorporated into numerous structures across North America, from the extreme climatic fluctuations of the prairies to the highly corrosive environments of some industries to severe conditions of maritime locations.

Prepainted sheet steel is colourful. A rainbow of colours allow creative opportunities to design projects with a palette as diverse as the imagination. The choices are virtually limitless, providing the ability to design colour into buildings so they stand out on the horizon, or blend in with neighbouring buildings. Corporate colours can be matched to establish a client's image, or other fashionable colours can be added to heighten the aesthetics of the project.

Prepainted sheet steel is economical. Steel offers the economies of lightweight roll formed product, allowing structures to be designed using economical components with the added advantage of having the flexibility of incorporating efficient insulation packages into the building envelope. Thanks to the versatility and range of quality prefinished sheet steel profiles, there are panel systems available to accommodate any budget.

Material Selection

All sheet steel building products used in a wall assembly have one thing in common: they are fabricated from metallic coated, quality controlled, sheet steel. This material can also be prepainted for additional corrosion protection and enhanced aesthetics. Each component of the steel sheet (steel core, metallic coating, and organic coating) is important to the service life of the finished product. There are a range of steel properties and coatings that provide flexibility in specifying the appropriate material. It is important to select the coatings to suit the anticipated environmental conditions and budget.

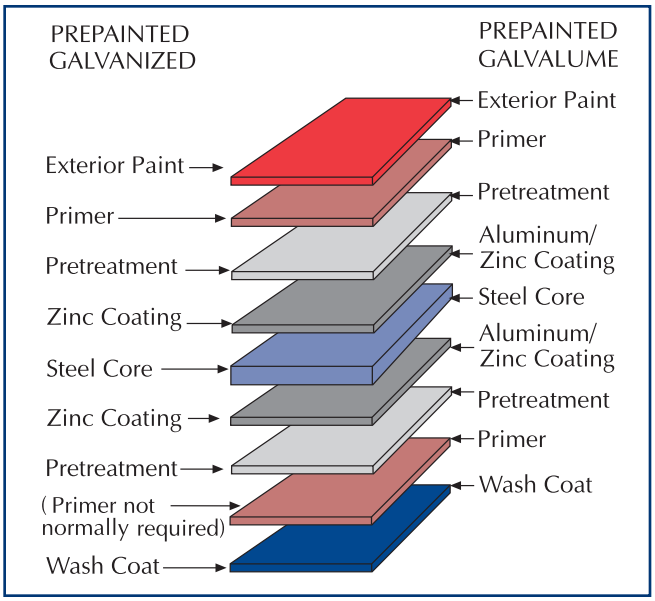
Steel Core: A structural sheet steel cladding system, is an engineered product and must be manufactured from sheet steel with certified structural properties. The data sheets available from the manufacturer will list the relevant material specifications and engineering data. Non-structural elements such as liner sheets, which are not designed as load carrying elements, do not need to meet the strict material requirements of the structural elements, but are still produced from quality controlled steel sheet.

The steel core of a sheet steel building product is varied in thickness to accommodate the structural requirements. When specifying a product, the decimal thickness must be used. The use of gauge numbers to specify thickness is not recommended since there is no standard relationship between gauge number and minimum thickness.

Metallic Coatings: It is important that corrosion of the steel be controlled and not allowed to affect the integrity and strength of the product; therefore, the steel core must be separated from the environment.

The first line of protection for the steel is supplied by the metallic coating, one of the most effective methods of protecting bare steel from corrosion. Both zinc and aluminum-zinc alloy coatings provide a tough, non-porous barrier that does not allow moisture to come in contact with the steel.

Besides acting as a protective barrier, zinc, and to a lesser extent aluminum, is able to "sacrifice" itself to protect the underlying sheet steel if both metals are exposed, like at a cut edge or a scratch. Sacrificial protection occurs when two dissimilar metals are in electrical contact and are coupled with water and oxygen. Under most conditions, zinc can protect gaps of bare steel or edges up to 2 mm (1/16 inch) in width. A more in-depth description of the cathodic protection process can be found in many engineering materials handbooks.



The aluminum-zinc alloy coating also provides a similar sacrificial and barrier type protection for the steel, as described above.

Metallic coatings are applied to steel sheet by the hot-dip process and are offered in a range of coating weights. The most common coatings specified for exterior applications are Z275 (galvanized) or AZ150 (Galvalume). For interior applications a lighter coating may be appropriate depending on the environmental conditions. The CSSBI publishes information on recommended coatings that can be used as a selection guide.

Zinc and aluminum-zinc alloy coated sheet steel is a popular construction material by itself. For maximum corrosion protection, however, a paint coating should be added to provide both colour and another barrier to the atmosphere. The organic top coat (paint) inhibits water and oxygen from reaching the underlying metallic coated sheet steel, thus effectively arresting the corrosion process.

Prefinished Coatings: Prefinished means the sheet steel has been painted before it is roll formed into the cladding shape. Prefinishing is done in a coil-coating process where paint is applied in a precise, multi-step process. The resulting baked-on paint coatings can meet very severe corrosion protection requirements and aesthetic demands.

Prefinished sheet steel is normally supplied with a full paint coat on the top side and a clear wash coat on the reverse side. This wash coat, which protects the top side during recoiling, is compatible with the top coat but is thinner. If desired, a pigmented wash coat or primed wash coat may be applied. Prefinished sheet steel can also be produced with a full paint coat on both sides of the sheet. An important note here: although different colours can be ordered on either side, the paint system must be the same type.

Since the mid-sixties, prefinished sheet steel cladding has demonstrated exceptional durability right across Canada, thanks to a highly efficient combination of materials protecting the steel core. There is a wide selection of systems and colours to suit all applications including commercial, industrial and architectural, more prestigious architectural and commercial applications, as well as aggressive industrial or marine environments. The fabricator should be consulted for details of the products and colours available

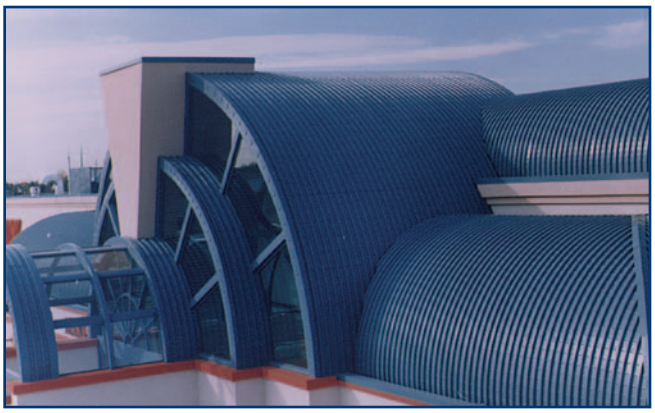
For colour matching, an actual paint sample of the desired colour is required. It is, however, technically difficult for different production lots of prefinished steel to have perfect colour match. There are, however, several ways to achieve satisfactory colour matching on a large project: 1) purchase the entire requirements for the project from one lot; 2) clad each building elevation with material from the same lot; 3) insert a new lot at an elevation change or break in the building structure to minimize the effect of any possible colour variation.

Visual Design

The architectural and aesthetic considerations that affect the building are classified as the "visual design". The visual design is mainly concerned with the exterior cladding elements and there are a number of issues of significance.

The **shape of the profile** will affect the look of the building. There are a wide variety of profiles available from the different manufacturers. These profiles range from flat hidden fastener products, to corrugated, to other combinations of fluted shapes, depths and spacings. The profiles can be combined to create different textures over the building. Accent strips and flashings can also add to the visual appeal, especially if coordinating colour combinations are used effectively. Texture can also be created with a Barrier series paint system which has an embossed surface. The thickness of this type of coating makes this texturing possible.

Orientation of the profile also influences the look of the building. Many cladding products can be installed horizontally, vertically or at an angle. There are limits, however, to the horizontal applications without some special attention. Some products such as certain hidden fastener flat panels are not recommended for horizontal applications because it is extremely difficult to achieve the smooth surface expected and oil canning can develop. Oil canning occurs in all types of flat building materials, but its effects in steel can be minimized through the correct selection of profile, thickness and colour. Check with the manufacturer for guidance.



Colour selection is one of the most significant decisions in the visual design process. The choice of primary and accenting colours used for the cladding, trims and accessories will determine the look of the building. Contact the fabricator for details of the range of colours available. The colour range may be different in each paint system. In general, any colour of paint can be matched and applied to sheet steel. However, there are a number of common colours that are more readily available from the fabricators which reduces the extra costs associated with producing a seldom used colour.

Accessories such as flashings, accent trims, doors and windows affect the overall look of the building. These items can be highlighted to enhance the visual appeal of the building or they can be subdued.

The **liner sheet** is a component that also affects the visual design of the building, but from the inside. In many buildings the liner sheet forms the interior surface of the wall and is exposed to view. It is necessary, therefore, to

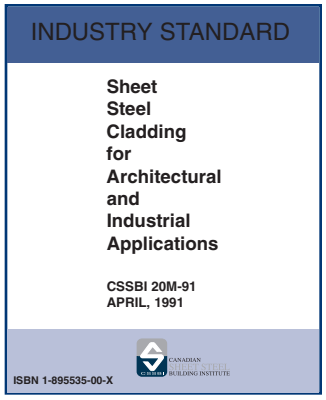
give consideration to the colour selection. The profiles are basically flat panels with small ribs. The fabricator should be consulted for details of liner sheet options.

Interfacing with other materials is easily done with sheet steel building products. Brick, masonry, wood and other materials can be integrated into the overall building envelope to develop simple or striking architectural features.

Strength Design

The strength design of the wall components is done by the manufacturer of the product. Span tables are available for all cladding profiles which are used to select the proper profile/thickness for the anticipated loads. The engineer who designs the main building structure can influence the economy of the wall assembly by making design decisions about the supporting structure.

- The girt spacings in the supporting structural steel frame can affect the design flexibility and economy of the insulated sheet steel wall assembly. The longer the distance between girts, the longer the span of cladding, and the stronger the cladding section must be. The stronger sections are those that are deeper and have thicker steel. To allow flexibility in the selection of profile, it is suggested that the girt spacing be between 1.8 m (6 ft) and 2.5 m (8 ft). A wider spacing can cause difficulties which may affect the economy of the project.

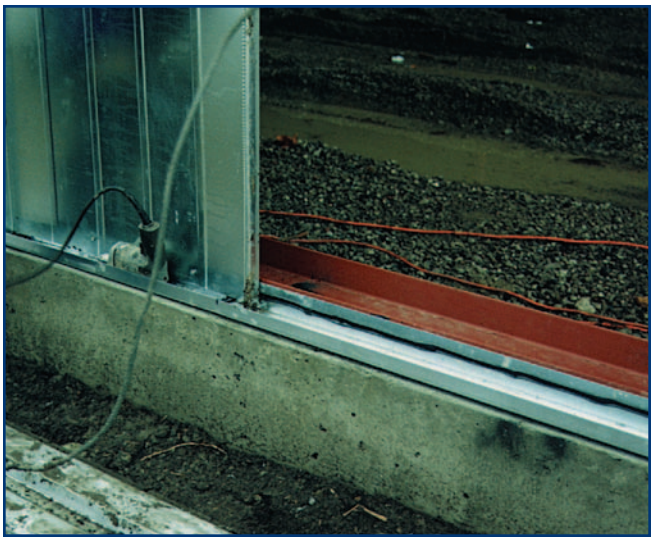


- The steel thicknesses commonly used are 0.46 mm (0.018 in) and 0.61 mm (0.024 in) although 0.76 mm (0.030 in) is a minimum for hidden fastener architectural panels.

- Sheet lengths are manufactured to order for the project and one of the advantages of sheet steel is the long lengths available. It is desirable where practical to use a single sheet from top to bottom, however, consideration must be given to profile and thickness to accommodate material handling, transportation and erection. The longer lengths may have consequences on the economy of the project where exceptional handling is required to produce a quality installation.

- It is important to the economy of the installation that the structural framework be perpendicular to the span of the cladding otherwise additional supports must be added.

- The base angle used to attach the liner sheets is supplied and installed by others. The workmanship of this base angle installation will affect the installation of the liner sheet. To maintain the flatness of the liner sheet, it is important that the base angle also be straight and true.



- In certain buildings it may be necessary to provide pressure release panels to vent high internal pressures associated with an explosion. The size and location of these panels are specified in the building

regulations. They are designed by the sheet steel fabricator and there are various means of doing so. The location and loads associated with these panels will have an impact on the design of the adjacent girts and supporting structure.

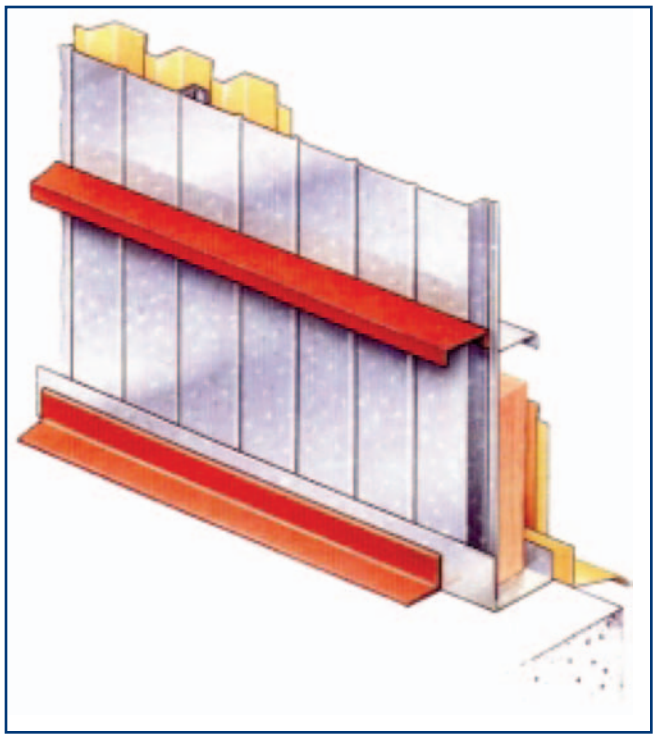
Building Science Issues

The design and construction of an insulated sheet steel wall assembly must recognize both the structural requirements of the system as well as the other functions of the assembly: rain screen, air retarder, vapour retarder, fire ratings, and insulating values.

The role of the **vapour retarder** is to control the migration of moisture from the warm interior, through the wall assembly to the outside. This is important in the Canadian climate where there are many days when the interior temperature is much greater than the exterior. This is significant because the warmer interior air can hold more moisture (ie. higher relative humidity) than the colder air. If this warm moist air is allowed to migrate towards the cold exterior, it will progressively cool until it reaches its dew point. At this temperature the air can no longer hold the moisture as a vapour and it will begin to condense out as water. In an insulated assembly the dew point is located within the insulated cavity. If condensation occurs, water will accumulate in the cavity causing loss of insulating properties as well as possible corrosion of the steel members.

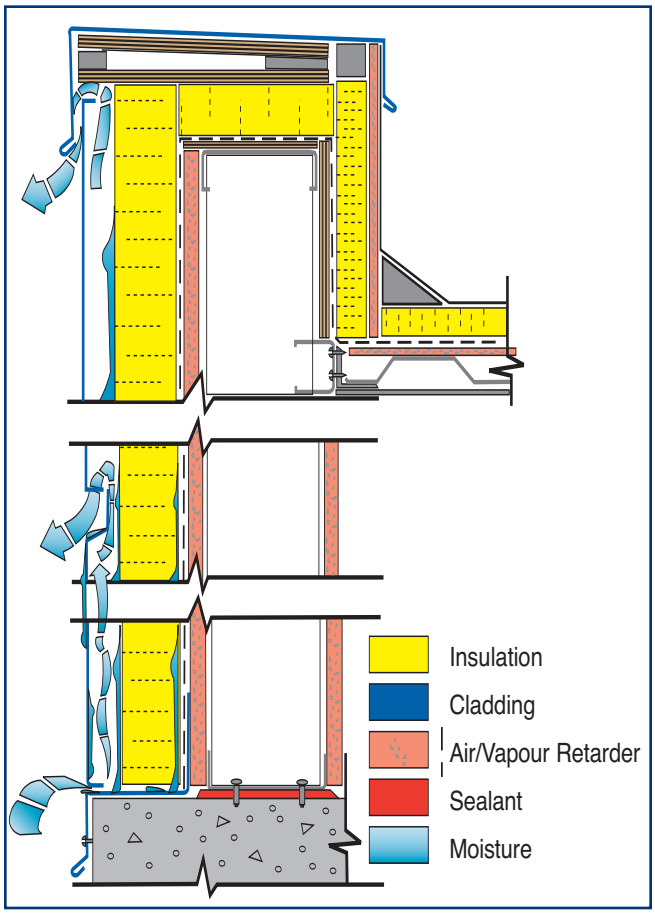
The migration of water vapour through the wall assembly is a very slow process unless it is carried along by air exfiltration. A wall assembly, as one of its many functions, must act as an air retarder. As the name implies, an **air retarder** controls the movement of air from the inside to the outside (or vice versa) of the building enclosure. The primary cause of heat loss and condensation problems in an insulated assembly is often uncontrolled air infiltration/exfiltration. To maintain healthy indoor air quality, proper air exchange is necessary; however, this exchange process must be controlled properly. The uncontrolled exfiltration of air out through holes in the wall assembly will take with it heat and moisture.

In an insulated sheet steel wall assembly the **liner sheet** is designed to act as the air and vapour retarder for the wall system. Steel is a perfect air and vapour retarder by itself, example being submarines. It is important, however, that the steel membrane be continuous so that there are no unrestricted paths for air/moisture to travel through. The liner sheet is normally supplied by the fabricator with the side laps factory caulked so that when assembled there is a continuous line of sealant between adjacent sheets. During installation, the connections at the top and bottom between the liner sheet and the supporting structural angles are caulked to seal these junctions. It is very important that the continuity of the liner sheet be maintained between the walls, roof and at all corners to maintain the continuity of the air/vapour retarder.



In some insulated wall assemblies, a separate **air retarder** may be added on the cold side of the insulation. It has been shown in thermal tests that convection currents can build up in thick insulated cavities (>150 mm, 6 in) which has a measurable impact on the thermal resistance of the assembly. The addition of an air retarder on the cold side of the insulation controls these convective air currents and maintains the insulating value of the assembly.

The **thermal resistance** of the wall assembly is another important building science design criteria. The internal sub-girts in the wall assembly can be varied in depth to accommodate almost any thickness of insulation needed. It is recommended that semi-rigid insulation be used since it will fit the cavity better than rigid types. Thermal bridging may be an issue with some assemblies, but this can be controlled with the application of insulating tape to the flanges of the sub-girts. Other proprietary thermal sub-girt systems are available for more demanding applications. Consult the manufacturers for details.



It is common practice in the industry to design a sheet steel wall assembly using the **rain screen principle.** The exterior cladding is vented to the exterior to reduce the pressure differential and control moisture flow into the cavity. These wall assemblies are designed with this in mind and it is not recommended that the exterior cladding be sealed at all joints.

Fire ratings and non-combustible construction are important for many types of building occupancies. Steel is definitely non-combustible and can be incorporated into any type of construction. The building code requirements for fire ratings is very extensive and often

changes with each code cycle. Steel construction has many benefits that can provide economical solutions to the various fire protection requirements. Fire rated sheet steel wall assemblies are available under ULC listings W605 (1hour) and W606 (2 hour). It is important to recognize that the fire rating of the wall assembly is a separate requirement from any fire ratings required for the structure itself. The design for fire protection is an important economic consideration and may justify seeking expert advice.

Accessories

Accessories for a sheet steel wall assembly include a variety of flashings for the cladding (base flashings, gable flashing, j-trim), windows, doors, ventilators and other components connected to the wall assembly. Trims can be used to advantage to highlight the visual appearance of a large expanse of wall area, or to provide colour changes. The material used to make the flashings or trim should be from the same parent coil as the cladding itself. This will ensure a colour match. For accent trims, the colour selection may be limited by the inventory of manufacturer's colours. For a small amount of a unique colour it may be more economical to post-paint. It is also recommended that the metallic coating of the flashing and trims be the same as the cladding sheets to prevent the contact of dissimilar metals.

Installation of an Insulated Metal Wall Assembly

The following is a step-by-step account of the installation of an insulated sheet steel wall assembly describing the sequence of events and the significant things to consider. The description is limited to the major components of the wall assembly. Specific details such as fastener types and spacing will be specified for each individual job. This discussion should be read in conjunction with the typical details given in the Appendix which will illustrate the component pieces.

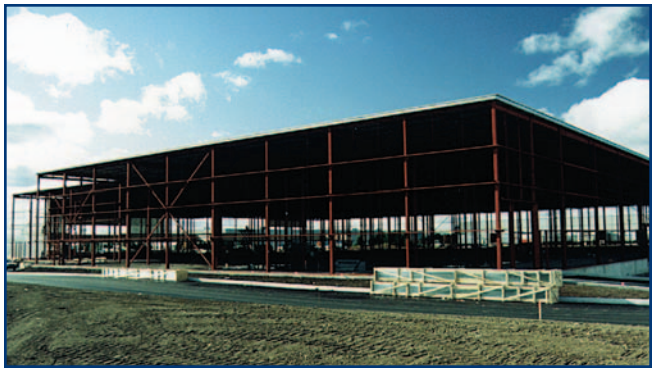
1. Site Inspection and Preparation

1.1 General Checks to Make

- Procedures for accessing the site and for receiving of materials and equipment.
- Storage areas are available adjacent to walls for materials.
- Suitability of the site for the staging or scaffolding needed to install the cladding.
- Location of power supply within site.
- Determine manpower numbers, skills and tools required to complete the job.
- Location of mobile trailer (on larger projects).
- Type of hoisting facilities required (cranes, fork lifts etc).

1.2 Review Design and Details of Job (Paper vs Reality)

- Compare job site to shop drawings and note any discrepancies.
- Check that alignment of structural supporting system is within tolerances. Report misalignment to the General Contractor before commencing installation.
- Ensure other materials are in place as required before starting the installation of the insulated wall assembly (i.e. wood blocking, roofing components, structural framing for openings). Not all related materials are installed as part of the main structure.
- Schedule regular job site visits to follow construction sequence of main structure to anticipate the start date for the wall assembly installation.



- Ensure supporting structure is complete and in place before ordering material to job site to prevent material sitting around exposed to the weather.
- For larger jobs, schedule the delivery of material as needed and prevent a build-up of material on site.

1.3 Safety

- Review safety codes and regulations to be applied to project and any other job site specific regulations to be observed at the time.

1.4 Receive the Materials on Site

- Care must be taken when unloading truck by fork-lift, crane, boom truck, truck-mounted crane or by hand.
- Store the materials adjacent to areas being installed, when possible. Follow CSSBI recommended storage procedures.
- Store insulation and small parts in a controlled central location.

1.5 Equipment Set-up

- Mobile scaffold tower to be erected as per Construction Safety Association Ontario (or equivalent) standard for scaffolds lower than 30 ft.
- Suspended scaffold to be erected as per Construction Safety Association Ontario (or equivalent) standard erection drawing.

2. Assembly Sequence

- Depending on the complexity of the structure, site conditions and climatic conditions, the insulated wall assembly may be installed by completely installing the liner sheet and sub-girts on the first pass, followed by the insulation and the outer sheet on a second staging.

  Or

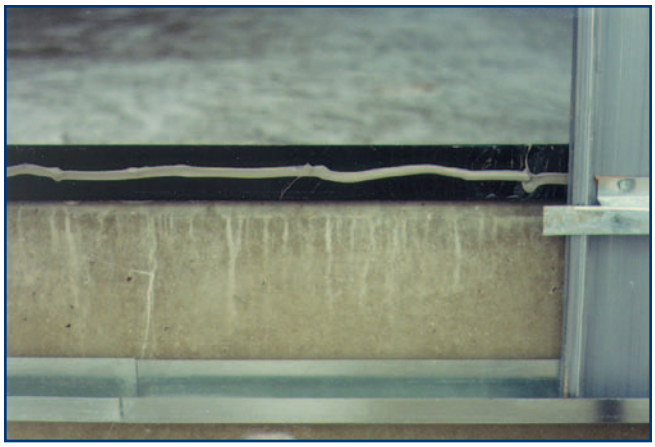
  The liner sheet, sub-girts, insulation and outer sheet may be installed in one section before moving the staging to the next section. This shows some of the flexibility of an insulated sheet steel wall assembly.

- Remember that the liner sheet of an insulated wall assembly forms the air/vapour retarder. As such, proper attention to its installation is paramount in achieving and maintaining a good seal for the building. Since a liner sheet is made from thinner material with a flat profile, there can be noticeable oil-canning. Normally the liner sheet is installed before the exterior cladding: consequently, there will be a period of time when the wind load will be acting on the liner and may cause some permanent deformations.

3. J-Channel and Liner Sheet

- The base angle is installed at the base of the wall on a bed of mastic. A bead of caulking is needed between the J-channel and the base angle. Attach the J-channel to the base angle (or other supporting structural member). Alternatively, a U-channel is used instead of a J-channel. Weep holes or gaps between adjacent channel ends provide drainage.

- Field caulk at the base and top of the wall elevation where the liner sheet will be fixed. This will maintain the continuity of the air/vapour retarder. Take care to maintain this seal between the liner sheet and adjacent membranes (roof membrane at the top, and base angle at the bottom).



- Hoist the liner sheet into place, align, plumb, clamp in place. Heavy sheets need to be raised using proper sheet clamps and a roof-mounted gin wheel or crane.

- Lighter sheets can be raised by hand. A guide rope may also be used to help steady the sheet as it is lifted into place.

- Secure the liner sheet by fastening the Z-bar sub-girt through the liner sheet to the structure with recommended fasteners (usually self-tapping screws or powder driven pins).

- A solid Z-bar sub-girt is used for liners with shallow ribs. A notched Z-bar is needed for liner sheets with larger ribs.

- Hoist the next liner sheet into place and secure to the structure in the same manner making sure to fully engage the side-lap.

- Stitch screw side laps of the liner sheets with recommended fasteners at spacings shown on the shop drawings, making sure the side lap is engaged and caulking (field or factory applied) is continuous.

- Liner sheets with significant flutes should include a closure which is caulked to ensure continuity of air/vapour seal. Consult the manufacturer.

- Where the wall height exceeds the maximum recommended for manufactured lengths of liner sheets, an end lap is required. This lap must be caulked to maintain the air/vapour seal.

- Where practical, the liner sheet is measured and cut to fit around openings before hoisting into place. Cutting can be accomplished using metal snips, nibblers, shears or reciprocating saws.

- Specific attention must be taken at the following locations: inside and outside corners; head, jamb and sill details at openings; top and bottom of the wall; end and side laps. The typical details in the Appendix show these conditions.

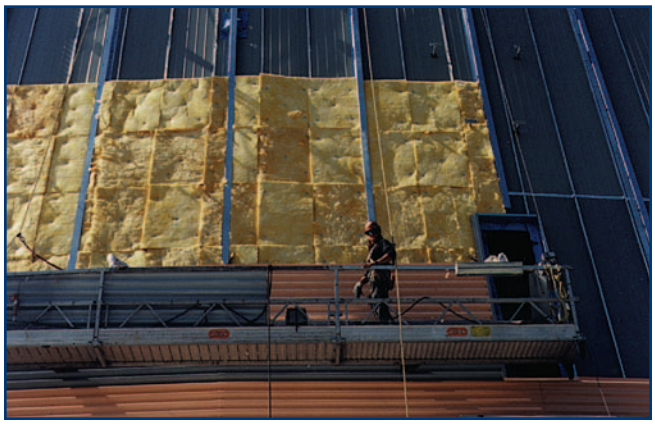
- Proper safety precautions must be taken when moving the mobile tower or scaffolding.

4. Insulation

- Usually semi-rigid or batt insulation is used.

- Temporarily secure insulation to the liner sheet using a liberal application of insulation adhesive or stick pins.

- The insulation is trimmed to fit between the Z-bar sub-girts and the liner sheet side laps. If applied in two layers, the second layer is installed over the first layer so the edges are staggered to reduce air circulation. Wood skewers are used to temporarily hold the second layer in place until the exterior sheet is installed.



- The insulation thickness is sized to snugly fit in the void between the liner and outer sheet. The insulation is sandwiched between the liner and outer sheet, thus the commonly used term "sandwich wall".

- Some exterior trims are also installed before the installation of the outer sheets, such as drip flashings, box corner flashings, jam flashings, head and sill flashings and accent trims.

5. Exterior (Outer) Sheet

The outer sheet is the part seen by the public. Extra care and attention to aesthetics taken at this stage of the installation makes the difference. Detail and care in workmanship of the fabrication and installation of trims affects the final appearance and weather-tightness of the overall assembly.

- Exterior sheets are installed essentially the same as the liner sheet.

- Hoist the first sheet into place, clamp, align (critical) and secure to the Z-bar sub-girt system using colour matched fasteners (galvanized fasteners for hidden fastener type sheets).

- Fasten the exterior cladding sheet into place with fasteners driven through the bottom of the flutes. Fasteners should be spaced a maximum of 300 mm (12 in) across the width of the sheet with fasteners at the side laps.

- Align and plumb vertically. Maintain a slight gap at the base of the wall between the bottom of the sheet and the drip flashing to facilitate air circulation over the face of the insulation for air pressure equalization.

- It is important to brush off filings after drilling to prevent these filings from rusting and staining the painted finish.

- Like the liner sheet, specific attention is taken at the following conditions of a wall cladding outer sheet installation: inside and outside corners; head, jamb and sill details at openings; top and bottom of wall; end and side laps.

- Where practical, the outer sheet is measured and cut to fit around openings before hoisting into place.

6. Proper Use of Closures

- Closures are sheet steel flashing or foam type pieces cut to match the profile of the cladding. These are installed to close off the wall cavity to prevent wind driven debris, birds or other small animals from entering. These closures are not intended to provide an air or vapour seal.

- Do not put closures along the bottom of the panel, install in the top only.

- Do not caulk the bottom of the panel to the drip flashing. Allow ventilation behind the panel and a path for moisture to drain.

7. End of the Day / Job

- Cleanup debris in the area.
- Secure materials on the wall and opened bundles on the ground.
- Secure equipment, (scaffolds, cranes etc).

Related Information

The CSSBI has a number of publications on various topics related to sheet steel building products. The following is a partial list of publications related to sheet steel assemblies. For a complete list, contact the CSSBI or visit our web site at www.cssbi.ca.

CSSBI 20M-99	Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Applications, May, 1999
CSSBI B12-90	Thermal Resistance of Double Skin Insulated Sheet Steel Walls & Roofs, February, 1990
CSSBI B14-93	Steel Roofing and Siding Installation Guide, January, 1993
CSSBI B16-94	Prefinished Sheet Steel for Building Construction, January, 1994

- Fire-Rated Exterior Sheet Steel Walls, May, 1992
- Position Paper on Oil-Canning: Specifying Wide Flat Panels in Metal Cladding, June, 1994
- CSSBI Member Company List

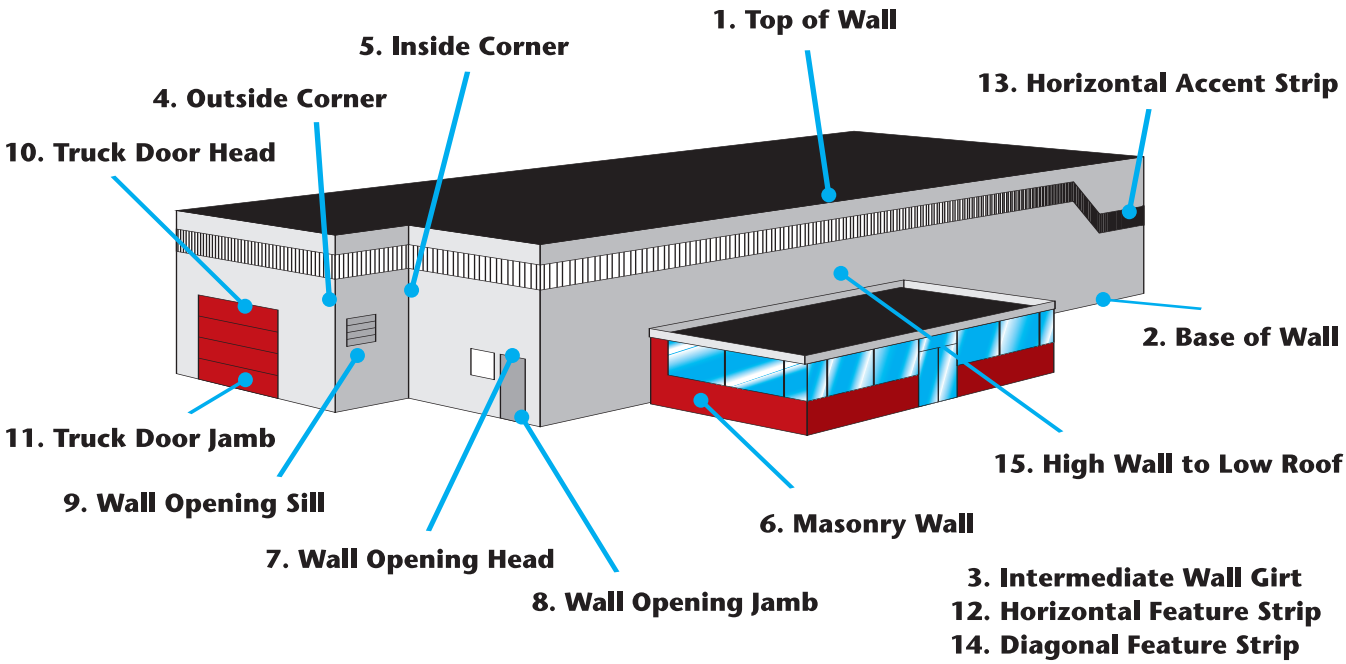
Sheet Steel Facts #1:	Cost Considerations for Prepainted Sheet Steel Cladding, June, 1994
Sheet Steel Facts #2:	Prepainted Sheet Steel: Taking on Canada's climate for two decades, June, 1994
Sheet Steel Facts #3:	Care and Maintenance of Prefinished Sheet Steel Building Products, June, 1994
Sheet Steel Facts #4:	Repainting Factory Prefinished Metal Panels, March, 1995
Sheet Steel Facts #5:	Understanding Limit States Design (LSD) Load Tables, July, 1995
Sheet Steel Facts #6:	Metallic Coated Sheet Steel for Structural Building Products, July, 1995
Sheet Steel Fact #7:	List of Old and New CSSBI Publications, February, 1996
Sheet Steel Fact #8:	Glossary of Steel Building Products Terms, August, 1996
Sheet Steel Fact #9:	Alternative Design Methods for Steel Deck Diaphragms, November, 1998
Sheet Steel Fact #10:	Sheet Steel Gauges: What They Mean, November, 1998
Sheet Steel Fact #11:	Specifiers Checklist, March, 1999

Appendix

STANDARD DETAILS

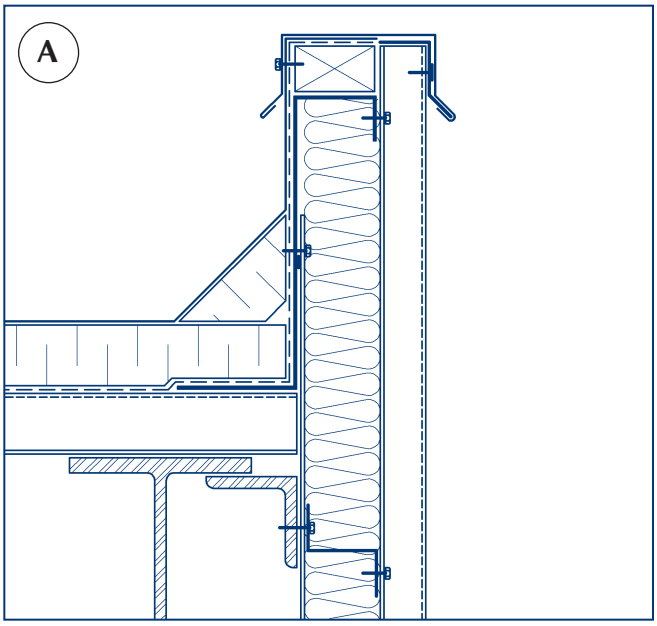
The following sections and details are representative of the basic components of an insulated sheet steel wall assembly, and demonstrate the function each detail is required to perform. Every CSSBI Fabricator Member and Applicator of insulated sheet steel cladding may provide you with details slightly different than those shown here which recognizes their particular products or practice. The function of each detail is to provide a building envelope that is structurally sufficient, thermally responsive to the building's design, and properly sealed for air/vapour leakage. In all cases good building science practices should be followed. For additional information on details not shown, consult a Fabricator Member.

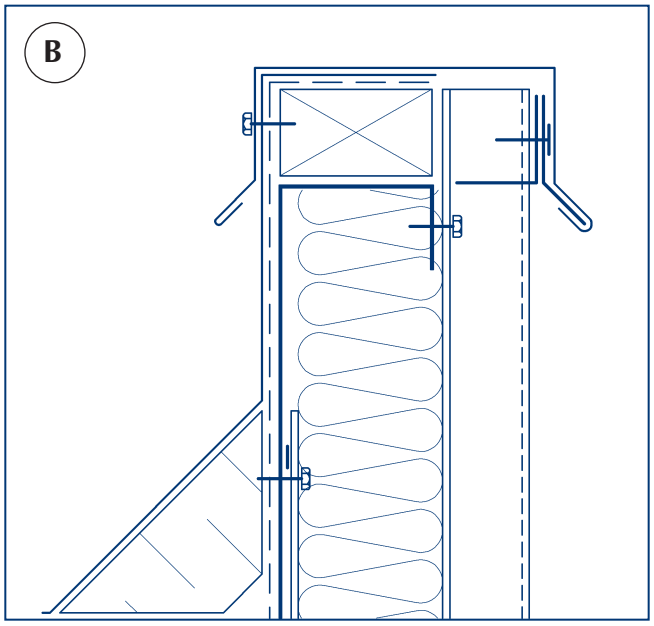
The overall building layout shown below indicates the location of each of the detail areas covered by the individual detail drawings. In some instances, there will be more than one detail drawing shown to give some options. These are representative details and not the only correct way of installing insulated sheet steel cladding assemblies.



Detail 1

TOP OF WALL





Installation / Assembly Notes (Detail "A"):

a) Clamp and fasten the metal upstand on top of the steel deck aligned with the face of the structural members that will support the wall assembly.
b) Apply a bead of caulking to the face of the upstand that will support the liner sheet.
c) Align and fasten the liner sheet to the upstand. Align and fasten the Z-bar sub-girt through the liner sheet into the supporting structural member.
d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
e) Align and fasten the exterior sheet to the Z-bar sub-girt and upstand with the specified fasteners. In Detail "B", a metal closure is included at the top of the cladding.
f) The remainder of the assembly is installed by other trades.

Specifier / Designer Notes:

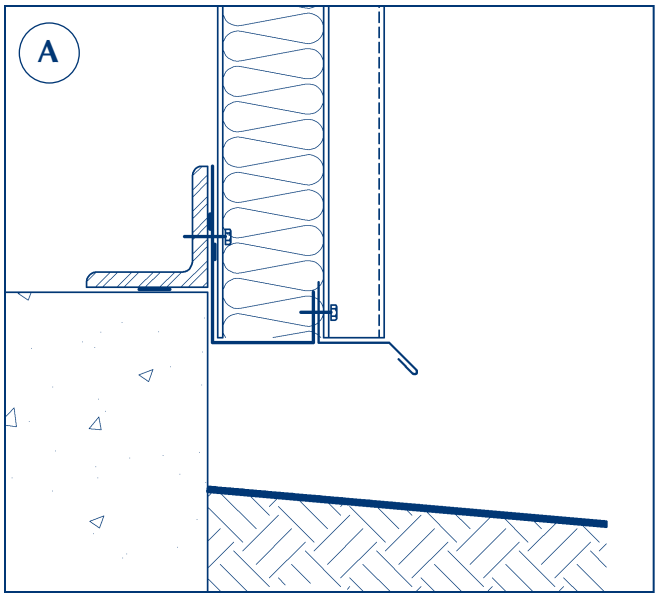
Cap flashings are fabricated by the roofer from flat sheet material of the same thickness as the exterior cladding sheet. This material is purchased by the roofer from the siding contractor unless otherwise specified.

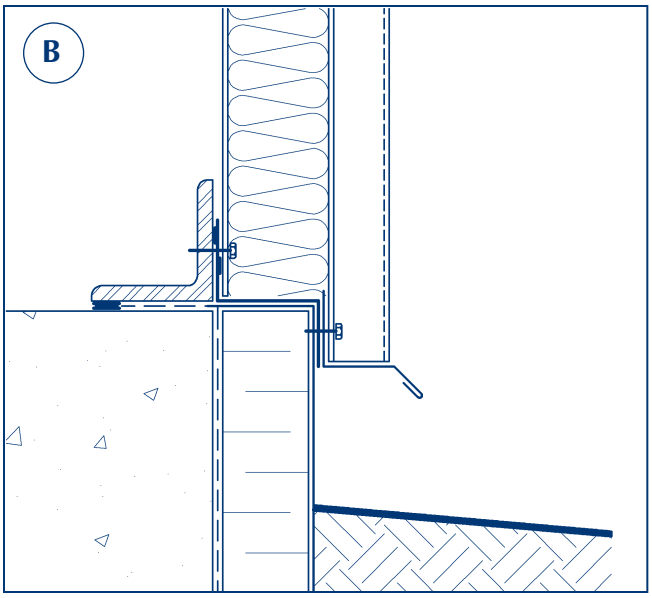
Special attention must be taken to ensure the air/vapour retarders of the various trades (roofer and cladding installer) are sealed together to ensure a continuous seal of the building envelope.

The statement "bead of caulking" used throughout these assembly notes is meant to represent a ribbon of sealant (either gunned caulking or Butyl tape). The actual material used is at the discretion of the applicator, provided the product used is appropriate for the intended application at the specific location.

Detail 2

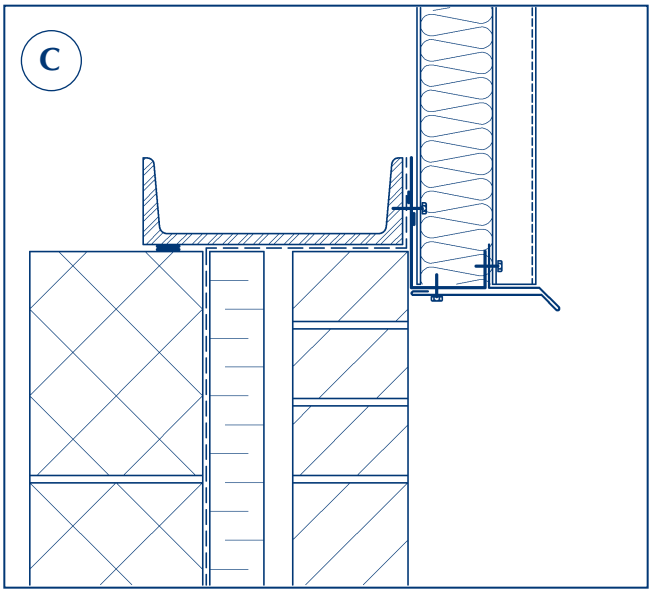
BASE OF WALL





Installation / Assembly Notes:

a) Apply a bead of caulking to the base structural support.
b) Align and clamp into place, the base sub-girt (J-channel, U-channel or Z-flashing).
c) Apply a second bead of caulking to the face of the sub-girt.
d) Align and secure the liner sheet to the structural support, through the sub-girt, ensuring a full and proper seal. Do not screw through the caulking since this may break the continuous seal.
e) Liner sheets with major ribs will require foam closures between the sub-girt and the liner to close the gaps. These closures are sealed with caulking.
f) Align and clamp the starter strip/drip flashing into place.
g) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
h) Hoist, align and fasten the exterior cladding sheet into place with specified fasteners.



Specifier / Designer Notes:

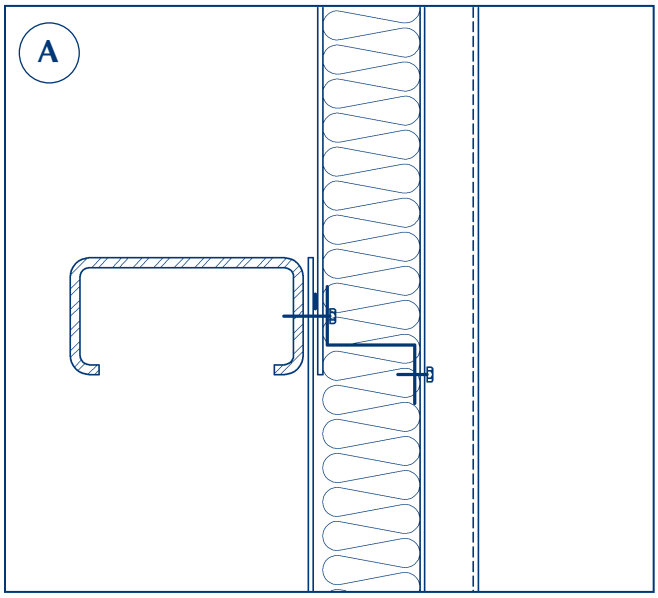
The structural support at the base of the wall is the first connection between the structure and the building envelope. To effect a proper air/vapour retarder of the building envelope, this member should be set in a bed of mastic by the installer of the structural support. The normal gap between the ends of a J-channel or U-channel allows for drainage if needed.

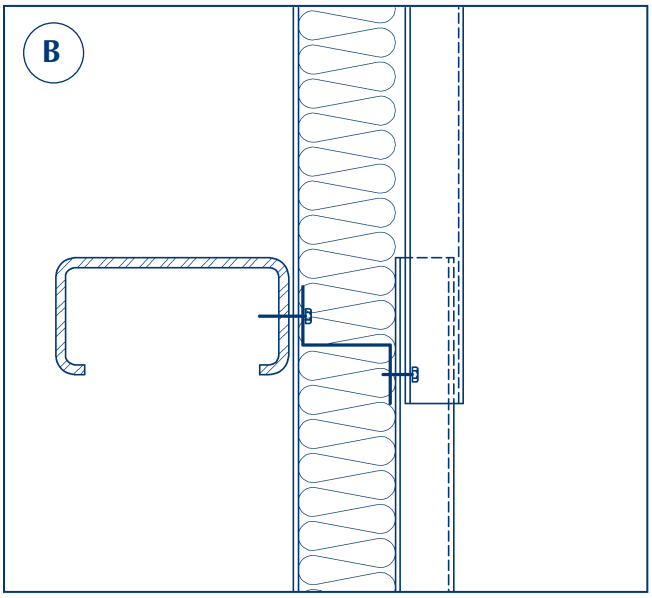
Detail "B" shows an alternative detail where a Z-flashing is used instead of a J-channel to support the cladding. In all cases it is recommended that the exterior cladding extend below the top of the foundation to prevent wind from driving into the building and to insulate the base angle.

Detail "C" illustrates the connection of wall cladding to a masonry wall. The installation sequence and details are the same as in Detail "A".

Detail 3

INTERMEDIATE WALL GIRT





Installation / Assembly Notes:

Detail "A" shows an end lap in a liner sheet. This may be necessary in wall assemblies higher than the maximum practical length of a liner sheet.

a) Install the lower liner sheet length first.
b) Apply a bead of caulking across the face of the liner at the end lap.
c) The minimum length of overlap should be 100 mm (4 in).
d) Fasten the upper length of liner and the Z-bar sub-girt to the wall girts with specified fasteners.
e) Apply insulation and exterior cladding sheet.

Detail "B" shows an end lap in an exterior cladding sheet. This will not necessarily occur at the same location as the lap in the interior liner sheet.

a) Install the lower sheet length first.
b) Install the upper sheet length and provide a minimum overlap of 100 mm (4 in). Do not caulk this lap.
c) Fasten the upper length of cladding to the Z-bar sub-girt with the specified colour matching fasteners.

Specifier / Designer Notes:

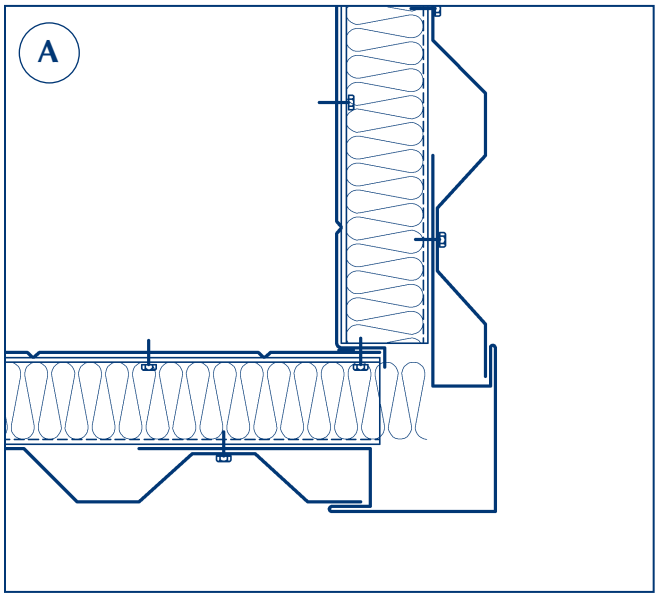
Sheet lengths are a function of manufacturing capabilities, transportation and site handling. While it is often the desire to cover an elevation with single length sheets, it is not always realistic or in fact good construction practice to do so. Cladding sheets are normally supplied in practical lengths up to 9.1 m (30 ft), and liner sheets on average 7.3 m to 7.9 m (24 to 26 ft). Longer sheets are available, but often at an added cost to produce, ship and install.

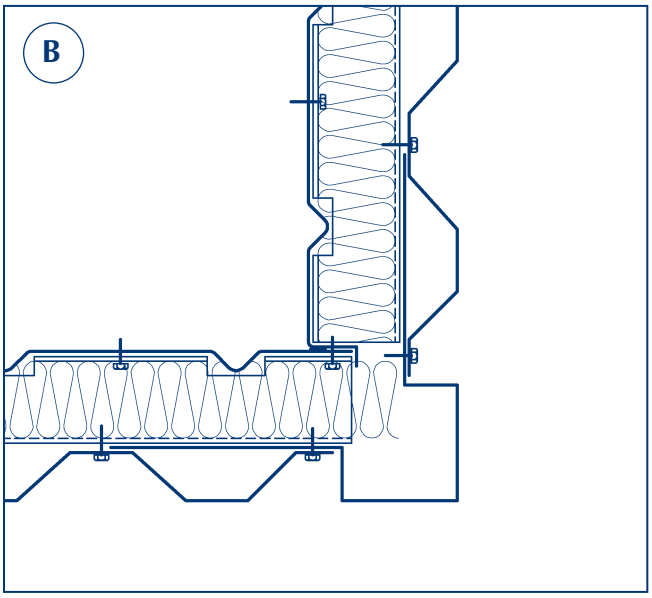
An overlap of either the interior liner or the exterior cladding sheets must occur at a structural support. It is important that the continuity of the air/vapour retarder of the liner sheet be maintained. The overlap in both cases must place the upper sheet over the lower sheet. This is necessary to effectively drain any moisture in the cavity or rain off the exterior sheet. Do not caulk an overlap in vertical exterior cladding sheets.

Some exterior cladding profiles, such as hidden fastener profiles, cannot be end lapped. In such instances, a butt joint detail should be provided complete with transitional flashings.

Detail 4

OUTSIDE CORNER





Installation / Assembly Notes:

a) Trim the last liner sheet, and Z-bar sub-girts in the elevation to extend 1 inch beyond the girt line.
b) Secure the liner sheets and Z-bar sub-girts to the structural frame with the specified fasteners.
c) Apply a bead of caulking to the back face of the liner in preparation for sealing the corner.
d) Hoist and align the first liner sheet in the next elevation. Secure to structural supports through the Z-bar sub-girts and liner sheet.
e) Fasten the trimmed edge of the first liner sheet to the side lap of the second sheet on the next elevation making sure the two sheets are properly sealed against air/vapour leakage. (A corner flashing is not required at this location).
f) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
g) Install the exterior corner flashing to the Z-bar sub-girts.
h) Trim and fasten the last exterior cladding sheet in the elevation into place.
i) Continue installing the exterior sheets along the next elevation.

Specifier / Designer Notes:

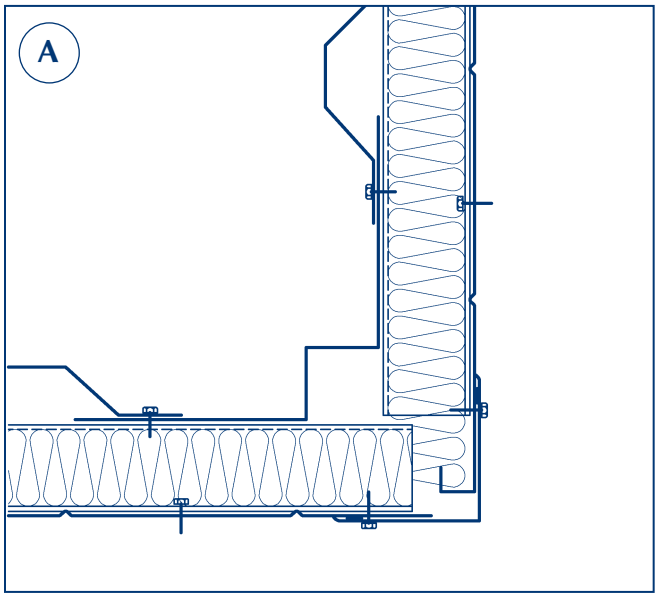
The corner detail of the liner sheet is critical to a proper air/vapour seal of the building. A continuous line of caulking and sufficient stitch fasteners are needed to maintain this seal.

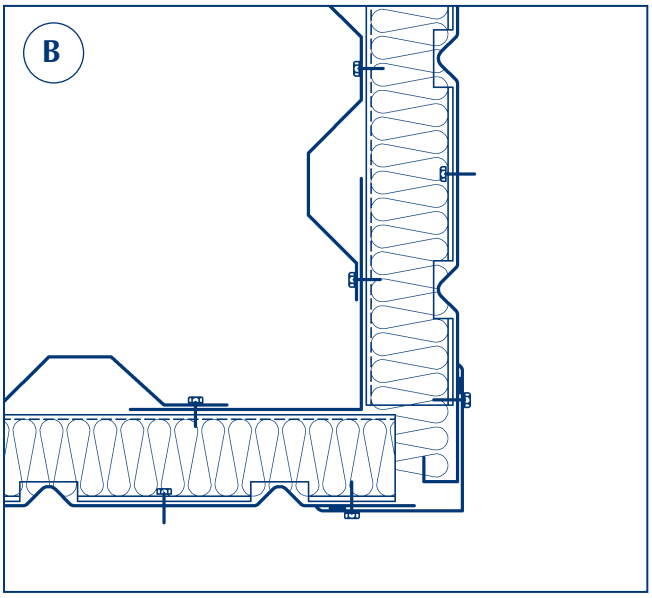
Detail “A” illustrates one type of outside corner flashing that is slightly different from Detail “B”. Either type is acceptable and differ only in appearance.

The liner sheet shown in Detail “A” has very shallow ribs and a solid Z-bar sub-girt can be used. The larger ribs in the liner sheet shown in Detail “B” require a notched Z-bar sub-girt.

Detail 5

INSIDE CORNER





Installation / Assembly Notes:

a) Trim the last liner sheet, and Z-bar sub-girts in the elevation.
b) Secure the liner sheets and Z-bar sub-girts to the structural frame.
c) Hoist and align the first liner sheet in the next elevation. Secure to structural supports through the Z-bar sub-girts and liner sheet.
d) Apply a continuous bead of caulking along the interior edges of both liner sheets. Install the liner sheet inside corner flashing fastening it to the liner sheets close to the caulking lines. Make sure the two sheets and the inside corner flashing are properly sealed against air/vapour leakage and there is no "fish mouthing" of the liner or flashing. If necessary, install more stitch fasteners.
e) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
f) Install the exterior inside corner flashing with the specified fasteners.
g) Trim and fasten the last exterior cladding sheet in the elevation into place with specified fasteners.
h) Continue installing the exterior sheets along the next elevation.

Specifier / Designer Notes:

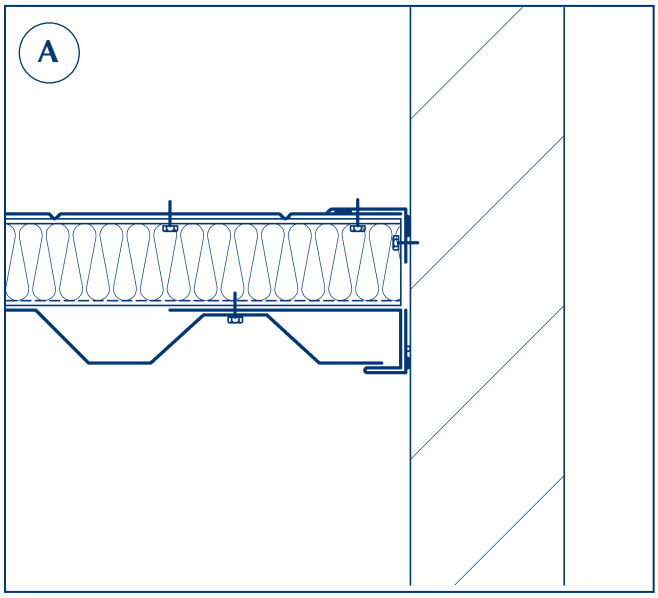
The corner detail of the liner sheet is critical to a proper air/vapour seal of the building. A continuous line of caulking and sufficient stitch fasteners are needed to maintain this seal.

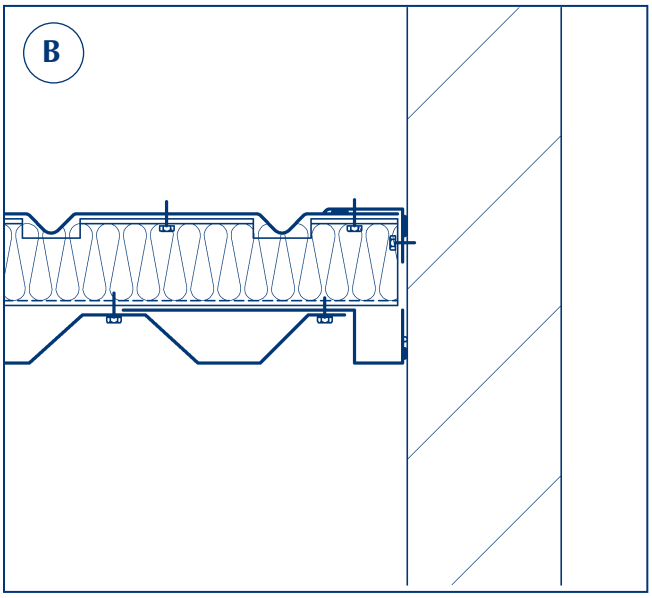
Detail "A" illustrates one type of inside corner flashing that is slightly different from Detail "B". Either type is acceptable and differ only in appearance.

The liner sheet shown in Detail "A" has very shallow ribs and a solid Z-bar sub-girt can be used. The larger ribs in the liner sheet shown in Detail "B" requires a notched Z-bar sub-girt and closures. In some assemblies with longer spans between structural supports, shallow corrugated profiles will be needed as a liner sheet to develop the needed structural capacity.

Detail 6

MASONRY WALL





Installation / Assembly Notes:

a) An angle flashing is connected to the masonry wall vertically along the corner of the structural supports and the masonry. A line of caulking or mastic is placed between this angle and the masonry wall.
b) Apply a line of caulking along the outstanding leg of the angle flashing.
c) Trim the last liner sheet and Z-bar sub-girt in the elevation.
d) Hoist and align the liner sheet and secure to structural supports through the Z-bar sub-girts and the corner angle flashing. Make sure not to fasten through the caulking.
e) Run a foam rod and line of caulking vertically up the masonry wall.
f) Press the J-trim into the caulking and fasten to the Z-bar sub-girts.
g) Trim and fasten the last exterior cladding sheet into place with specified fasteners.

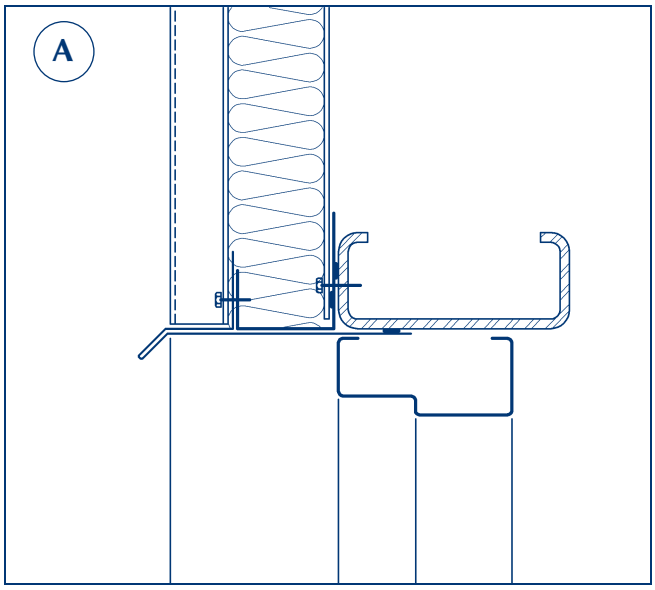
Specifier / Designer Notes:

The air/vapour seal along the masonry wall will be more difficult to maintain due to the roughness of the surface. The caulking or mastic applied between the corner angle and the masonry must be sufficient to fill any cavities.

Sealing the J-trim along the masonry wall will prevent the entry of wind-driven rain into the wall cavity.

Detail 7

WALL OPENING HEAD DETAIL



Installation / Assembly Notes:

a) Cut the J-channel to fit the width of the opening. Cut the liner sheet(s) to fit the opening.
b) Apply a bead of caulking to the structural support.
c) Align and clamp into place the J-channel.
d) Apply a second bead of caulking to the face of the J-channel.
e) Hoist and align the liner sheet. Fasten into place through the J-channel into the structural support ensuring a full and proper seal. Do not screw through the caulking since this may break the continuous seal.
f) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
g) Run a line of caulking along the under side of the head structural support where the drip flashing will end.
h) Align and clamp the drip flashing, pressing it into the caulking.
i) Trim and fasten the exterior cladding sheets into place through the drip flashing into the J-channel.

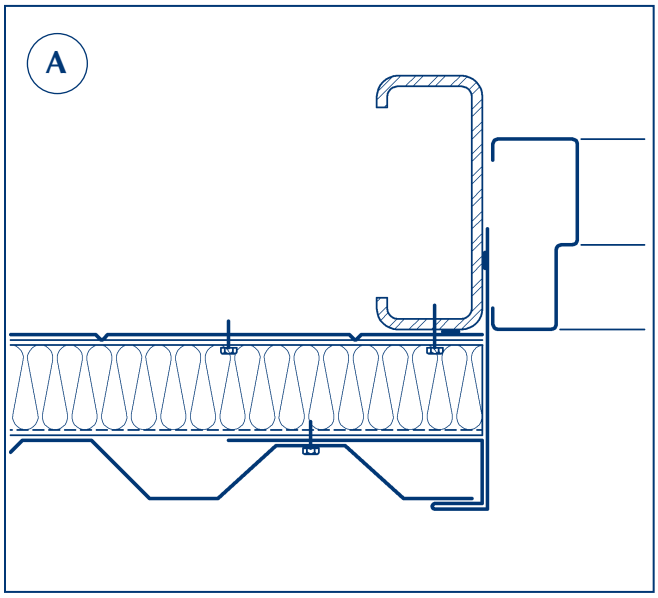
Specifier / Designer Notes:

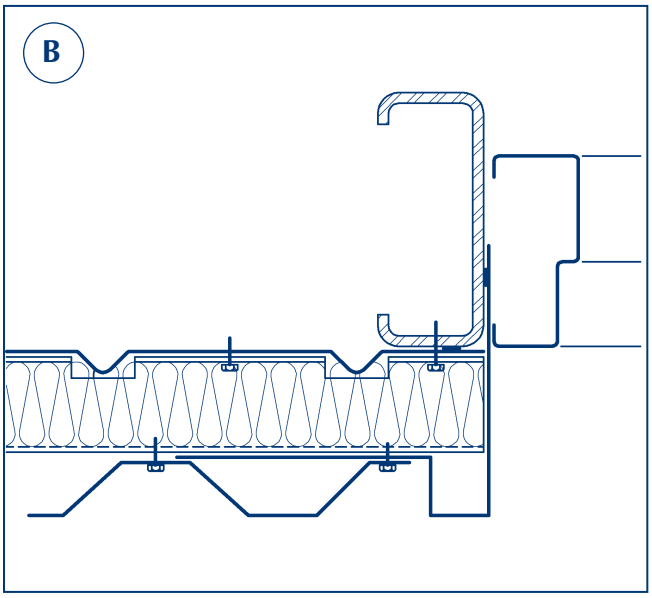
This detail applies to the head of a man door or for openings to accommodate windows or louvers. The cladding and liner are cut to fit flush with the opening. Detail 8 should be consulted for flashing at the jambs. Detail 9 should be consulted for flashing at the sill. The continuity of the seal at the junction of the head and jamb is important to maintain the air/vapour retarder.

The drip flashing is made of the same material as the exterior cladding sheet. The dimensions of the wall assembly need to be provided to the manufacturer so this piece can be fabricated to the correct size. Installing and sealing of the infill (i.e. door, window, louver) is the responsibility of others.

Detail 8

WALL OPENING JAMB DETAIL





Installation / Assembly Notes:

a) Cut the liner sheet and Z-bar sub-girts to fit the opening.
b) Run a line of caulking down the jamb structural member.
c) Hoist and align the liner sheet. Fasten through the Z-bar sub-girts into the jamb structural support.
d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
e) Run a line of caulking along the inside of the jamb structural support where the corner flashing will end.
f) Align and clamp the exterior corner flashing into place, pressing it into the caulking.
g) Trim and fasten the exterior cladding sheet into place through the corner flashing into the Z-bar sub-girts.

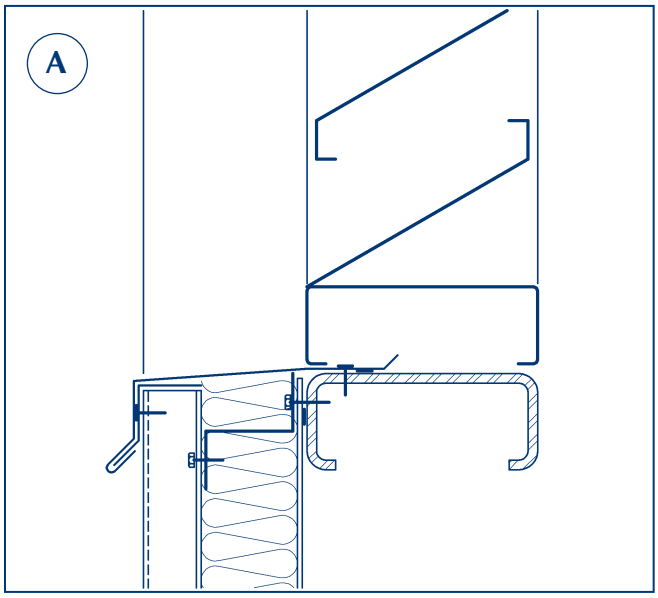
Specifier / Designer Notes:

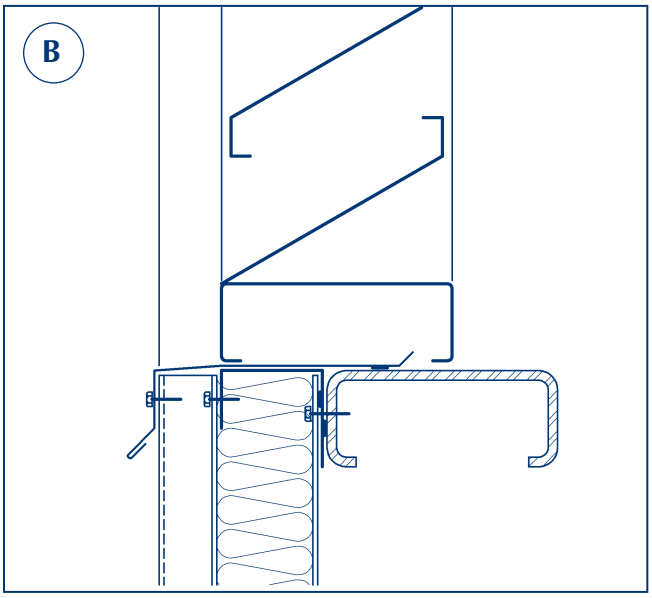
This detail applies to the jamb of an opening for a man door or to accommodate accessories such as windows or louvers. The cladding and liner are cut to fit flush with the opening. Detail 7 should be consulted for flashing at the head. Detail 9 should be consulted for flashing at the sill. The continuity of the seal at the junction of the head/ jamb, jamb/ base angle, and jamb/sill is important to maintain the air/vapour retarder.

The corner flashing is made of the same material as the exterior cladding sheet. The dimensions of the wall assembly need to be provided to the manufacturer so this piece can be fabricated to the correct size. Installing and sealing of the infill (i.e. door, window or louver) is the responsibility of others.

Detail 9

WALL OPENING SILL DETAIL





Installation / Assembly Notes:

a) Cut the Z-bar sub-girt (or J-channel) and liner sheet(s) to fit the opening.

For Detail "A":

b) Run a line of caulking along the front of the structural girt.
c) Hoist and align the liner sheet. Fasten into place through the Z-bar sub-girt into the structural girt.

For Detail "B":

b) Apply a bead of caulking to the structural support.
c) Align and clamp into place the J-channel.
d) Apply a second bead of caulking to the face of the J-channel.
e) Hoist and align the liner sheet. Fasten into place through the J-channel into the structural girt.

Continue for both:

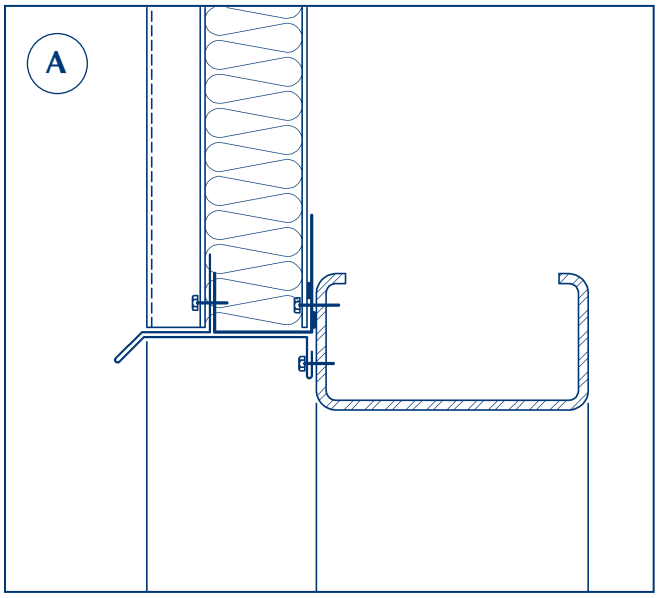
f) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
g) Run a line of caulking along the top of the structural girt where the drip flashing will end.
h) Trim and fasten the exterior cladding sheets into place.
i) Fasten the closure piece to the top of the cladding. (For Detail "A")
j) Trim and install the drip flashing, pressing it into the caulking.

Specifier / Designer Notes:

Detail "A" and Detail "B" show two options for framing around a sill for a louver. The major difference is in how far back the louver (or window) is to be set. It is important that the sill drip flashing be sloped from the louver to the outer edge without any flat areas to retain water. Installing and sealing the window or louver into place is the responsibility of others.

Detail 10

TRUCK DOOR HEAD DETAIL



Installation / Assembly Notes:

a) Cut the J-channel and liner sheet(s) to fit the width of the opening.
b) Apply a bead of caulking to the structural support.
c) Align and clamp into place the J-channel.
d) Apply a second bead of caulking to the face of the J-channel.
e) Hoist and align the liner sheet. Fasten into place through the J-channel into the structural support ensuring a full and proper seal. Do not screw through the caulking since this may break the continuous seal.
f) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
g) Align and fasten the drip flashing to the structural support.
h) Trim and fasten the exterior cladding sheets through the drip flashing into the J-channel. Use colour matched fasteners.

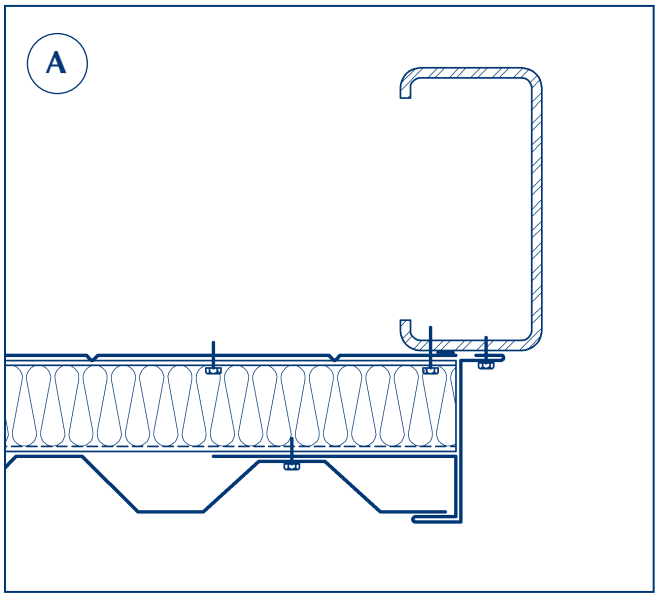
Specifier / Designer Notes:

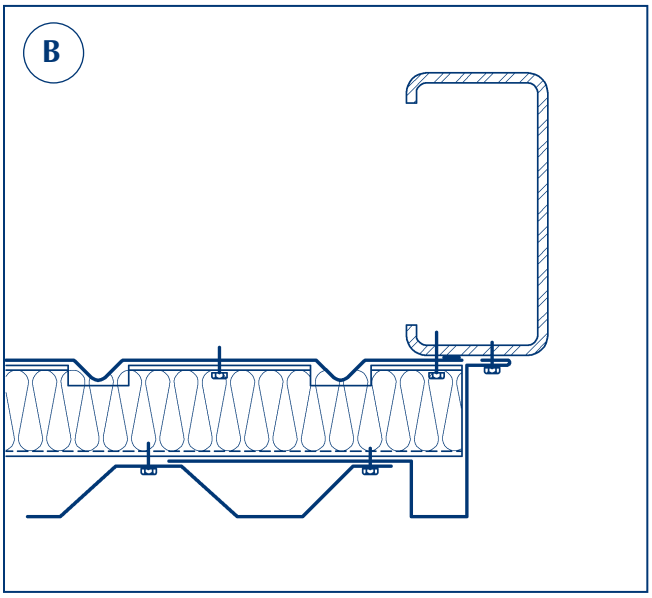
This detail applies to the head of a truck door. The cladding and liner are cut back from the opening so that accidental contact will not damage the cladding sheets. This detail could also incorporate bumpers and air seal equipment. Detail 11 should be consulted for flashing at the jambs. The continuity of the seal at the junction of the head and jamb is important to maintain the air/vapour retarder.

The drip flashing is made of the same material as the exterior cladding sheet. The dimensions of the wall assembly need to be provided to the manufacturer so this piece can be fabricated to the correct size.

Detail 11

TRUCK DOOR JAMB DETAIL





Installation / Assembly Notes:

a) Cut the liner sheet and Z-bar sub-girts to fit the opening.
b) Run a line of caulking down the jamb structural member.
c) Hoist and align the liner sheet. Fasten through the Z-bar sub-girts into the jamb structural support.
d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
e) Align the corner flashing and fasten to the structural jamb.
f) Trim and fasten the exterior cladding sheets through the corner flashing into the Z-bar sub-girt.

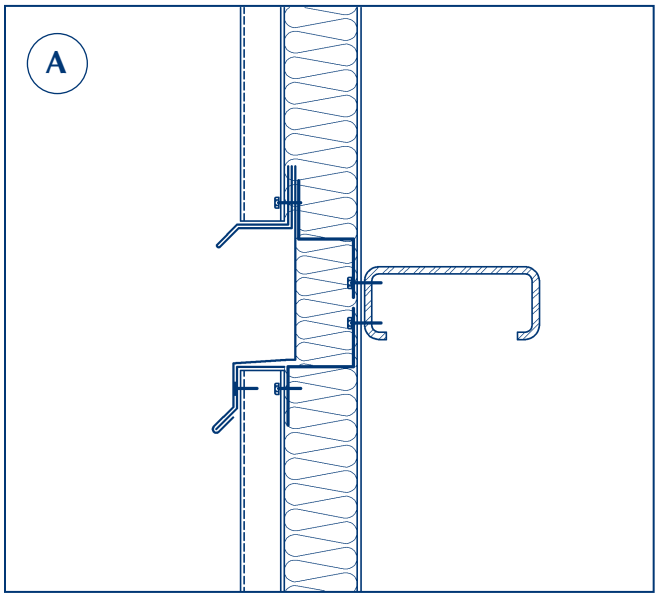
Specifier / Designer Notes:

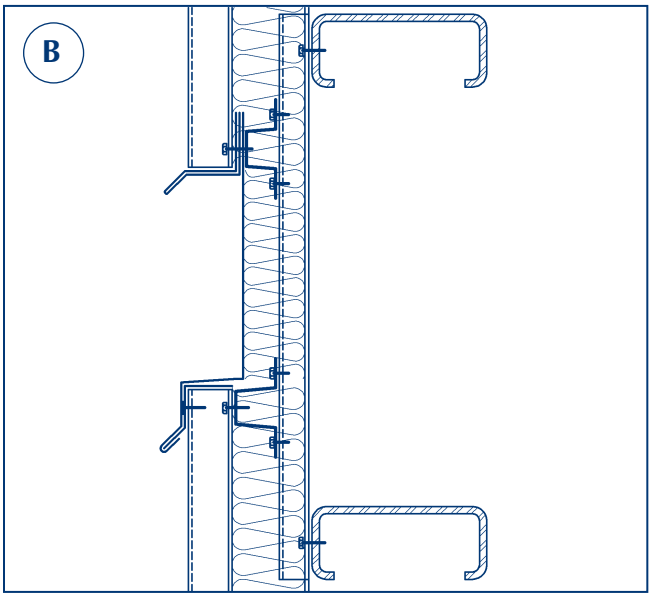
This detail applies to the jamb of a truck door. The cladding and liner are cut back from the opening so that accidental contact will not damage the cladding sheets. This detail could also incorporate bumpers and air seal equipment. Detail 10 should be consulted for flashing at the head. The continuity of the seal at the junction of the head and jamb, and at the jamb and base angle, is important to maintain the air/vapour retarder.

The corner flashing is made of the same material as the exterior cladding sheet. The dimensions of the wall assembly need to be provided to the manufacturer so this piece can be fabricated to the correct size.

Detail 12

RECESSED FEATURE STRIP





Installation / Assembly Notes:

a) Hoist, align and fasten the liner sheet through the Z-bar sub-girt into the structural framing.
b) If vertical sub-girts are used (i.e. Detail "B"), these must be cut to length and installed at regular intervals along the structural supporting members. The spacing and fastening of these sub-girts is critical and will be called up in the specifications.
c) Install the additional horizontal sub-girts if required (i.e. Detail "B").
d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
e) Hoist and align the lower section of the exterior cladding sheets, fastening into the sub-girt.
f) Install the feature strip by fastening it to the lower cladding sheets.
g) Hoist and align the upper section of exterior cladding. Put the drip flashing in place before fastening the bottom of the upper exterior cladding sheet.

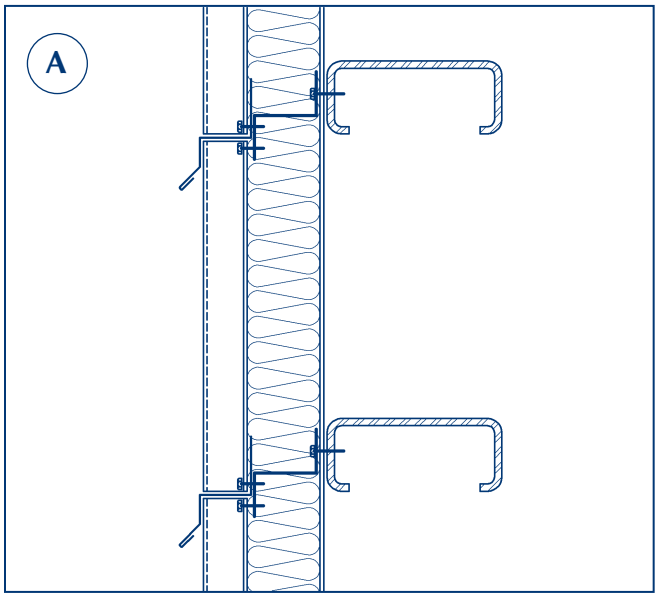
Specifier / Designer Notes:

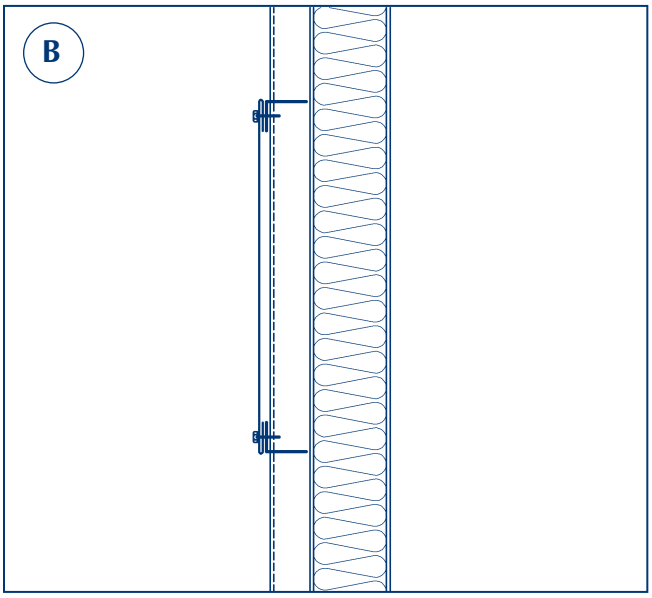
There are a number of ways to frame around a horizontal feature strip. The best method depends on the size of the strip and the location of the structural supports. Detail "A" is for a narrow strip that can be supported by two Z-bar sub-girts attached to a common structural support. Detail "B" is for a larger strip that is supported by hat-section sub-girts spanning between structural supports. It is important to coordinate the location of the feature strip with the structural designer to accommodate supporting the strip without the need for extra framing.

A feature strip is a flat piece of prefinished material installed for aesthetic reasons. There is a limit to the practical width of a flat feature strip beyond which oil-canning will begin to affect the appearance. For recommendations on maximum sizes, or for other options, consult the fabricator.

Detail 13

HORIZONTAL ACCENT STRIP





Installation / Assembly Notes:

Detail "A":

a) Hoist and align the liner sheet, fastening through the Z-bar sub-girt into the structural support.
b) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.
c) Hoist and align the lower section of the exterior cladding sheets, fastening into the Z-bar sub-girt.
d) Align and clamp in place the lower drip flashing.
e) Install the accent strip by fastening it to the Z-bar sub-girts.
f) Hoist and align the upper section of exterior cladding. Put the drip flashing in place before fastening the bottom of the upper exterior cladding sheet.

Detail "B":

a) Face-fasten the feature strip to the cladding. The closures are optional.

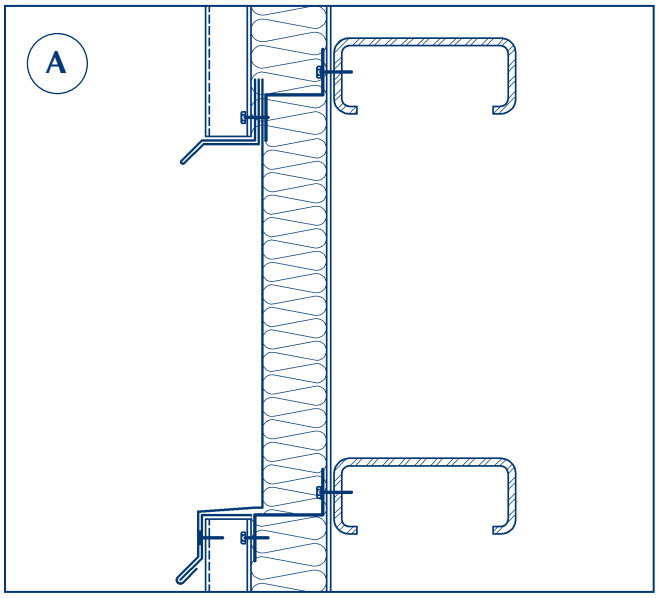
Specifier / Designer Notes:

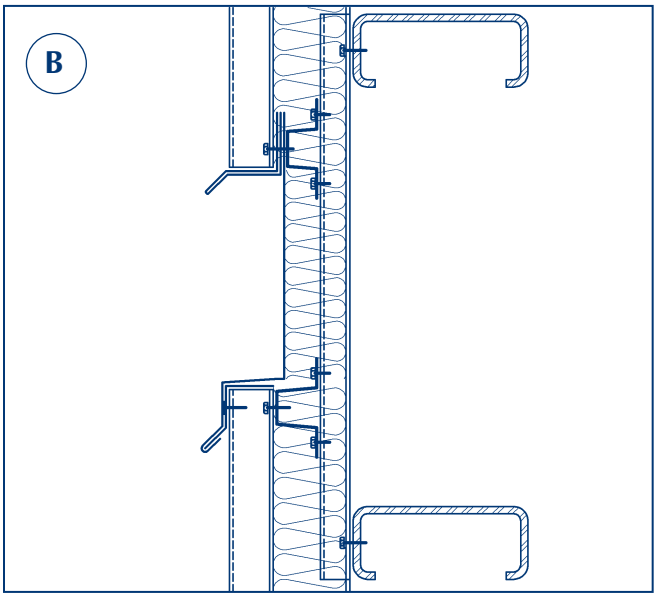
A horizontal accent strip differs from a feature strip in that it is made from a cladding profile instead of a flat sheet and can span much greater lengths. The upper and lower ends of the strip need to be supported by structural members. The drip flashing material needs to be colour matched to the cladding and accent trim.

An alternative method of providing a accent is to fasten a flat sheet directly to the face of the exterior cladding. This is a very simple and economical method. There is a limit to the practical width of a flat accent strip beyond which oil-canning will begin to affect the appearance. For recommendations on maximum sizes, or for other options, consult the fabricator.

Detail 14

DIAGONAL RECESSED FEATURE STRIP





Installation / Assembly Notes:

a) Hoist, align and fasten the liner sheet through the Z-bar sub-girt into the structural girt. The Z-bar sub-girts will be installed at the proper angle and location to accommodate the diagonal feature strip.

b) If vertical sub-girts are used (i.e. Details "B"), these must be cut to length and installed at regular intervals along the structural supporting members. The spacing and fastening of these sub-girts is critical and will be called up in the specifications.

c) Install the additional horizontal sub-girts if required (i.e. Detail "B").

d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.

e) Cut the exterior cladding sheets on the proper bevel. Hoist and align the lower section of the cladding sheets, fastening into the sub-girt.

f) Install the feature strip by fastening it to the lower cladding sheets.

g) Hoist and align the upper section of exterior cladding. Put the drip flashing in place before fastening the bottom of the upper exterior cladding sheet through the drip flashing and the feature strip into the sub-girt.

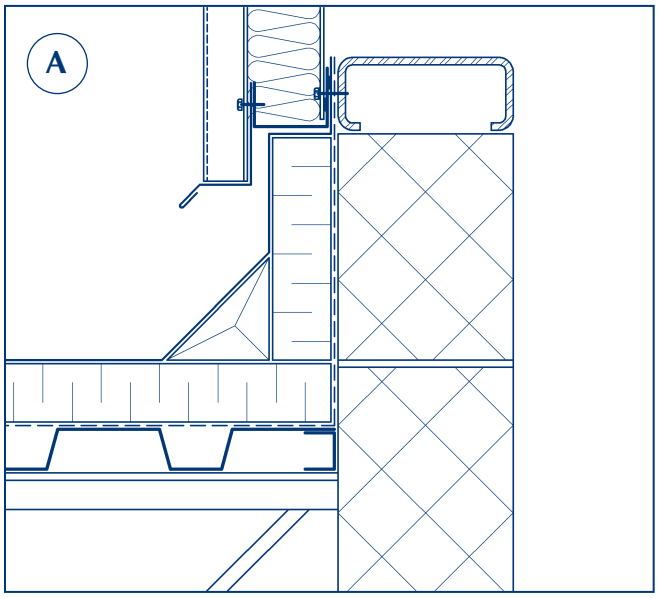
Specifier / Designer Notes:

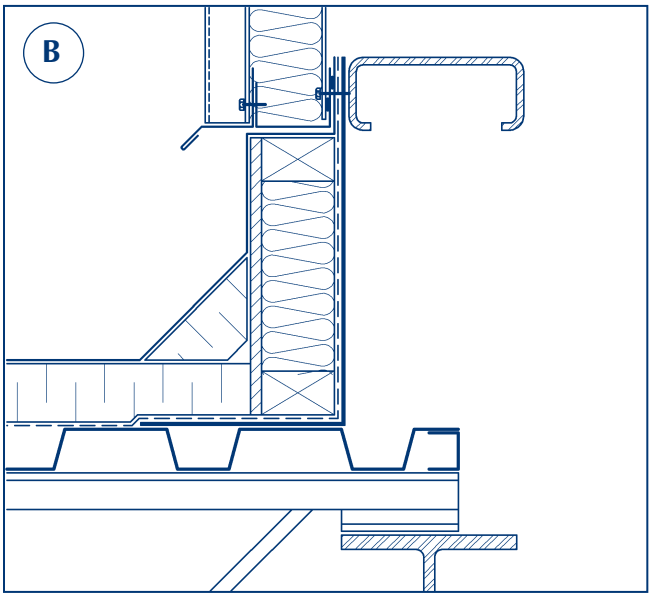
A diagonal feature strip, like a horizontal feature strip, must be supported along each edge. The supporting J-channel, or Z-bar, must in turn be supported by the structural girts. It is important to coordinate the location of the feature strip with the structural designer to accommodate supporting the strip without the need for extra framing.

An alternative type of diagonal feature strip can be created as shown in Detail 13B where a flat sheet is face fastened to the cladding. A metal closure is optional, but if it is used, it will need to be cut on the correct angle. There is a limit to the practical width of a flat accent strip beyond which oil-canning will begin to affect the appearance. For recommendations on maximum sizes, or for other options, consult the fabricator.

Detail 15

HIGH WALL TO LOW ROOF





Installation / Assembly Notes:

a) Ensure that the vapour retarder from the roof assembly is brought up to the supporting structural member. It will need to be caulked to the back of the J-channel to maintain the air/vapour retarder. Also ensure that the roofing membrane extends up over top of the structural member.

b) Apply a bead of caulking to the vapour retarder at the structural support. Align and clamp the J-channel in place. Apply a bead of caulking to the J-channel.

c) Hoist and align the liner sheet fastening into place through the J-channel into the structural support.

d) Apply insulation adhesive or stick pins to the liner sheet and press the insulation securely into position.

e) Align and clamp the drip flashing into place.

f) Hoist, align and fasten the exterior cladding sheets into place through the drip flashing into the J-channel.

g) The remainder of the construction is done by others.

Specifier / Designer Notes:

Detail "A" and Detail "B" are different only in the type of knee wall assembly. The insulated knee wall (or concrete block wall), vapour retarder and roofing materials are installed by others before the installation of the wall assembly.