

Notice to Electrical and Building Contractors

Acceptable practices for installation of insulation contact (IC) Air-tight recessed luminaires in insulated ceilings

July 15, 2010

Question/enquiry: Do recessed luminaires need a 6 mil poly vapour barrier when installed in an insulated ceiling even when they are rated air tight and are IC (insulation contact) certified?

Answer: No, however there are 3 recognized acceptable installation methods.

The continuity of the air barrier is a building code issue. The installation is also a concern to Electrical Inspectors as it is the electrical trade that is responsible for the installation which must match the intended use outlined in the luminaires listing documents in order to be acceptable. As such it becomes a cross-discipline issue.

This item is being called inconsistently by Inspectors throughout Alberta and Electrical Contractors have requested a uniform position be adopted throughout the Province. This item was discussed at both the Electrical and Building Inspectors 2010 conference's leading to this conclusion.

Some History:

- Any penetration that allows heated (or cooled) air to leak into attic spaces contributes to the air leakage rate of a house. Air leakage is undesirable as it increases fuel bills, causes uncomfortable drafts and leads to moisture problems and mould. These issues can compromise the integrity of the structure and the health of the occupants. Historically, the greatest problem area has been when improper installations occur in bathrooms.
- ABC 9.25.3.3 (6) requires continuity of the air barrier system. Penetrations of the air barrier system such as those created by the installation of doors, windows, electrical boxes...shall be sealed to maintain the integrity of the air barrier system over the entire surface. So the luminaire needs to be air tight to maintain the integrity of the air barrier.
- ABC does not concern itself with the means or acceptable practices to comply with 9.25.3.2 . Apx A – “protection against air leakage must be provided by a system of air-impermeable materials jointed with leak free joints”. ...”special measures must be taken to make such openings as air tight as possible”. This provision is met by the luminaires system of sealing with gaskets and other means (such as a poly pan).
- Systems have constantly improved for making recessed luminaires air tight. This has been driven primarily by International Energy Codes that focus on the building envelope and insulation requirements. Installations have progressed from Non-IC rated luminaires surrounded by sealed drywall boxes to insulation contact luminaires mounted in sealed boxes and/or surrounded by vapour barrier, to IC air tight luminaires mounted directly in the insulation with no vapour barrier utilizing gaskets or an air tight trim kit to accomplish the air tight requirement.

The following are acceptable installation methods:

- **The best way to ensure a long term intact air barrier is to not install any recessed luminaires in an insulated ceiling – avoid it whenever possible**
- **All recessed luminaires installed in an insulation contact installation must be marked Type IC (Insulation Contact)**

Acceptable Methods:

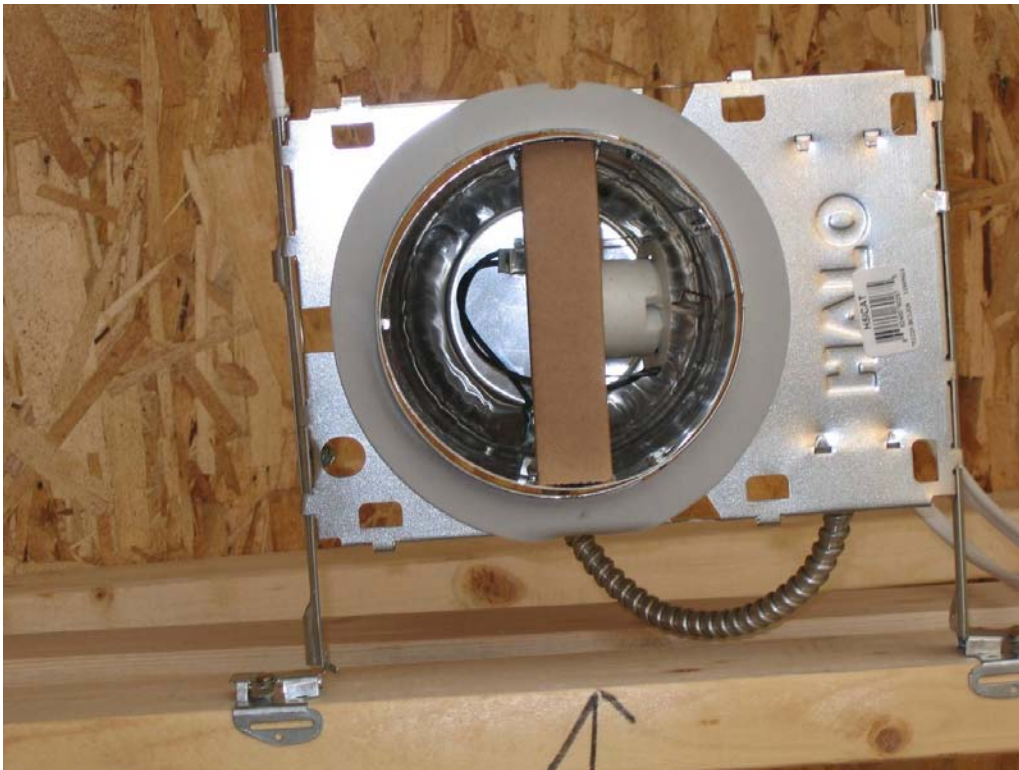
1. Using an air tight, insulation contact (IC) luminaire mounted directly into the insulated space with no poly around it. This type of luminaire must be installed as per the manufacturer's installation instructions and with all the required gaskets intact – see details for method 1.
2. Using an IC luminaire surrounded with a formed 90°C rated poly pan. The poly pan must be properly installed and sealed – see details for method 2.
3. Using an IC luminaire surrounded with a sheet of 6 mil CGSB vapour barrier. The poly must be properly installed and sealed – see details for method 3.

Method 1 – IC air tight certified luminaire installed without any type of poly.

This is considered best practice as this method leaves no major voids in the insulation layer and eliminates seal failures along the seams of vapour barriers.

There are four primary methods specified by the luminaire manufacturers to insure an airtight seal of the certified airtight housing to the ceiling, but the most common for new construction is described below. This description uses Cooper Lighting's Halo H51-CAT as an example (as they are widely utilized) but these practices are similar between manufacturers. All luminaires must be marked for insulation contact and also have a label indicating they are air tight tested to ASTM E283. The orange Washington State label is the most common identifier for products tested to this standard but other labels are also satisfactory.

At rough-in: The luminaire comes with a gasket on the plaster frame normally pre-installed at the factory. This gasket creates an air tight seal between the luminaire's plaster frame and the vapour barrier at the ceiling interface. Installers and Inspectors must be aware that the luminaire housing may also have other factory installed or field assembled gaskets on it as well, such as on the cable penetration to the housing, on the top of the housing or for screw hole slots that are part of the housing's height adjustment (to bring it flush for different drywall thicknesses and to set the lampholder at the right height). All of these must be in place at rough-in.



Method 1 - This shows an IC air tight luminaire installed at the rough in stage. Note the air gap between the plaster frame gasket and the inner housing – it is quite significant and is the main reason installers and inspectors were insisting on a poly hat or vapour barrier surrounding the housing to ensure an air tight installation. This gap is sealed at the finish with an additional accessory gasket . (more on that later).

At insulation stage: Installation of the vapour barrier is to flow across the ceiling level and mate with the gasket on the plaster frame. When drywall is installed, the vapour barrier is pressed against this gasket.



Example of an IC air tight installation, installed without a vapour barrier surrounding the housing. In this case the insulation bats were installed tight around the housing with the remainder of the insulation is blown into place. Sealing at the vapour barrier occurs at the factory gasket on the plaster frame. No sealant is placed along with the plaster ring gasket. Opening in the vapour barrier is normally cut at the same time the drywall is installed, but you might want to make arrangements with the drywaller to leave it intact so the interior of the housing is not over-sprayed with ceiling texture which interferes with the finish seal and can cover required labeling.

At Finish: There are 2 options for completing an air tight, code compliant installation. **It is this step that has been commonly missed by installers.**

- 1) Before installing the trim kit, a gasket is installed to seal the gap between the drywall and the inner housing. The gasket is attached to the drywall and is rolled 90 degrees to seal against the inside of the housing. For the example Halo product, this requires installation of a GA-ATH5 gasket (which does not come with the rough in or trim kits - it must be purchased separately). Some of these gaskets also have tabs to cover and seal the housing height adjustment slots. For other manufacturers, use the sealing method specified by the manufacturer for completion of the air tight system – it may be a gasket or an approved sealant (usually silicone). Finish is completed with a trim kit specified by the manufacturer for use with each type of housing. Manufacturers 'information for air tight compliance varies greatly, particularly for the finishing trim area gaskets – you may need to do some homework here for the brand you utilize.

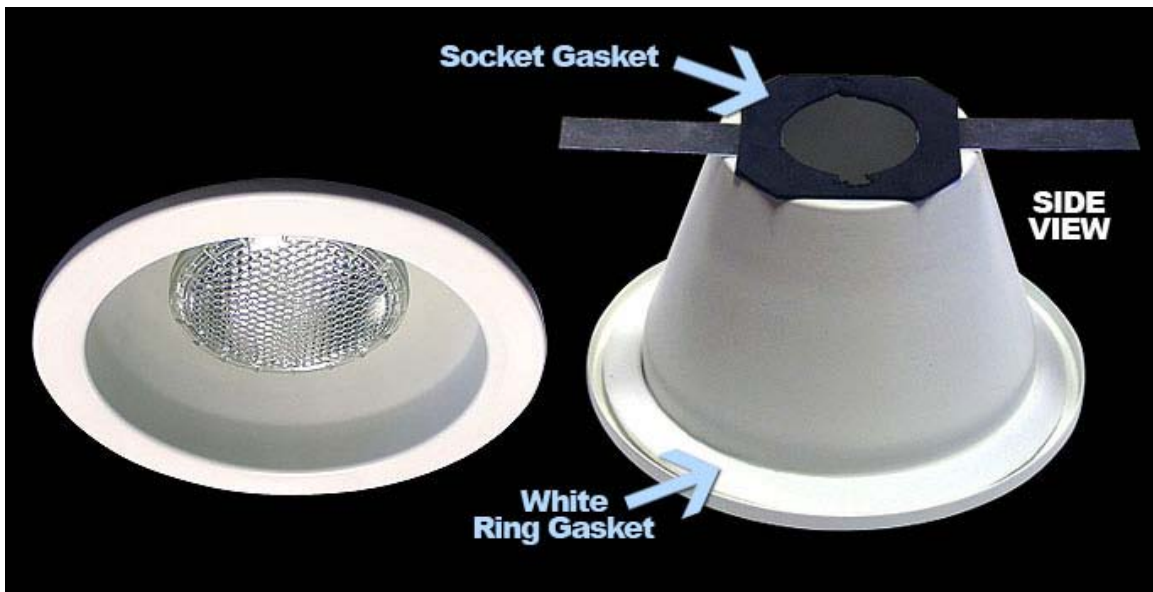
or

- 2) Install a certified air-tight trim kit. This type of trim kit incorporates seals and air tight construction together in the trim kit. The trim forms a tight seal to the inside of the fixture and also seals the ceiling interface in conjunction with an air tight enclosure. The certified airtight trim kit in combination with the luminaire housing makes the luminaire airtight.

At finish - the final step for an air tight compliant installation:



Option 1 - Installing the gasket at the ceiling interface is done when the trim is installed. This shows the Halo GA-ATH5 gasket. Note the housing must be clean of all overspray from the ceiling texture. The trim also helps to hold and shape the gasket. Silicone sealant is used to seal the drywall-housing gap by some manufacturers. If your supplier cannot provide a factory gasket then sealant would be an acceptable (but messy) alternative.



Option 2: Install an air tight trim kit which includes gaskets on the socket entryway and on the ceiling interface.

Method 2 - Installed with a 90° rated poly pan.

At rough-in: An IC rated luminaire is required. The 90°C rated poly pan is to be properly installed. Most manufactures make these in 24" and 16" dimensions to match standard truss spacing. The sides of the poly pan are to rest in contact with the sides of the trusses, with the bar hangers nailed through the poly pan into the truss. Do not slice the sides of the poly pan so the hangers penetrate through. Installers often use poly pans that do not match the truss spacing forcing them to cut the pan for the hangar bars. Proper installation will result in only one penetration of the pan for the wire(s). Last step is to shape the poly pan to the housing to minimize dead air space and voids in the insulation layer.



This shows a Type IC air tight pot light installed with a 90° C poly hat installed in the correct orientation and in a size that matches the truss spacing. The sides of the poly hat are in contact with the sides of the trusses, with the bar hangers nailed through the poly pan into the truss.



This would not be acceptable. Installer cut slots for the hangar bars by using the wrong size poly pan or the right size pan in the wrong orientation. Sometimes installers don't cut the pan instead just run the brackets under the pan making it impossible for the insulator to properly seal the edges.

At insulation stage: Installation of the ceiling vapour barrier is to seal (with acoustic sealant) against the 4 outside edges of the poly pan. The wire penetration(s) are also to be sealed with acoustic sealant.

At Finish: Standard trim kits are installed, no gaskets required.

Issues against using poly pans compared to other methods:

Addition of a poly pan creates a large void in the insulation layer. Manufacturers indicate the poly pan is to be formed around the luminaire housing to eliminate this void but in practice, this does not work very well as forming the pan does not retain the shape of the housing and at the same time distorts the shape of the pan making it difficult to properly seal the perimeter edges. As well the edges of the poly pan don't all end up under a truss so the seal is not compressed by the drywall making it prone to failure over time.

Stiff construction and formed edges provide superior sealing ability when compared to using a sheet of vapour barrier.

Method 3 - An IC luminaire surrounded with a sheet of 6 mil CGSB vapour barrier.

At rough-in: An IC rated luminaire is required. The 6 mil CGSB vapour barrier is the only acceptable poly. The size of the sheet must be adequate to allow the edges of the poly to rest in contact with the sides of the trusses, with the bar hangers nailed through the poly into the truss. There must be 4" of free poly at all edges to seal with the mating ceiling vapour barrier. Proper installation will result in only one penetration for the wire(s).

At insulation stage: Installation of the vapour barrier is to flow across the ceiling level and seal with acoustic sealant to the edges of the vapour barrier draped over the recessed luminaire. The penetration of the vapour barrier for the wire(s) is also to be sealed with acoustic sealant.

At Finish: Standard trim kits are installed, no gaskets required.

Issues against using 6 mil poly hats compared to Method 1: Still a significant void in the insulation layer that does not occur if the housing is in direct contact with the insulation. The long term life of the sealant around the perimeter is questionable. The edges are not perfectly flat or square and not all are compressed under the drywall. .

Note – often 6 mil vapour barrier is rejected by inspectors as there is some question if this material meets the “suitable for 90 °C” requirement marked on the luminaire. (These luminaires are certified and marked to indicate that vapour barrier in contact with the housing must be suitable for 90° C.)

The question has been raised – does 6 mil CGSB poly draped over the luminaire meet the luminaires listing requirements for “vapour barrier to be suitable for 90°C”? The answer is YES based on this information.

- 1) From CGSB (the certification body for this product) - The suitability of use for CGSB 6 mil vapour barrier over top of recessed lighting is not part of the CGSB testing protocol. CGSB suggested for the temperature suitability requirement, it would be wise to contact the manufacturers of this product since the CGSB standard does not include any reference to the product being suitable for use in installation of electrical equipment.
- 2) Upon surveying vapour barrier manufacturers and a raw material supplier (Nova Chemicals) the answer that was provided always referred to the melting point temperature - 6 mil vapour barrier will get soft at 90°C and melting occurs at 105 - 110 °C.
- 3) The preset thermal cutouts integrated into modern recessed luminaires are intended to protect the wiring (also rated at 90° C) would also protect the poly.



Installation with 6 mil CGSB vapour barrier.

- Used the right type of poly – 6 mil CGSB
- Proper application of hanger bars nailed through the poly, installer did not cut holes in the poly with hanger bars through the slits.
- Lots of overlap at all edges for attachment of adjacent sheets.

Issues against using 6 mil vapour barrier compared to Method 1: Addition of a poly sheet also creates a void in the insulation layer. The edges of the poly are never flat and square making it difficult to properly seal the perimeter edges. As well the edges of the poly usually do not end up under a truss so the seal is not compressed by the drywall making it prone to failure over time.

If you would like additional information, e-mail don.bradshaw@airdrie.ca and request the complete research package produced for discussion at the Electrical Inspectors Association (EIAA) and Alberta Building Officials Association (ABOA) conferences held in February and June 2010. This contains more background, information on acceptable labels and how they fit into code, vapour barrier vs air barrier issues and 6 mil vapour barrier temperature suitability.