

## K-FLEX TITAN™ COMPLIANCE WITH FLORIDA RESIDENTIAL CODE REQUIREMENTS FOR INSULATION INSTALLED OUTDOORS

Most jurisdictions within the State of Florida have adopted the 2012 or later version of the Residential Energy Efficiency Code as published in the International Energy Conservation Code (IECC). Provisions regarding protection of piping insulation installed outdoors can be found in section R403.3.1 (2012) or R403.4.1 (2015 and 2018). There is no substantive difference between these requirements. The 2012 code states:

**R403.3.1 Protection of piping insulation.** Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance, and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tapes shall not be allowed.

**K-Flex Titan™:** K-Flex Titan is a flexible, co-extruded jacketing material that is factory applied to K-Flex Insul- Tube pipe insulation. The polymeric jacketing material offers excellent abrasion, weather, and UV resistance while maintaining the insulation's flexibility, which makes it ideal for outdoor application. K-Flex Titan fully complies with the 2012 through 2018 published requirements of the IECC Residential Energy Efficiency Code.

As with all codes, individual jurisdictions (state, county, city / town, etc.) are empowered to modify these code requirements. The modification / amendment and adoption process is usually done through a series of open meetings, and the code, with modifications is published by the authority having jurisdiction (AHJ) and would include an effective date. Another way to modify the adopted code is through a formal or informal code interpretation. This process is part of the administrative provisions, and similar to above, the interpretation would be published (on AHJ letterhead) along with an effective date (which may be immediate).

The wording above is the only wording that has been codified. K-Flex USA has not seen any adopted modifications to the above code provisions, nor have we seen any code interpretations. We are aware that in some jurisdictions, code officials have been presenting the attached flyer as the "code requirements". This flyer is a piece of literature published by a manufacturer of jacketing / insulation materials for the sole purpose of promoting their own products. This flyer is NOT a code provision and in fact misrepresents actual published code requirements. There is no provision in the code language above requiring that a jacket must be removable. It is not stated, it is not implied. It does not exist.

The flyer references Chapter 10 of the ASHRAE Handbook. Neither the Residential Energy Code nor the IECC references this handbook or this chapter. It is NOT a code requirement. We cannot speak for ASHRAE, but as an ASHRAE member of the committee responsible for this chapter of the handbook, we can state that this chapter is specifically targeted to *industrial* refrigeration systems, and does not address residential applications. Further, industrial refrigeration systems commonly utilize fully adhered jacketing over fully adhered vapor barriers. The "intent" of requiring separate, independently applied vapor barriers and protective jacketing was to reinforce the concepts that vapor barriers are not protective jackets, protective jackets are not vapor barriers, and for these systems, *both* are necessary to insure optimum performance as system operating temperatures can be as low as -100°F. Even "removable" jackets such as stainless steel, galvanized, aluminum or PVC are not removable to the extent that they can be reused after they have been removed. If they are removed, they are discarded and replaced. Inspection of these refrigeration insulation systems is accomplished through NDT ports or through non-destructive testing (such as an x-ray or gamma ray process) that does not require the removal of jacketing or insulation.

The author of a code change proposal will state the intent of the proposal. Even if the code change proposal is adopted, it does not mean that the voting members agreed with the *intent*. They agreed with the proposed language. And nowhere in the language is there a requirement that the jacketing be removable. Nowhere.

But we should be able to apply some *logic* to this specific application. Why should the *jacket* be removable? To access the insulation. But if there is a problem with the piping system, it is necessary to remove the *insulation* as well as the jacket. So what is the real benefit of having a removable jacket? In this case, the answer is "none". Let's take



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this one step further. K-Flex Titan has a *clear* jacket. It does not even have to be removed to see if there is a problem with the insulation. Whether a jacket is removable or not, it is the *insulation* that has to be removed in order to access the piping beneath it. And we certainly hope that the authors of this flyer do not intend to promote removable *insulation* on below ambient lines as it is absolutely critical that all seams and terminations are fully sealed to prevent condensation on the piping and possible corrosion.

It just so happens that not only are lines insulated with K-Flex Titan are easy to inspect, but in the event of a problem the insulation is easily removed by cutting it off with a sharp knife and the same insulation / jacketing can usually be reinstalled after the problem is corrected by using contact adhesive to seal all joints. If the jacketing becomes damaged, the jacket *does not have to be removed* to make the necessary repairs. It is a simple matter to repair the jacketing by applying a marine grade sealant over the damaged area or to replace a small section of the insulation. And damage to the K-Flex Titan jacket does not adversely affect the permeability of the insulation as the flexible, closed-cell insulation under that jacket has a lower (better) perm rating than the jacketing. The perm rating of the jacketing complies with the requirements of the 2012, 2015 and 2018 International Mechanical Code (IMC).

**To summarize, removable jackets are not required by the published applicable code provisions and removable jackets offer no real benefits with respect to inspection or repair when compared to K-Flex Titan. K-Flex Titan complies with the published 2012, 2015 and 2018 IMC and IECC code requirements and offers distinct advantages for inspection and repair.**

We are aware that many if not all jurisdictions within the State of Florida have required that insulation installed on outdoor piping to pass a “weed wacker test”. K-Flex USA has been at the forefront when it comes to supporting these code jurisdictions and providing a product, K-Flex Titan that meets this durability requirement. With that said, this *unofficial* code requirement could not be codified for a number of reasons. Here are the basic issues:

1. There is no test method. Test methods are typically developed by independent organizations such as ASTM, ANSI, ULI, FMRC or other organizations with expertise in these areas.
2. The equipment used to conduct this test is not specified. Gas or electric trimmer? Residential or commercial trimmer? What type of string (or blade)? How many RPM?
3. Test parameters are not established. How far is the weed wacker from the test specimen? How many specimens? Horizontal or vertical orientation, or both? What is the test duration?
4. No acceptance criteria have been established. What are the pass / fail criteria? How is performance actually measured?

Since none of the above information has been published, it is not possible to codify this requirement, and if it cannot be codified, it cannot legally be enforced.

The well-meaning intent of the weed wacker provision is to provide a level of insulation durability that prevents the insulation on outdoor residential HVAC equipment from being damaged by casual contact with a weed wacker. But in proposing this requirement, AHJ’s may have overlooked the obvious and unnecessarily complicated code compliance and enforcement. A weed wacker is only used in proximity to these lines because grass and / or weeds are growing. If we were to apply a root cause analysis, the logical and most basic solution to the problem would be to prevent growth of weeds, grass or shrubs within 18 inches of an outdoor HVAC line. No growth means no need for a weed wacker, lawn mower or hedge trimmer. And more importantly, it means *no damaged insulation*. This requirement could be easily codified, would not require a dubious test method, and could be easily complied with and enforced. This requirement could be easily retrofitted. It would *not* eliminate the need for jacketing to comply with the IECC and IMC, but those published requirements are easily complied with and enforced.

In looking more closely at this manufacturer’s advertisement, it is curious that in the bottom of the first column they refer to “2012 IECC Code and Commentary (relevant to 2015, 2018 IECC) Calls for Weather and Physical Damage Protection”. To quote, “This section requires protection for piping in all exposed in (sic) exterior installations. The piping insulation should be protected from sunlight, moisture, wind and solar radiation, but also from personnel who may step on it, run into it with equipment, etc. and cause it to be damaged. Adhesive tape is not permitted to be used, because it will limit maintenance and damage the insulation’s permeability characteristics”.

The focal point should be “protected from *moisture*”. A removable jacket that features a Velcro overlap *cannot protect from moisture*. Even if the *body* of the jacket material meets “**ASTM E96** water vapor permeability (Class II)”, that applies *only to the jacketing material*. The Velcro seam leaks water /moisture and air like a sieve. Do a quick and simple test. Using a piece of jacket, form a seam (this seam will be better quality than anything that will be formed in the field). Next, hold it up to your mouth and try to blow through the seam or suck air through the seam. It is easy *because it is Velcro and Velcro is porous*. Velcro seams are susceptible to possible air, moisture and vermin intrusion. And because the jacket is intentionally *not fully adhered*, there are plenty of gaps between the jacket and insulation for moisture to collect and vermin to thrive. Velcro seams are a bad idea for any application requiring a tight seal.

Although not specifically referenced in this advertisement and not required by the residential codes, potential users (especially multi-family residential and commercial users) should be aware of two other considerations:

1. Some jacketing materials with a Velcro closure system are not ASTM E84 25/50 rated. A 25/50 rating is not required by the IMC for a “weathering jacket”. However, if the jacket is not 25/50 rated, it may not be acceptable for use inside the building envelope on components of an air handling system or in plenum areas.
2. Some jacketing materials with a Velcro closure system are not ULI / ULC listed as Plastic Components per Test Method UL94. This is important for 2 reasons. First, only listed products can be used in ULI / ULC firestop designs. Second, many code jurisdictions require that all *components* of UL Listed HVACR equipment also be UL listed as approved components per UL94. Insulation materials that are not UL listed per UL94 could not be used in conjunction with UL listed equipment.

K-Flex Titan is Listed per UL94 (file E300774) and is ASTM E84 25/50 rated for wall thicknesses up to and including 2 inches.

K-Flex USA thanks you for your consideration. For additional information please contact your K-Flex representative or the K-Flex USA technical support team.

## New Florida Energy Code: Outdoor Refrigerant Pipe Insulation Requirement Protection Must Be Removable for Equipment Maintenance



### Protection

Must Protect from Weather, UV, Equipment Maintenance, Solar Radiation (Heat), Physical Damage, Removable & Reusable

### Must Be Removable

"Must be installed independently and in addition to any factory- or field-applied vapor retarder."

-2017 ASHRAE Handbook

Technical Bulletin

### Energy Code: Pipe Insulation Protection

Residential R403.4.1

Commercial C403.2.10.1

Protection of Piping Insulation: Piping insulation exposed to weather shall be protected from damage, including that due to sunlight, moisture, **Equipment Maintenance**, wind and shall **provide shielding from solar radiation that can cause degradation of the material.** Adhesive tape shall not be permitted.



Damaged Insulation from landscape maintenance

-2015 IECC

### NEW 2017 ASHRAE Handbook Chapter 10. Insulation Systems for Refrigerant Piping

#### Weather Barrier Jacketing

Weather barrier jacketing on insulated pipes and vessels protects the vapor retarder system and insulation from weather, ultraviolet (UV) light and physical abuse. Various plastic and metallic products are available for this purpose.

**"The protective jacketing must be installed independently and in addition to any factory- or field-applied vapor retarder."**

#### IMPORTANT! CODE INTENT

Outdoor pipe insulation protection, an IECC code requirement, was adopted directly from the ASHRAE 90.1 standard, it was proposed and approved to the 2012 IECC, as EC110-90/10 & EC207-09/10 the code language and intent remain unchanged in the 2015, and 2018 IECC.

The intent of the original code change is very clear; it was the harmonization of ASHRAE 90.1 protection with IECC. In the original proposal the Equipment Maintenance requirement was specifically addressed in the author's reason statement.

"All AC units require periodic maintenance. The frequency varies with how hard the unit operates, exterior temperature, preventative maintenance program, and many others. **In every occasion, every maintenance provides an excuse for the Freon line insulation to be touched and removed.**"

The protection must be removable and allow for replacement if the protective cover is damaged. This will protect the pipe insulation's thermal conductivity insuring system efficiency and will reduce cost due to pipe insulation replacement. **Protection must be installed independently of any pipe insulation or line set and in addition to any factory- or field-applied vapor retarder or coating.**

### 2012 IECC Code and Commentary (Relevant to 2015, 2018 IECC) Calls for Weather and Physical Damage Protection

"This section requires protection for piping insulation in all exposed in exterior installations. The piping insulation should be protected from sunlight, moisture, wind and solar radiation, but also from personnel who may step on it, run in to it with equipment, etc., and cause it to be damaged. Adhesive tape is not permitted to be used, because it will limit maintenance and damage the insulation's permeability characteristics..."

### IMPORTANT!

#### International Mechanical Code 1107.7

Exposure of refrigerant pipe joints.

Refrigerant pipe joints erected on the premises **shall be exposed for visual inspection prior to being covered or enclosed.**

#### ...But the insulation says "UV".

UV is only one of the five requirements of this code; manufacturers usually have a limited UV resistance and their installation instruction states that the insulation must be protected when installed outdoors. The Code also requires shielding from solar radiation that causes degradation of the materials-this includes HEAT. Most UV tests do not include HEAT! Heat will even degrade insulation indoors such as attics or garages where there is no UV light.

**Protecting Piping Insulation to Comply with the IECC**  
"As this requirement is not merely concerned with UV resistance, an insulation material that is only listed as "UV retardant" or "UV resistant" **would not comply with these code requirements** and would not be acceptable for use in jurisdictions that have adopted these requirements without additional protection."

K-Flex Technical Bulletin TA88-0616

### IMPORTANT!

#### White Gel Coat May Not Comply

UV protection is limited; its purpose is to protect insulation from tearing during installation. Manufacturer's instructions **still require additional protection if installed outdoors. Protection must be removable & independent of insulation.**



#### Co-Extruded Cover Systems May Not Comply

**Are not removable!**

The Co-extruded insulation or coatings applied directly to the insulation's external surface **may not exceed 0.05 perm**, under Residential Code M1411.5, when tested in accordance with ASTM E 96. **Protection must be removable & independent of insulation.**



#### "Adhesive Tape Shall Not Be Permitted"

Any Adhesive Taping for Protection is not Allowed, Regardless of Dimensions.

"Adhesives tapes are not removable without damaging the insulation."

