

**NIA-TIC-103-24 TYPES OF SEALANTS FOR THERMAL INSULATION**

TYPE	FUNCTION	KEY PROPERTIES FOR SELECTION			
<b>Joint Sealants - Rigid Insulation</b>	<ul style="list-style-type: none"> <li>Used in the butt joints of rigid insulations to seal against water and water vapor ingress where two pieces of rigid insulation come together or terminate against a solid surface.</li> <li>Typically used for below ambient operating systems.</li> <li>Applied to a depth of one inch or more across the entire joint.</li> </ul>	<ul style="list-style-type: none"> <li>Compatibility with insulation type</li> <li>Water vapor permeability in a joint</li> <li>Service temperature at the sealant surface</li> <li>Volume Solids</li> <li>Compatibility with vapor retarders</li> </ul>			
	<b>GRADE</b>	<b>CHEMISTRY TYPE</b>	<b>TYPICAL INSULATIONS</b>	<b>TYPICAL SEALANT EXPOSURE TEMPERATURE RANGE*</b>	
	<b>Non-Curing / Non-Setting</b>	<ul style="list-style-type: none"> <li>Sealants that do not set firm to create an adhesive bond of the insulation. They remain pliable and pasty or fluid in the joint.</li> <li>Removal of the insulation will not result in breaking the insulation.</li> <li>Banding, taping or other mechanical fastening is required to secure insulation.</li> </ul>	Butyl Rubber Based	PIR, PUR, Phenolic, Cellular Glass, other solvent compatible rigid types	-261 F to + 200F (-163 C to 93 C)
	<b>Reactive Cure Adhesive / Sealant</b>	<ul style="list-style-type: none"> <li>Multi-component, reactive cure adhesives that permanently bond insulation to itself or other surfaces</li> <li>also act as a sealant when used in the joints of insulation.</li> <li>Removal of the insulation will result in breakage.</li> <li>Applied where the insulation must be permanently held to the adjacent surface or where banding or mechanical fastening is not to be used.</li> <li>Typically solvent free and &gt;95% non-volatile</li> </ul>	Polyurethane (2 component)	Polystyrene, PIR, PUR, Phenolic, Cellular Glass**	-300 F to 200 F (-180 C to 93 C)
			Epoxy (3 component)	Cellular Glass**	-320 F to 250 F (-196C to 120 C)
TYPE	FUNCTION	KEY PROPERTIES FOR SELECTION			
<b>Flashing Sealants</b>	<ul style="list-style-type: none"> <li>Seal protrusions and breaks in the insulation system against water and water vapor ingress</li> <li>Used on the exterior of insulation system to seal between the insulation surface and protrusions such as supports, valves and fittings</li> <li>Also for sealing joints and overlaps in metal jacketing.</li> <li>Vapor barrier and water intrusion sealant.</li> </ul>	<ul style="list-style-type: none"> <li>Compatibility with insulation type and adjacent substrate</li> <li>Water vapor permeance of the sealant film</li> <li>Service temperature at the sealant surface</li> <li>Weather and UV resistance</li> <li>Flammability of the sealant – Wet Sealant</li> <li>Fire Resistance – Flame Spread dry sealant</li> </ul>			
	<b>GRADE</b>	<b>CHEMISTRY TYPE</b>	<b>TYPICAL INSULATIONS</b>	<b>TYPICAL SEALANT EXPOSURE TEMPERATURE RANGE*</b>	
	<b>Solvent Based</b>	<ul style="list-style-type: none"> <li>Used with below ambient operating systems to provide a seal against water and water vapor ingress</li> <li>Low water vapor permeance (&lt; 0.03 perms by ASTM E96, Method A)</li> <li>Weather and UV resistance</li> <li>Dry to create a permanently flexible, maleable film</li> <li>Fire Resistance – Flame Spread (&lt;25 by ASTM E84)</li> <li>Also for sealing metal jacketing</li> </ul>	Butyl Rubber Based	PIR, PUR, Phenolic, Cellular Glass, aerogel, rubber foam, faced fibrous insulation and other solvent compatible rigid types	- 67 F to + 250 F (-55 C to 120 C)
	<b>Oil Based</b>	<ul style="list-style-type: none"> <li>Low VOC sealant where required for interior uses</li> <li>Used with polystyrene insulation for flashing and joint sealing</li> <li>Low water vapor permeance (&lt; 0.1 perms by ASTM E96, Method A)</li> <li>Dry to create a pasty film with reinforcement</li> </ul>	Oil Based	Polystyrene, PIR, PUR, Phenolic, Cellular Glass, aerogel, rubber foam; faced fibrous insulation	-40 F to 300 F (-40 C to 150 C)
	<b>Silicone Sealants—RTV</b>	<ul style="list-style-type: none"> <li>Used on above ambient operating systems or where the surface temperature at the sealant surface will be hot (up to 600 F (315 C))</li> <li>Used with polystyrene insulation for flashing and sealing</li> <li>Water vapor permeance &gt; 0.5 perms – non-vapor retarder</li> <li>Service temperature range:</li> <li>100% Silicone, RTV Curing Sealants</li> <li>+/- 25% Joint Movement (ASTM C920)</li> </ul>	Silicone	Polystyrene, PIR, PUR, Phenolic, Cellular Glass, aerogel, rubber foam, faced fibrous insulation	Standard: -40 F to + 300 F (-40 C to 150 C) High Temperature: -40 F to + 600 F (-40 C to 315 C)

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<b>Vapor Stop Sealants</b>	<ul style="list-style-type: none"> <li>• Create a vapor stop or vapor dam to isolate adjacent sections of insulation from each other and prevent water vapor migration within the insulation system</li> <li>• Applied in a continuous film to seal from the surface of the pipe over the butt ends of insulation to the outer surface</li> <li>• Applied at pipe supports, flanges, valves, T's, terminations, maintenance areas and at regular intervals along the pipe</li> <li>• Used on cold and cryogenic insulation systems</li> </ul>	<ul style="list-style-type: none"> <li>• Compatibility with insulation type</li> <li>• Water vapor permeance of the film</li> <li>• Service temperature at the sealant surface</li> <li>• Leachable halide content (ASTM C871)</li> <li>• Flammability of the sealant – Wet Sealant</li> </ul>			
	<b>GRADE</b>	<b>CHEMISTRY TYPE</b>	<b>TYPICAL INSULATIONS</b>	<b>TYPICAL SEALANT EXPOSURE TEMPERATURE RANGE*</b>	
	<b>Solvent Based Sealant/ Coatings—Cryogenic Service</b>	<ul style="list-style-type: none"> <li>• Cryogenic insulation systems where the vapor stop is most critical</li> <li>• One or two component butyl rubber based sealants with service temperature ranges from -320°F to 250°F (-196°C to 121°C)</li> <li>• Form a monolithic thin film from the pipe to outer insulation surface</li> <li>• Always applied with mesh reinforcement. Film must be applied and allowed to dry before being covered by adjacent insulation.</li> <li>• Very low water vapor permeance (&lt;0.02 perms by ASTM E96, Method A)</li> <li>• Halogen free formulation used with stainless steel piping (&lt;90 ppm Cl-, ASTM C871)</li> </ul>	Butyl Rubber Based	PIR, PUR, phenolic, cellular glass, rubber foam, faced aerogel blanket	-320 F to 250 F (-196C to 120 C)
	<b>Mastics and Coatings—Chilled water and Cold Systems</b>	<ul style="list-style-type: none"> <li>• Cold, below ambient systems to 0F (-18C) such as chilled water, glycol, brine and other moderately cold systems</li> <li>• Low water vapor permeance (&lt; 0.05 perms by ASTM E96, Method A)</li> <li>• Exposure temperature range of the coating to cover the operating temperature of the system</li> <li>• Applied in a reinforced film from the pipe to the outer surface. Typically used with fibrous insulation with installed vapor retarder jacketing</li> </ul>	Waterbased vapor retarder coatings	Faced fibrous insulations, faced aerogel blanket, polystyrene, PIR, PUR, phenolic, cellular glass, rubber foam,	0 F to 200 F (-18 C to 93 C)
	<b>Joint Sealants—Rigid Insulation on Cold and Cryogenic Systems</b>	<ul style="list-style-type: none"> <li>• Create a "vapor dam" by embedding the insulation in a joint sealant between the bore and the pipe and sealing all joints.</li> <li>• Sealant is applied minimum three inches (75 mm) back from the end of the insulation and to the butt joints of the insulation from the pipe to the outer surface.</li> <li>• Confirm compatibility of insulation type and the sealant and the service temperature range</li> <li>• Typical with polystyrene insulation to -40F (-40C)</li> </ul>	Oil Based	Polystyrene, PIR, PUR, phenolic, cellular glass,	-100 F to 300 F (-73 C to 150 C)
		Butyl Rubber Based	PIR, PUR, phenolic, cellular glass	-100 F to 200 F (-73 C to 93 C)	
<p>* Temperature range that the sealant itself is exposed to in operation. The operating temperature of the system may be higher or lower where sealants are used on outer layers or on the surface of the insulation. Always refer to the manufacturers product data sheet for suggested exposure temperature ranges.</p>					
<p>** For cryogenic service temperatures &lt; -105 C refer to manufacturer's product data sheets for suitable exposure temperature ranges with cellular glass insulation</p>					
<p>*** For vapor stops, where the sealant is in direct contact with the pipe, tank or equipment, the exposure temperature of the sealant must match the service temperature range of the system.</p>					