

TRADE OF
Industrial Insulation

PHASE 2

Module 4

Insulation – Materials, Science and Application

UNIT: 10

Nitrile Rubber

Produced by

S O L A S

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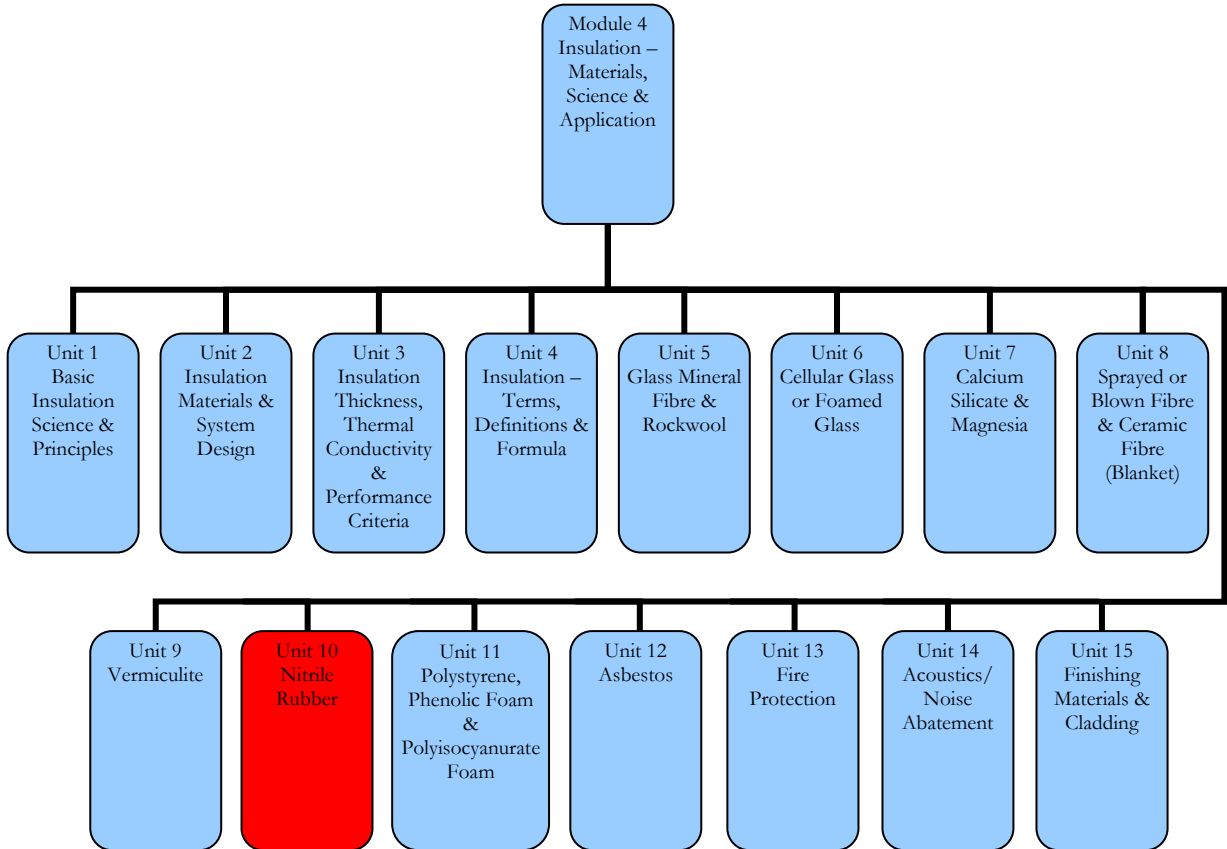
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Introduction

Nitrile rubber insulation is a very versatile and flexible insulation. It is widely used the Industrial insulation, air-conditioning, plumbing and Hvac industries. It is a closed cell elastomeric insulation and is resistant to water vapour, oil and most acids. Because of its flexibility it is ideal for insulating vessels, curved or irregular shapes.



Unit Objective

By the end of this unit *each apprentice* will be able to:

- List and describe the properties, uses and applications of nitrile rubber.
- Identify expanded nitrile rubber forms.
- Demonstrate the safe handling of this material.

1.0 Nitrile Rubber or Acrylonitrile Butadiene Rubber

Key Learning Points

- Material composition of nitrile rubber.
- Identification of nitrile rubber materials.
- Applications of nitrile rubber: resistance to mineral oils, vegetable oils and many acids.
- Cost limitations.
- Chemical name /designation: Acrylonitrile butadiene rubber.
- Thickness and density range.
- Service temperature range.
- Reaction to fire of nitrile rubber.

1.1 Product Composition and Characteristics

Nitrile rubber (Armaflex) is a versatile and flexible closed cell elastomeric insulation suitable for applications up to an approximate maximum continuous operating temperature of 105°C.



Nitrile rubber materials.

Elastomeric products are commonly based on a blend of poly vinyl chloride (pvc) and nitrile butadiene rubber (nbr) using a chemical blowing agent. The basic processing steps in manufacturing the product are mixing, extrusion, or shaping or heating. During the heating step, the elastomeric portion is crosslinked, or vulcanized, and the chemical blowing agent decomposes to produce primarily nitrogen gas.

1.2 Properties, Uses and Applications of Nitrile Rubber

Properties

- Elastomeric products offer excellent flexibility.
- Resistant to water vapour.
- Resistant to thermal transmittance properties.
- Oil and acid resistant (refer to manufacturer's data sheets before installation).
- Excellent adhesive and coating receptiveness.
- Good cutting characteristics and easy to fabricate.

Proper installation is critical to the insulation system's performance.

Uses

Elastomeric insulation or nitrile rubber products are used to prevent condensation on refrigeration copper piping, heating and ventilation pipe work and air-conditioning pipe work. Within its stated temperature range, there are few restrictions which would prohibit the use of this product with proper installation techniques. It can be used on hot and cold plumbing pipes and also as an insulation blanket on ductwork.

Applications

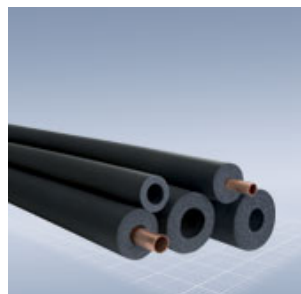
- Refrigeration pipe work, heating and ventilation pipe work, air-conditioning pipe work.
- Heating and ventilation ductwork systems.
- Vessels and curved or irregular surfaces.

Refer to Armaflex manufacturer's brochures for further details

1.3 Thickness and Density Range

- Armaflex pipe insulation: 10, 13, 19, 25 and 38mm
- Armaflex sheet insulation: 3, 6, 10, 13, 19, 25, 38 and 50mm.
- Armaflex roll insulation: 10, 13, 19, 25, 38 and 50mm.

The typical density range is 50kg/m³ to 100kg/m³ depending on the choice of product.



1.4 Service Temperature Range

Typical temperature range of elastomeric / nitrile rubber (Armaflex) is 105°C (upper limits) and -57°C (lower limits). Armaflex also recommends a temperature usage range for AP Armaflex pipe, sheet and roll insulation from -183°C to +105°C depending on the method of application. For applications of -40°C to -183°C it is advisable to contact the manufacturers. At temperatures below -29°C, elastomeric insulation starts to become less flexible. However, this characteristic does not affect the thermal efficiency and resistance to water vapour permeability of Armaflex insulation.

1.5 Fire Characteristics

Nitrile rubber will not contribute significantly to fire and in certain circumstances is self-extinguishing.

2.0 Cutting and Application

Key Learning Points

- Cutting and application of nitrile rubber.
- Compatible adhesives.
- Available forms of nitrile rubber.
- Typical uses and applications.
- Cost limitations.

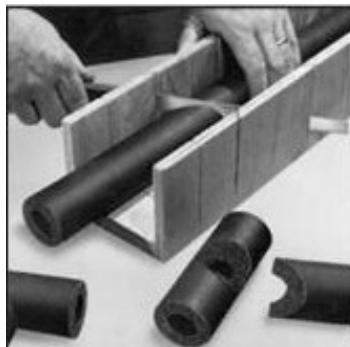
2.1 Rules for Working with Nitrile Rubber (Armaflex)

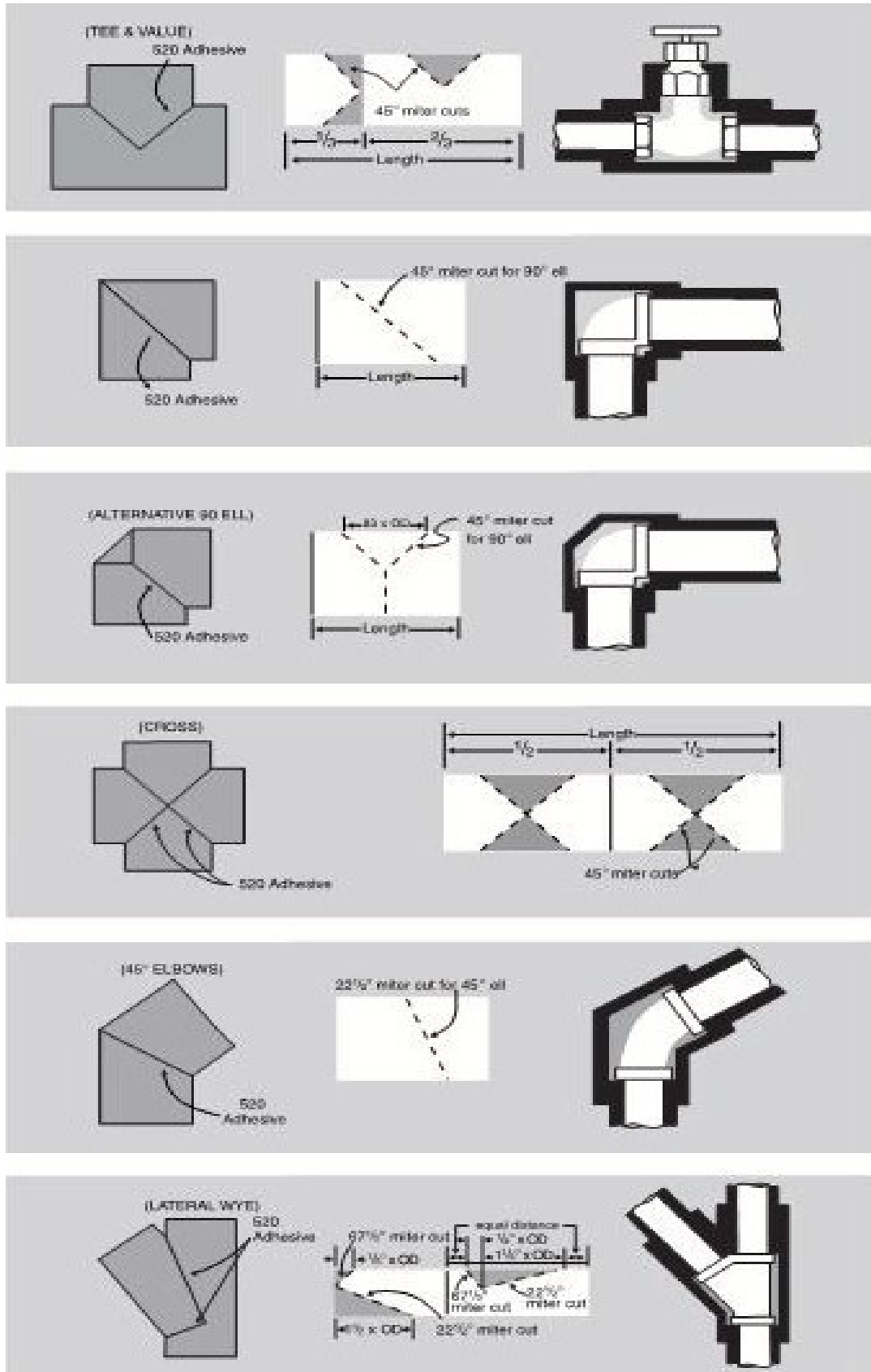
- Use good quality tools, in particular a sharp knife, fresh Armaflex adhesive and a good brush.
- Oval tubes should always be split on the flat side.
- Use clean Armaflex material – with no dust, dirt, oil or water on the surface, if the material is dirty clean before use.
- Use the right dimensions.
- Never pull glued joints when sealing them, always push the joints together.
- Never insulate plants and systems that are in operation. Plant and equipment that has been insulated can be restarted 36 hours later as this is the length of time it takes for the adhesive to fully cure.

2.2 Cutting Nitrile Rubber

Refer to module 1- unit 10 – section 4 – application of insulation material to pipe work.

- Use a sharp, non-serrated edge knife. Note the long knife length in the photo.
- On smaller pieces of Armaflex pipe insulation, brace the piece to be cut with your hand as illustrated. This will insure a clean and accurate cut.
- The illustrations below show sleeve-type fitting covers. The same fabrication steps may be used for copper tube fittings.





2.3 Nitrile Rubber Forms

Refer to section 1.0 above.

Please refer to your insulation supplier regarding the cost of nitrile rubber insulation and adhesives.

2.4 Compatible Adhesives

Armaflex® 520 Adhesive is an air-drying contact adhesive that is excellent for joining seams and butt joints of Armaflex Pipe and Sheet Insulations for line temperatures up to 250°F (120°C). The adhesive may also be used to apply Armaflex Sheet Insulation to flat or curved metal surfaces that will operate at temperatures up to 180°F (82°C).

520 Adhesive will make a resilient and heat-resistant bond with many materials where the use of a solvent-base neoprene contact adhesive is suitable and desirable.

It will make a strong resilient bond for sealing laminated aluminum foil and vapor-retarder jackets.

Application

Mix well and apply only to clean, dry, oil-free surfaces. For best results, the adhesive should be brush-applied in a thin, uniform coat to both bonding surfaces. Allow the adhesive to tack prior to joining both surfaces. Avoid open time of more than 10 minutes. 520 Adhesive bonds instantly, so pieces must be positioned accurately as contact is made. Moderate pressure should then be applied to the entire bonding area to insure complete contact.

It is recommended that the adhesive be applied at temperatures above 4°C and not on heated surfaces. Where application between 0°C and 4°C cannot be avoided, exercise more care in applying the adhesive and closing the joint. Applications below 0°C are not recommended.

Where lines and tanks that are insulated and will operate at hot temperatures, 520 Adhesive must cure a minimum of 36 hours at room temperature to attain heat resistance for insulated pipe to 120°C and insulated tanks and equipment to 82°C.

Adhesive-bonded seams and joints of Armaflex Pipe Insulation must cure before finishes are applied. Where the insulation is installed by adhering seams and butt joints, the adhesive must cure 24 to 36 hours.

Adhesive-bonded seams and joints of Armaflex Sheet Insulation must cure before finishes are applied. Where the insulation is installed by adhering seams and butt joints only, the adhesive must cure 24 to 36 hours. Where the insulation is installed against surfaces with full adhesive coverage, requiring wet adhesive at joints, the adhesive must cure seven days. Thinning is not recommended. Most lacquer thinners can be used to clean fresh residue from tools and work pieces.

3.0 Health and Safety

Key Learning Points

- Hazard associated with this material.

3.1 Health Risks Associated with Nitrile Rubber Insulation

- Inhalation: Inhalation of dust may cause irritation to the upper airways.
- Ingestion: Exposure to dust can irritate mucous membranes and respiratory tract.
- Skin: Exposure to dust may irritate the skin and cause reddening.
- Eyes: Exposure to dust may cause eye irritation.

3.2 Handling and Storage

When using nitrile rubber insulation products, provide general or local ventilation systems as needed, to maintain airborne dust concentrations below the regulatory limits. Local vacuum collection systems are preferred since it prevents the release of contaminants into the work area by controlling it at source.

- Handling: Avoid generation of dust. Wash hands before eating, drinking, smoking or using the toilet.
- Storage: If storing for long periods, protect the product from the weather.
- Hands: Wear gloves – rubber or plastic gloves are recommended.
- Eye protection: Wear safety glasses with side shields or dust goggles.
- Ventilation: Use local exhaust ventilation when handling materials.
- Work area: Keep the work area clean at all times to avoid trip hazards due to materials left on the floor. Develop a positive attitude towards working with insulation products and know the risks involved.
- Information: Always refer to the manufacturer's data sheets for information on health and safety and precautions required when using the product.

3.3 Handling Adhesives

Hazards

- Excessive skin contact may cause drying and cracking of the skin and result in dermatitis.
- Contact with the eyes will cause irritation.
- Inhalation may cause irritation of the respiratory track, coughing, headache, dizziness and nausea may occur.

Safe handling

- Extremely flammable vapours may ignite explosively or cause flash fire. Use ventilation to prevent the accumulation of solvent vapours.
- With adequate ventilation respiratory protection should not be needed. If proper ventilation is not afforded, wear respiratory equipment approved for organic vapours.
- Wear protective gloves and eye goggles when using adhesive products.

Storage

- Store adhesives in an area suitable for flammable products.
- The recommended storage temperature for Armaflex 520 adhesive is 90°F.
- Use ventilation to prevent the accumulation of solvent vapours, keeping in mind that the ventilation pattern must remove the heavier than air solvent vapours.

3.4 Product Information

Always refer to the manufacturer's data sheets before using nitrile rubber or other insulation materials. These data sheets provide the relevant information required to use the products in a safe manner.

Summary

Nitrile rubber (Armaflex) is a versatile and flexible closed cell elastomeric insulation. It is resistant to water vapour, oil and most acids. It has excellent adhesive receptiveness and it is easily cut and fabricate. Its maximum operating temperature is 105 °C, which makes it ideal for insulating hot/cold water pipes, air-conditioning pipe work and in blanket form is used to insulate ventilation ductwork. Nitrile rubber will not contribute significantly to fire and in certain circumstances is self-extinguishing. It is available in pipe-sections, rolls and in sheet forms.

- Elastomeric products offer excellent flexibility.
- Resistant to water vapour.
- Resistant to thermal transmittance properties.
- Oil and acid resistant (refer to manufacturer's data sheets before installation).
- Excellent adhesive and coating receptiveness.
- Good cutting characteristics and easy to fabricate.

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