Guide

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# A Guide to Rubber Sheetings

# Executive Summary

This Guide provides those within conversion, engineering and manufacturing industries a clear insight into the Rubber Sheetings process and applications.

Whatever your specialised sheeting needs, J-Flex can help you based on our decades of experience in rubber sealing solutions.

# Sheet Production

Let us focus on the two most important pieces of equipment involved in Rubber Sheet production.

## Calender

Let's take a look at the calender. The word "calender" is derived from the Greek word "kylindros", which is also the source of the word "cylinder". Note the spelling too - calender, not calendar.

The calender is a large, heavy machine used to produce accurately controlled sheet material of two types:

a) Rubber Sheeting of uniform width and thickness, free from blemishes.

b) Rubberised fabrics coated by rubber compound.

The Rubber Sheeting is produced by passing a pre-warmed rubber compound into the top nip* of the calender. The rubber then adheres to the middle roll before being finally shaped to the thickness required at the second nip. The finished sheet is then taken away on a belt or conveyor to be rolled up in a liner material. A liner is required to prevent the rubber sticking to itself or losing tack.

## Rotacure

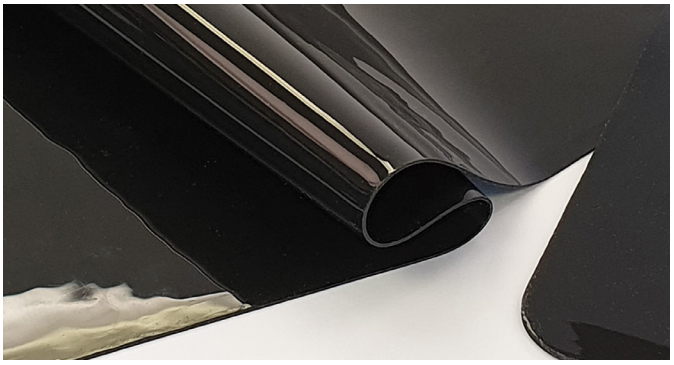
The rotacure can continuously vulcanise rubber products such as sheeting, belting and matting. This machine cures the rubber by passing it around an oil- heated curing drum. The product can also be pressurised to give better surface finish.

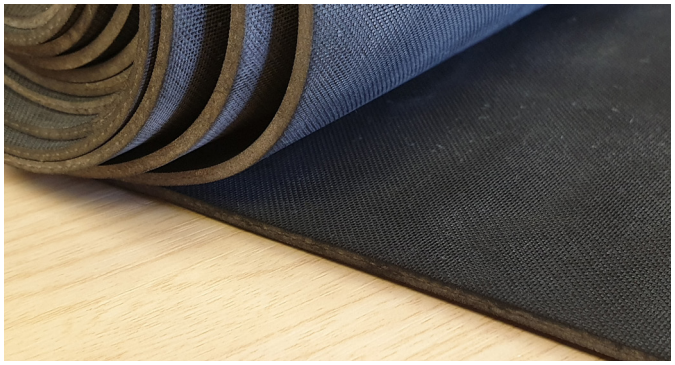
* The word 'nip' refers to the distance between adjacent rolls on a calender.

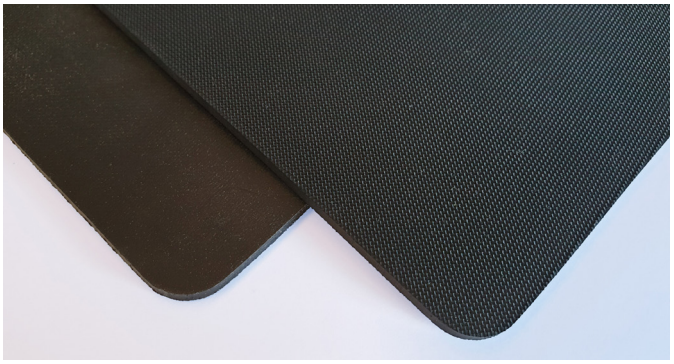
# Rubber Sheetings - Materials

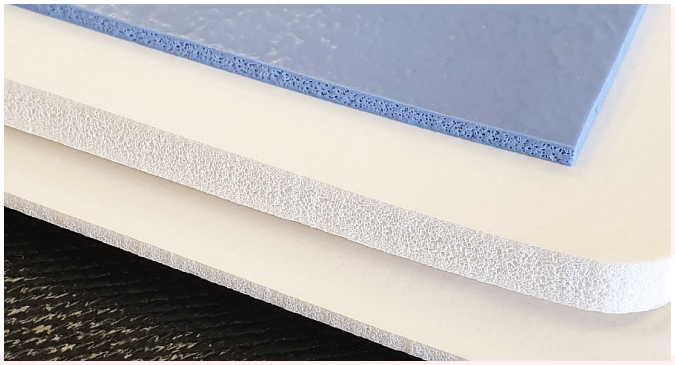
Rubber Sheetings can be manufactured in a wide range of natural and synthetic rubbers. At J-Flex we are only concerned with premium grade materials, majoring on Silicone, Viton™, FKM, EPDM + diaphragm, thin gauge and moulded sheets.

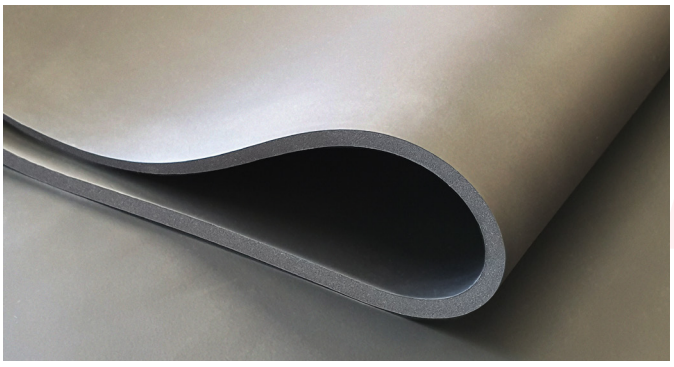
Which material or polymer is best for your application depends on the environment that the material is going to be subjected to. For example, UV, weathering, temperature extremes, solvent resistance, abrasion and resilience will affect the type of material that would be best for a particular application.











# Physical Properties - An Explanation

The principle physical properties applied to Rubber Sheetings and how they are measured are detailed below.

| Property | Method of Measurement | ISO Reference | ASTM Reference | BS Reference |
|---|---|---|---|---|
| Hardness | Measured in degrees and based on the penetration into the rubber of a defined indetor under a set load. Three scales are commonly used: IRHD (International Rubber Hardness Degrees), Shore A, and Shore D for hard materials over 90° Shore A. IRHD is preferred for most specifications but Shore A is also in widespread use. | ISO 48 | D2240<br>D1415 | BS 903<br>(Part A26) |
| Density<br>(Specific Gravity) | Density is defined as the mass per unit volume and is measured by weighing the rubber sample in air and water.<br>$S.G = \frac{\text{weight in air}}{\text{weight in air} - \text{weight in water}}$ | ISO 2781 | - | BS 903<br>(Part A1) |
| Tensile Strength | This is measured in various units and is expressed as a force per unit area. A standard dumbbell type test piece of unknown cross sectional area is used which is stretched until it breaks. The force required to do so is then recorded and expressed as force per unit area. | ISO 37 | D412 | BS 903<br>(Part A2) |
| Elongation | Elongation is defined as the length at breaking point expressed as a percentage of its original length (i.e. length at rest) e.g. if a rubber reaches twice its length before breaking its elongation is 100%. | ISO 2285 | D412 | BS 903<br>(Part A2) |
| Compression Set | A cylindrical button of rubber of known thickness is compressed to a fixed height (typically 70% or 75% of its original height) at a defined temperature for a specified period of time. The button is then released, allowed to recover (typically for 30 mins) and the thickness is measured. Compression Set is the height that is not recovered expressed as a percentage of the amount by which it was compressed.<br>$\%\ \text{Comp. Set} = \frac{\text{original height - recovered height}}{\text{original height - compressed height}} \times 100$ | ISO 815<br>(Part 1 & 2) | D395 | BS 903<br>(Part A6) |

# Widths, Lengths, Thicknesses, Tolerances & Weights

## Silicone Rubber Sheet

| Thickness (mm) /Tolerance | Standard Roll Width (mm) | Standard Roll Length (m) | Weight per/sqm (kg) | Weight per/roll (kg) |
|---|---|---|---|---|
| 0.3 (+/- 0.20) | 1200 | 10 | 0.70 | 8.4 |
| 0.5 (+/- 0.20) | 1200 | 10 | 0.75 | 9 |
| 0.8 (+/- 0.20) | 1200 | 10 | 1.00 | 12 |
| 1.0 (+/- 0.20) | 1200 | 10 | 1.25 | 15 |
| 1.5 (+/- 0.25) | 1200 | 10 | 1.88 | 23 |
| 2.0 (+/- 0.35) | 1200 | 10 | 2.50 | 30 |
| 3.0 (+/- 0.40) | 1200 | 10 | 3.75 | 45 |
| 4.0 (+/- 0.40) | 1200 | 10 | 5.00 | 60 |
| 5.0 (+/- 0.50) | 1200 | 10 | 6.25 | 75 |
| 6.0 (+/- 0.50) | 1200 | 10 | 7.50 | 90 |
| 8.0 (+/- 0.70) | 1200 | 5 | 10.00 | 60 |
| 10.0 (+/- 0.70) | 1200 | 5 | 12.50 | 75 |
| 12.0 (+/- 0.80) | 1200 | 5 | 15.00 | 90 |
| 15.0 (+/- 0.80) | 1200 | 2 | 18.75 | 45 |
| 20.0 (+/- 5%) | 1000 | 1 | 25.00 | 25 |

## Silicone Sponge Sheet (Standard Density)

| Thickness (mm) /Tolerance | Standard Roll Width (mm) | Standard Roll Length (m) | Weight per/sqm (kg) | Weight per/roll (kg) |
|---|---|---|---|---|
| 1.5 (+/- 0.50) | 1000 | 10 | 1.25 | 12.5 |
| 2 (+/- 0.50) | 1000 | 10 | 1.55 | 15.5 |
| 3 (+/- 0.50) | 1000 | 10 | 1.70 | 17 |
| 4 (+/- 0.50) | 1000 | 10 | 1.90 | 19 |
| 5 (+/- 0.50) | 1000 | 10 | 1.95 | 19.5 |
| 6 (+/- 0.50) | 1000 | 10 | 2.10 | 21 |
| 8 (+/- 0.8) | 1000 | 10 | 2.50 | 25 |
| 10 (+/- 0.8) | 1000 | 10 | 2.90 | 29 |
| 12 (+/- 1.50) | 1000 | 10 | 3.60 | 36 |
| 16 (+/- 1.50) * | 1000 x 600 | n/a | n/a | 2.5 (per sheet) |
| 20 (+/- 2.00) * | 1000 x 600 | n/a | n/a | 3.0 (per sheet) |
| 25 (+/- 2.50) * | 1000 x 600 | n/a | n/a | 3.7 (per sheet) |

* = available in sheet form

## Viton™/Fluor-A-Com® FKM Rubber Sheet

| Thickness (mm) | Tolerances - **Viton™** | Tolerances - **Fluor-A-Com®** |
|---|---|---|
| 0.5 | - | 0.2 |
| 1.0 | 0.3 | 0.2 |
| 1.5 | 0.3 | 0.2 |
| 2.0 | 0.3 | 0.2 |
| 3.0 | 0.3 | 0.3 |
| 4.0 | 0.4 | 0.3 |
| 5.0 | 0.4 | 0.4 |
| 6.0 | 0.5 | 0.4 |
| 8.0 | 0.7 | 0.5 |
| 10.0 | 1.0 | 0.5 |
| 12.0 * | - | 0.6 |
| 15.0 * | - | 0.6 |
| 20.0 * | - | 0.6 |
| 25.0 * | - | 0.6 |

* = available in sheet form

**Viton™** available in 1400mm width.
**Fluor-A-Com®** available in 1000 to 1500mm widths.

*Note: Widths can vary depending upon your requirements and currently J-Flex Rubber Products offer many sheetings in widths ranging from 1000mm, 1200mm, 1400mm and 2000mm. Disclaimer: This information is offered as a guide only. Some sheet producers' materials may alter depending upon the quality of the base material which affects the specific weight. We recommend all materials are tested and approved for application by you and your customer.*

# Special Properties

Apart from the standard material grades, there are a number of sheet products offering special properties including:

- Abrasion Resistance
- Electrical Insulation
- Electrical Conductivity
- Anti-Static
- Flame Resistance
- Food
- Pharmaceutical
- Drinking Water
- Low Temperature
- Ozone

It is important that you specify tangible requirements to ensure you receive the best sheeting solution for your application.

Many specifications exist including; FDA, WRAS, ASTM, SAE, British and European Standards - ensure you know what you're buying.

# Surface Finish

Rubber Sheeting can be vulcanised in a number of ways, depending on the polymer, formulation used, width, thickness and the finish desired.

1. **a) Smooth Finish Sheeting**

   This finish is obtained by vulcanising on a rotacure, heat tunnel or flat press.

   **b) Fabric Impression Sheeting**

   This finish is obtained by interleaving the calendered rubber sheeting with a woven fabric prior to vulcanisation.

The woven fabric used is normally either cotton or nylon type and an impression of the fabric is imparted to the rubber surface during vulcanisation.

2. **Visual Characteristics of Sheeting**

All sheetings will possess a finish which is commercially acceptable, i.e. the surface may contain marks or irregularities provided that these would not materially affect the performance of the sheeting.

Some manufacturing faults could result in failure or affect the working life of the sheet. Sheeting must, therefore, be supplied with no more than three such faults in an area of $3m^2$.

# Storage of Rubber Sheeting

Vulcanised rubber products should be stored in clean, dry conditions within the temperature range of 5 to 30°C. They should not be subject to excessively high or low humidity.

If store temperatures fall below 0°C, products should be conditioned at ambient temperature for 24 hours before use.

Exposure to direct or reflected sunlight, ozone producing machinery, oils, solvents, corrosive liquids and fumes, rodents, insects and vermin must be avoided.

Products should be stored on a firm even surface free from mechanical stress and deformation.

It is recommended in accordance with best warehousing practice that goods in long term storage should be checked periodically to verify their condition.

See also ISO 2230:
Vulcanised Rubber - Guide to Storage.
https://www.iso.org/standard/35946.html

## About J-Flex

**J-Flex is a leading UK elastomer solutions provider.**

Solutions include high performance elastomer sheetings for gasket conversion and lamination applications plus manufactured elastomer components such as: mouldings, extrusions, bellows, seals, sleeves and expansion joints.

Established in 1984 we are a family-run business with over 200 years of combined industry experience. We are experts in industrial rubber product manufacture and supply, and have a real passion for helping our customers by finding the best solutions - we're already doing this for over 2,000 customers and we regularly export to over 55 countries.

At J-Flex, we are efficient and professional in everything we do. If you are looking for product availability, reliability and a timely response to your requests, we deliver every time.

Check out our website **www.j-flex.com** for product information, data sheets and more.

## About the Author

John Kirk set up J-Flex in 1984 and is the Chairman of J-Flex. As an industry veteran, with over 45 years' experience in the rubber industry, John relishes the opportunity to help customers with solutions to their industrial rubber engineering challenges.

Having travelled worldwide on a regular basis, John is able to tap into his extensive network of contacts to drive the J-Flex business forward to the benefit of customers.

With a strong customer focus, John is also keen to develop new products to meet customer requirements.

John is eager to ensure the rubber industry as a whole meets the quality standard customers expect which is one of the reasons for writing this Guide.

RISQS Supplier Qualification Scheme

CYBER ESSENTIALS

**Accreditations | Product Testing | Quality**

- Accredited to BS EN ISO 9001: 2015.
- Members of the official Chemours Viton™ Licensee Programme.
- We hold Cyber Essential certification.

We ensure where appropriate that our products are tested and approved by the relevant authorities and will provide relevant certifications on request.

For further information please visit our web page:
www.j-flex.com/quality-assurance/

bsi. ISO 9001:2015 Quality Management
Certificate No. RS 27920

Viton™
Partner of Viton,™ a Brand of the Chemours Company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