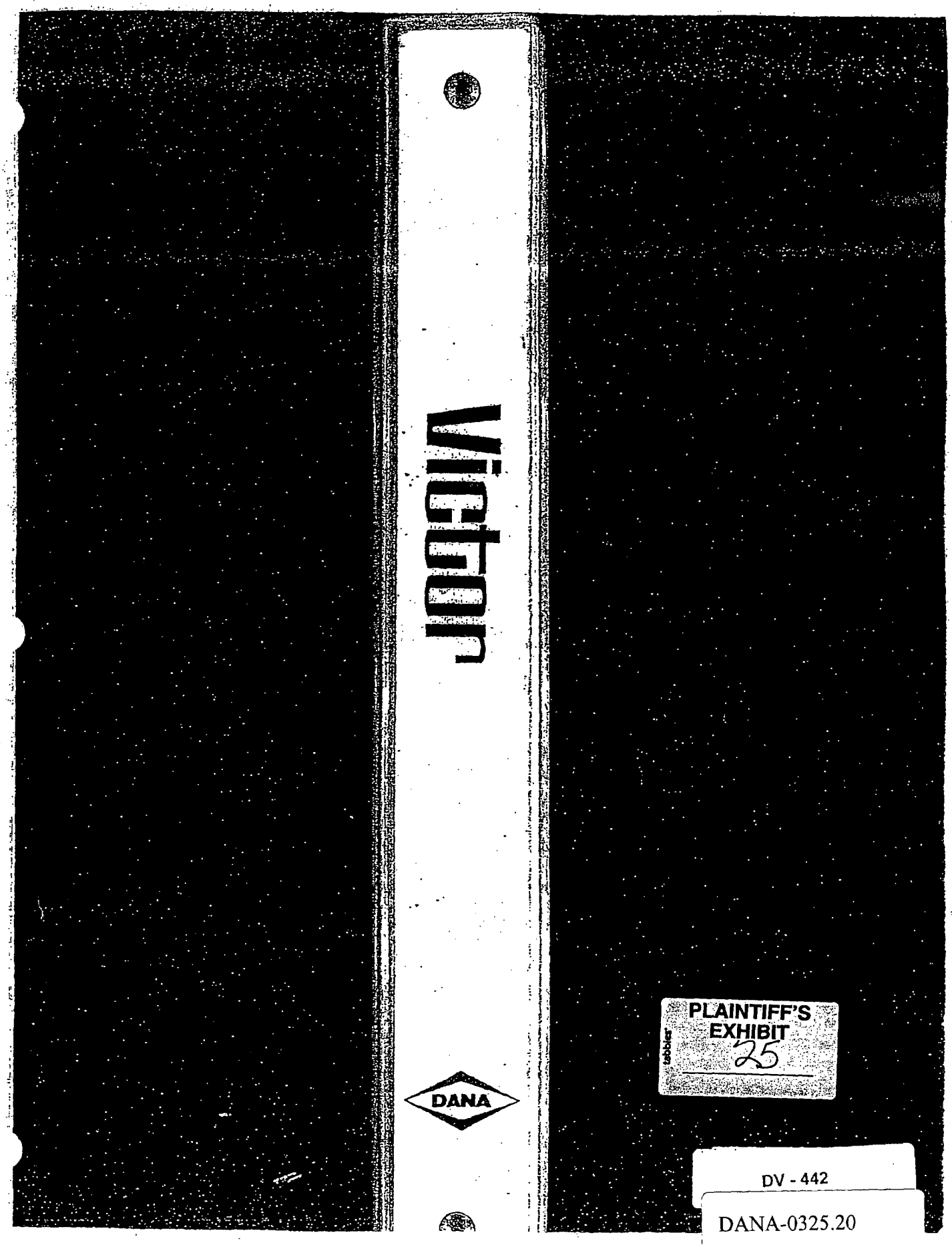
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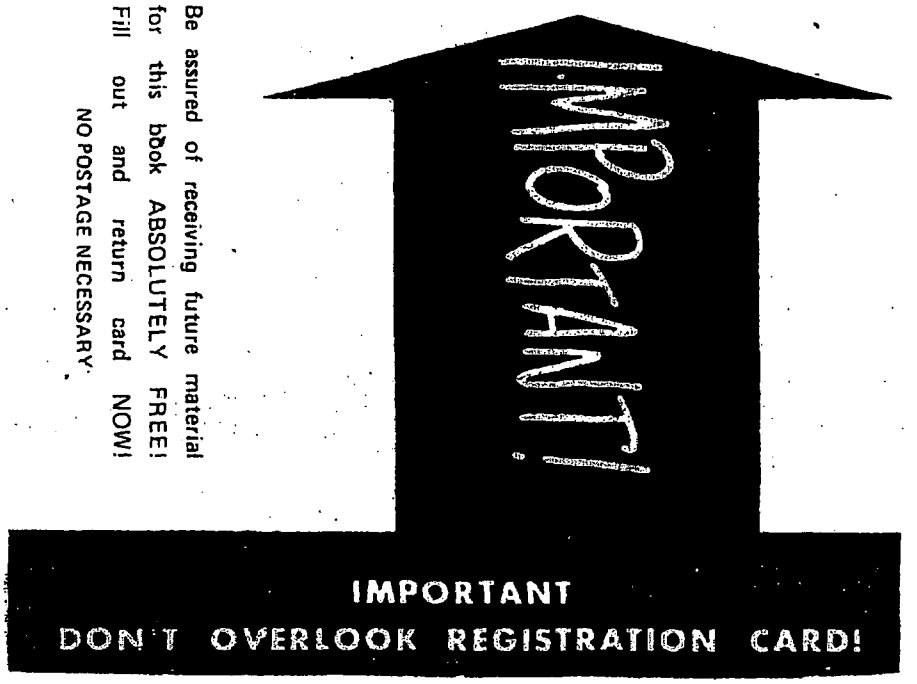

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# VICTOR IS INTERNATIONAL

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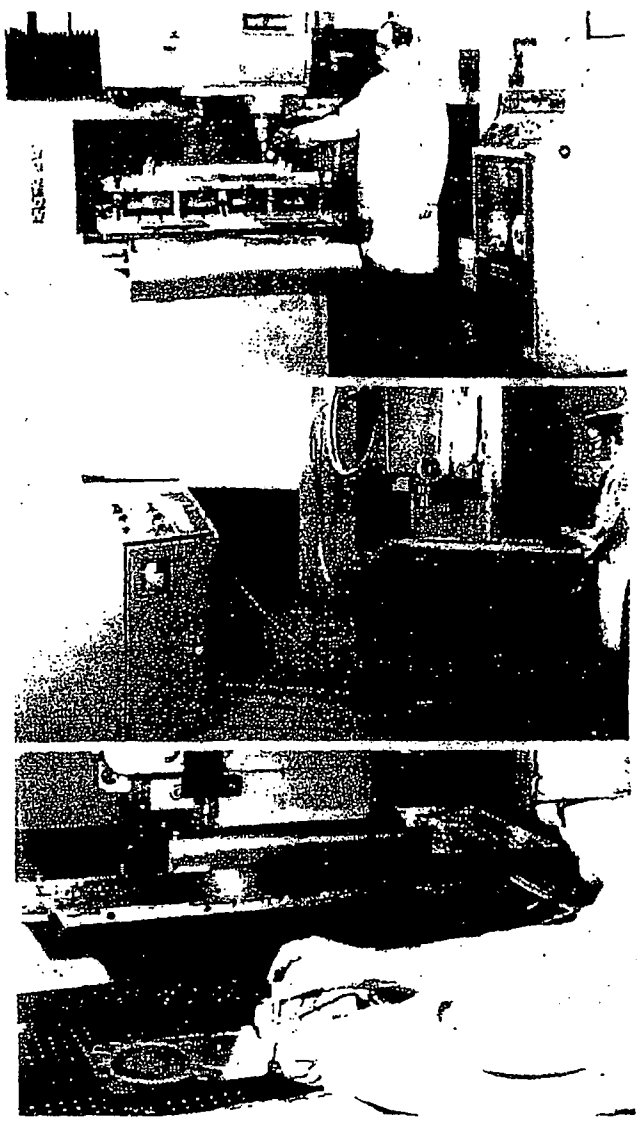
# GENERAL INFORMATION

As long as there are engines, pumps, machinery and home appliances to be sealed, whether to contain power forces such as internal combustion, or to confine lubricants, fuels, and other fluids, there will always be a need for gaskets and gasketing materials. The Victor Products Division research and development laboratories continue to stress creative development that will insure sealing progress far into the future, regardless of the parameters involved.

Tens of thousands of different types and styles of gaskets for automotive and industrial applications emanate from the Victor Products Division's manufacturing facilities. Working with basic raw materials, processing is done with the material on a continuous flow until finished production parts are manufactured. In many instances entire kits of gaskets are assembled by Victor to provide customers with all their requirements for the replacement market. Typical industries served by Victor are: automotive, agricultural, aircraft, marine, railway, construction, power and power transmission equipment, the petroleum industry, machinery and machine tools, electrical, refrigeration and air conditioning industries, household appliances, and suppliers to the armed services.

Worldwide, over one million square feet of manufacturing floor space is devoted to producing Victor gaskets and gasket materials. Over the past several years 250,000 sq. ft. of new manufacturing facilities have been put into service to provide the most modern and efficient production systems for our customers.

Naturally quality is a keynote. All products manufactured and sold by Victor are carefully inspected and checked against Victor's own rigorous standards, before being made available to our customers.



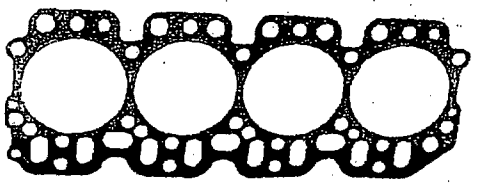
*The three-axis Gorton rail mill makes complex-shaped, compound die construction easy. Holding tolerances of ± .0002 inches with 30% less bench labor and 50% less machining time is not uncommon.*

*Few machines can position, drill and/or bore as fast as the three-axis Fosdick tape drill. Positioning speeds of 200 inches-per-minute and accuracy of ± .001 are standard.*

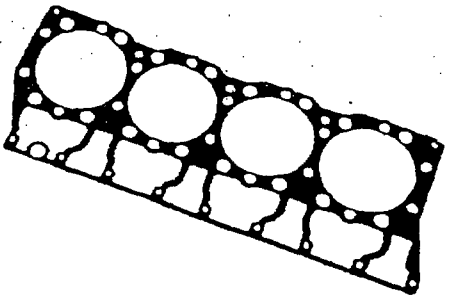
*E.D.M. permits much faster production of complex, close-tolerance beading dies than by conventional machining.*

# VICTOR DEVELOPMENTS

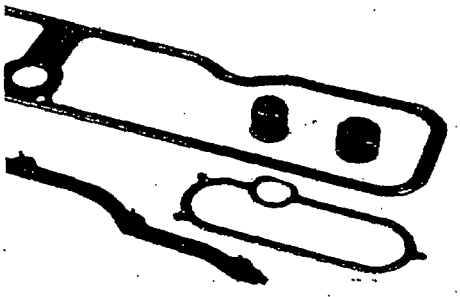
In order to serve our customers' needs, many new products and procedures have been developed, which insure Victor's leadership in the field of sealing products.



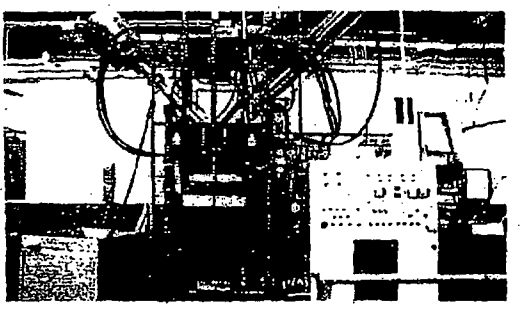
Victocote, an exclusive Victor formulation is shown as applied to a tractor cylinder head gasket, to increase sealability in areas of low sealing stress. Victocote is available in several base polymers and can be applied to a variety of materials.



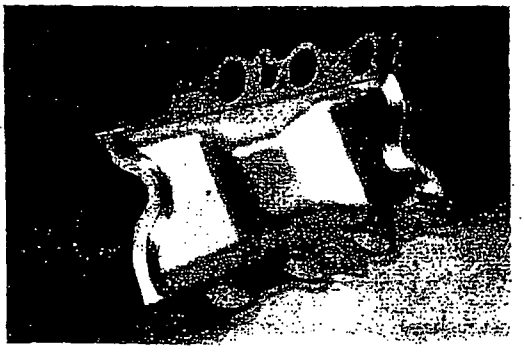
Rubber coated steel using Victor's exclusive 937 coating is used to produce a diesel engine deck plate gasket, where close tolerances must be maintained and fluid sealing is crucial.



Molded rubber gaskets or inserts, as pictured above, are used to seal fluids when sealing stresses are minimal.



A new injection molding press for molded rubber gaskets is one of Victor's continual manufacturing innovations to provide low cost, high quality products.



An engine valley cover intake manifold gasket using the Victor Solicor 620 construction, is shown above. The addition of the chemically bonded asbestos-rubber facing to the metal body insures adequate sealing to reduce oil consumption and meet all emission control standards.

Intake manifold gaskets for "V" type engines are manufactured on this new 500 ton press in our Havana, Illinois hard gasket manufacturing facility.

TECHNICAL DATA

## Basic Theory of Sealing

In order to provide a leak-free joint between any two members of an assembly, one condition must be met: The size of the potential leakage paths must be smaller than the molecular size of the medium to be confined. As long as this is true, total sealing will be achieved. If this condition is not met, the extent of the resulting leakage will be governed by the laws of fluid mechanics and thermodynamics.

Simply stated, the extent of the leakage will be determined by the number of molecules allowed to pass simultaneously through any given section of the joint and the driving force (differential pressure) behind them.

The task relegated to the gasket, therefore, is to yield (or flow) sufficiently into the minute asperities of the two mating members of the joint in order to limit the size of the potential leakage paths to nothing larger than the molecular size of the confined medium. Having done this, the gasket must retain that condition for the expected life of the assembly.

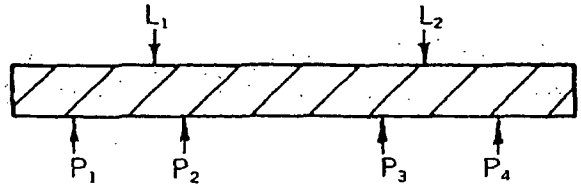
As simple as the foregoing appears, the real problems encountered in any application are caused by the environment of the joint. Such factors as chemical and thermal reaction between the confined medium and the gasket material, system vibrations, relative motion between mating surfaces, and pressure of the confined medium all influence the performance of the gasketed joint. Identification of the magnitude of each of these factors is a necessity prior to successful design of a gasket.

## Extension of Basic Theory to the Mechanism of Sealing the Cylinder Head

### The Dynamic Case

In order to effectively seal the cylinder head of the typical reciprocating piston engine, adherence to the basic theory of sealing must be embraced. One further factor must be recognized, however. As the firing pressures in the combustion chamber produce assembly deflections of some magnitude, the cylinder head gasket must accommodate them while attempting to seal the combustion gases. The system deflections and the consequential gasket motion result in a reciprocating stress (or load) condition on the gasket and its components. Unless the magnitudes of the operating stress limits on the gasket are considered, success of any gasket would be due strictly to chance.

To completely understand this mechanism of operation, one should refer to an ideal free body force diagram of the cylinder head (FIG. 1). In this figure, $L_1$ & $L_2$ are equal and represent the bolting forces. $P_1$, $P_2$, $P_3$ & $P_4$ are equal and represent the compressive forces common to the gasket. As the figure shows, the system is in equilibrium since the sum of the forces is equal to zero.




As the engine is fired, however, the combustion force must be added, $F_V$ (FIG. 2). The combustion force can be calculated from the firing pressure (peak) and the area over which it acts,

$$F_v = p_{max} A$$

In order to maintain equilibrium in our free body, intuitively one can see that either $L_1$ & $L_2$ must increase and /or $P_1$, $P_2$, $P_3$ & $P_4$ must decrease in some proportion to the magnitude of $F_V$.

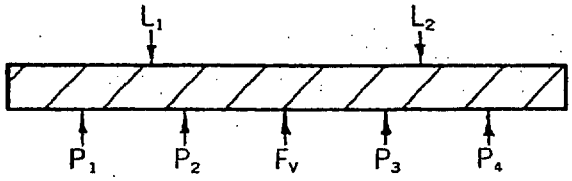



FIG. 2

Considering the elasticity of the bolts,

$$L_1 = L_2 = k_B \triangle \ell = L_B,$$

where $k_B$ is the spring constant of the bolts and $\triangle \ell$ is the incremental change in bolt length. Further, the gasket being elastic (ideally) has a similar characteristic:

$$\sum_{n=1}^{4} P_n = k_G \triangle G = \sum P_G,$$

where $k_G$ is the spring rate of the gasket and $\triangle G$ is the incremental change in gasket thickness.

From the foregoing, we know that

$$F_V + \sum P_G = \sum L_B,$$

or,

$$F_V = \sum L_B - \sum P_G$$

Thus, when $F_V = 0$, or approximately so,

$$\sum L_B = \sum P_G \quad ;$$

but, when $F_V$ is at its maximum, $\sum L_B$ will be at its maximum and $\sum P_G$ will be at its minimum. The precise magnitudes of these forces, of course, depend entirely on the contributing engine parameters and the particular gasket design used. Their magnitudes do, as mentioned previously, influence the system deflections in the assembly as well as the sealing stresses on the gasket. If the forces were known and an ideally rigid assembly (except for the bolts and gasket) were considered, the resulting deflection common to the bolts and gasket could be calculated as well as the change in the sealing stresses. The real case, however, usually presents the most challenge, so further discussion will be given that.

As mentioned earlier, the cylinder head gasket must fulfill the requirements presented under the basic theory of sealing and maintain the seal during combustion within the chamber. Recognizing that the sealing stress (on the gasket) is at a minimum during peak firing pressure, one might intuitively feel that the gasket should seal as long as any amount of sealing stress remains. Unfortunately, such is not indicated in laboratory work conducted at Victor. Rather, data observed agree very closely with the theory of static friction: $f = \mu N$.* That is, leakage past the gasket occurs when the sealed fluid pressure produces a force, $F_H$, against the edge of the gasket equal to or greater than the frictional forces, f, on the gasket opposing it. (FIG. 3). One would theorize that micromotion occurs between the gasket and mating surfaces at such a time which disturbs the plastically formed gasket surface, thereby allowing leakage to progress along

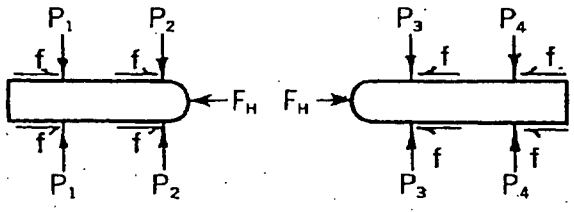



FIG. 3

various leakage paths. One can validly conclude, therefore, that a seal can be maintained provided the sealing load is always sufficient to allow a frictional component at least equal to the fluid force exerted on the edge of the gasket.

The apparent simplicity of the above is not intended to be misleading. As stated earlier, the sealing stress on the gasket is at a minimum during peak firing pressure. Therefore, the effective sealing load at this time must be sufficient to allow a frictional component adequate to resist the fluid force on the gasket edge. In order to achieve this, the rigidity of the cylinder head and block gasket surfaces must be considered as well as the initial load on the gasket, its thickness and its spring rate, the spring rate of the bolts, and the combustion force acting on the cylinder head. Precisely determining the effective values for each of these factors would be an almost insurmountable task, especially in view of the fact that each will assume a number of values depending on

*In the notation of this discussion, $f = \mu N$ would read $f = \mu \sum P_G$

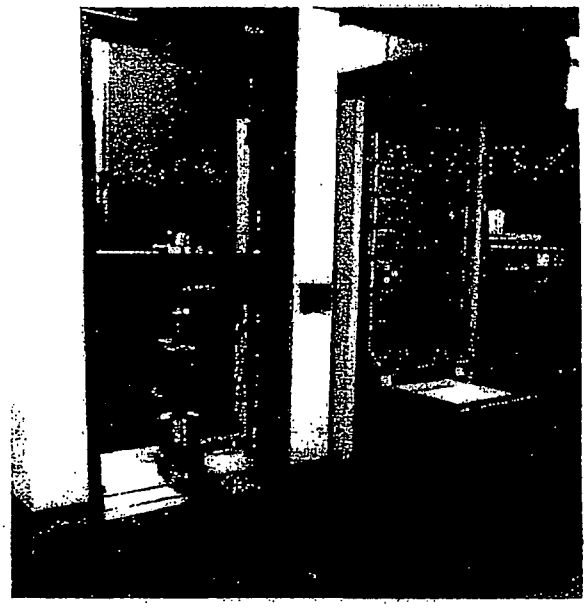
the particular region of the cylinder head gasket being considered. Nonetheless, VICTOR empirically has analyzed local conditions in several troublesome cases.

### Liquid Sealing

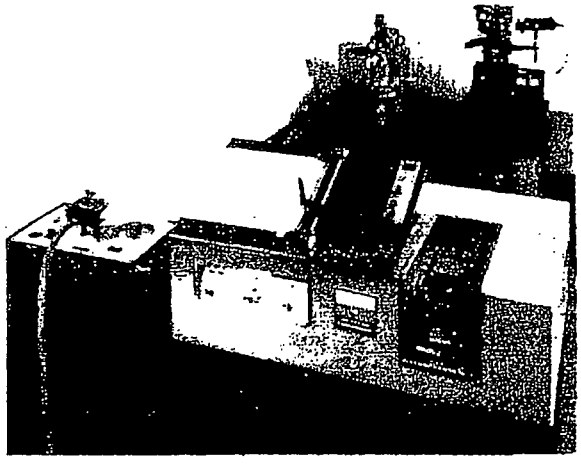
Although much of the preceding discussion is entirely applicable to the liquid sealing portion of the cylinder head gasket, further clarification to the theory of liquid sealing may be in order. Failure of a liquid seal is normally due to either leakage over the gasket-joint interface or leakage through the gasket material. Thus, the mode of liquid seal failure in the cylinder head gasket is not unlike that encountered in other applications such as thermostat housing or valve cover gaskets. The peculiarity of the cylinder head liquid seal, however, is that it is subjected to reciprocating stresses similar to those experienced by the combustion seal. Therefore, any failure of the liquid seal will usually be initiated during combustion since the sealing stress is at a minimum at that time. Progression of liquid leakage to a detrimental extent may be minimal or accelerated depending on the local conditions at and near the seal.

### Transitory Action

Presuming that the initial seal has been achieved according to the foregoing principles, the conditions must be maintained throughout the expected life of the assembly. Many factors will be at work changing the initial conditions obtained at the time of engine assembly. To name a few, imperfect elasticity of engine components (cylinder head, bolts, threads, block, cylinder sleeves) and the gasket, irregular thermal growth of various engine and gasket components, and creep-relaxation of the gasket all contribute to general degradation of the initial conditions. Unless these factors are recognized and compensated for in the design stage of the engine and gasket, the integrity of the assembly will be compromised at some point in time.



*Victor's new 20,000 pound Instron test machine equipped with an environmental chamber is used for evaluation of gasket material properties under dynamic conditions.*



*In the foreground, an infra-red spectrophotometer used for determining changes in gasket materials under environmental conditions of heat and for quality control of incoming materials.*

*In the background, a micro hardness tester and metallograph used for determining properties of metals.*

## Coatings for Gasket Materials

VICTOR gaskets are available with a variety of coatings to serve a number of purposes, including sealing, lubrication, prevention of adhesion to adjacent surfaces, and protection of the gasket material. VICTOR'S most popular coatings are described below. Others are available or can be fabricated to fill specific needs.

VICTOR 597 ANTISTICK COATING

This is a specially compounded clear formulation applied to composition cylinder head gaskets to prevent sticking to the engine head or block. It is effective at all normal temperatures encountered in cylinder head applications. It is unaffected by temperature and humidity extremes encountered in parts storage. The coating does not adversely affect the sealability of the coated gasket material.

VICTOR 999 ANTISTICK COATING

Similar in effectiveness to other VICTOR antistick coatings, this formulation is specially compounded for the sealing surfaces of soft gasket materials. It is highly effective in minimizing gasket-to-flange adhesion, thus permitting easy disassembly of flanged joints. Unaffected by temperature and humidity extremes, the coating also does not affect the sealability of the gasket material.

VICTOR ALUMINUM PRECOTE

This is an aluminum-pigmented organic coating for beaded steel and metal-asbestos layer gaskets. It is a soft coating, effective as a sealer. The thickness is .00075 — .0015" per side. It retains sealing properties after aging 5 hours at 350°F. The coating remains adhered to substrate during disassembly of head and block. It has excellent resistance to water and antifreeze solutions; no softening, blistering, or separation from steel substrate will occur when immersed in water, 50:50 ethanol / water mix, or 50:50 ethylene glycol / water mix for 70 hours at boiling temperature for beaded steel or 16 hours at 180°F. for layer gaskets.

VICTOR BLACK PRECOTE

This is a cured graphite-pigmented thermosetting resin for beaded steel manifold gaskets and similar applications. It is a clean, dry film firmly bonded to the base metal, functioning as a sealer and lubricant, permitting thermal expansion and contraction of the manifold assembly without leakage or damage. It also provides rust protection and resistance to corrosive atmospheres. The thickness is .0006 — .0008" per side. After aging 1 hour at 750°F., the surface may be reduced to graphite, but the coating will not blister or peel and remaining coating will withstand the metal bending on itself without cracking. No softening, blistering, or separation from steel substrate will occur when immersed in water, 50:50 ethanol / water mix, or 50:50 ethylene glycol / water mix for 70 hours at boiling temperatures.

VICTOR CLEAR PRECOTE

This is a cured unpigmented thermosetting resin for steel plate gaskets and metal-asbestos layer gaskets. It is a clean, dry film firmly bonded to the base metal as a soft, effective sealer. It also provides rust prevention and resistance to corrosive atmospheres. The thickness is .00075 — .0015" per side. After aging 1 hour at 500°F., this coating will not blister or peel and will withstand the metal bending on itself without cracking. It has the same excellent fluid resistance as VICTOR ALUMINUM PRECOTE.

VICTOR 941 MOLY PRECOTE

This is a molybdenum disulfide-pigmented organic coating for beaded steel gaskets. It is a clean, dry film firmly bonded to the base metal, functioning as a sealer and lubricant, permitting thermal expansion and contraction of the assembly without leakage or damage. It also provides rust protection and resistance to corrosive atmospheres. The thickness is .00075 — .0015" per side. Sealing properties are maintained at operating temperatures from —60°F. to 1300°F. as they occur in normal operating conditions for the intended applications. It has the same excellent fluid resistance as VICTOR BLACK PRECOTE.

VICTOCOTE 930

This is a dry film of black chloroprene rubber latex applied to selective portions of VICTOCOR and SOLICOR gaskets to enhance sealing properties in areas of difficult fluid sealing, such as regions of low gasket body stress of cylinder head gaskets. It provides additional thickness in these areas and flows under load to fill surface irregularities and assure positive fluid seal. It is resistant to temperatures up to 250°F. continuously and 400°F. intermittently. The thickness is .002 — .004" per side. It has excellent fluid resistance; some softening may occur at the following conditions, but no blistering, disintegration, or separation from the substrate:

ASTM Oil #3, 5 hours, 300°F.
Transmission oils, 70 hours, 250°F.
Water; 50:50 Ethanol / Water;
50:50 Ethylene Glycol / Water, 22 hours, boiling

VICTOCOTE 950

This is a silicone rubber composition applied as a bead or over selective flat areas of gaskets to help achieve high unit loading in areas of difficult sealing. It provides added thickness and flows under load to fill surface irregularities to assure freedom from leakage. This flexible material has excellent resistance to oils, fuels, coolants, and combustion gases over a wide temperature range from —65°F. to +400°F. It is not adversely affected when subjected to water, 50:50 ethanol / water solution, or 50:50 ethylene glycol / water solution at boiling conditions for 70 hours. As a silicone material, it has the added advantage of helping prevent sticking of the gasket to engine components upon disassembly. Coating can be applied over flat areas or as a bead to thicknesses up to .010" as needed for specific gasket applications.

VICTOR 937 NITRILE RUBBER COATING

This is a soft, black nitrile synthetic elastomer coating for steel gaskets and for controlled thickness tolerance applications such as deck plate gaskets for diesel engines. It functions as a sealer and protects against rust and effects of corrosive atmospheres. It resists temperatures up to 275°F. continuously or 350°F. intermittently. The thickness is .0005 — .0010" per side. It incurs insignificant hardening after 24 hours at 300°F. It has excellent fluid resistance; some softening may occur at the following conditions, but no blistering, disintegration, or separation from the substrate:

ASTM Oil #1, 70 hours, 300°F.
Transmission oils, 70 hours, 250°F.
Water; 50:50 Ethanol / Water;
50:50 Ethylene Glycol / Water, 22 hours, boiling

Victor

# TECHNICAL DATA

## Gasket Flange Materials

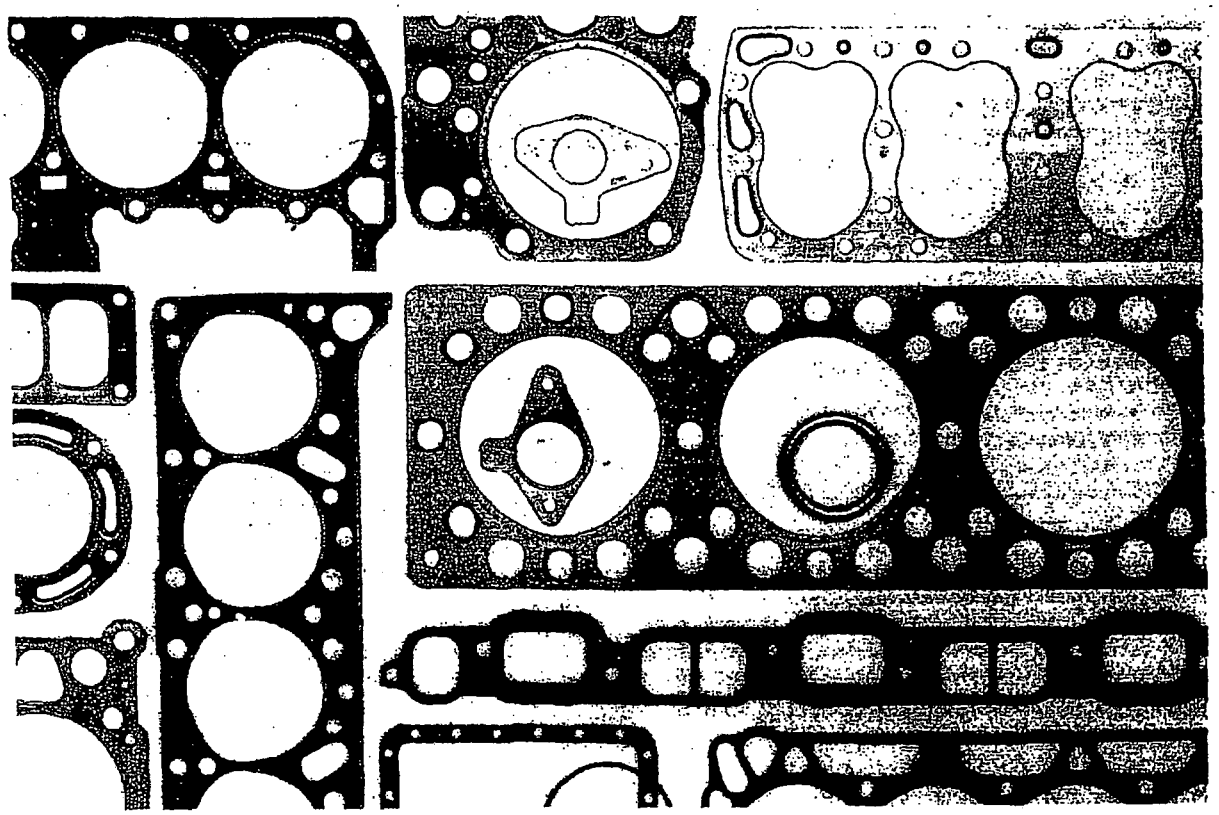
Flanges in gaskets commonly serve either or both of two basic purposes: They may be used to locally increase the stress level to aid in achieving an initial seal, or they may offer protection to the remainder of the gasket from a particularly severe local condition in the engine or machine assembly.

Three metals are commonly used in gasket flanges or grommets: Copper, tin plated steel, and stainless steel. The selection of the proper metal is determined by the environment experienced by the flange.

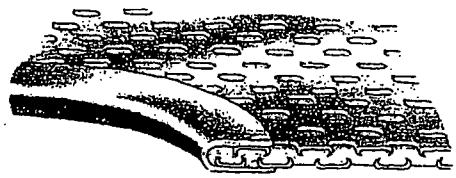
For example, copper being noted for its ductility, softness, and resistance to water would normally be specified in areas that were lightly loaded (required high degree of conformability) or exposed to water or steam.

Tin plated steel is specified where corrosion resistance is not extremely critical, but where exposure to higher temperatures is common and better mechanical properties are required.

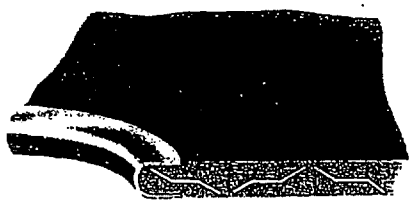
Stainless steels are used for those flanges that are exposed to particularly corrosive environments or subject to extremely high temperatures, stress levels, or abrasive action. Various grades of stainless steel are available to satisfy the specific requirements of the application.



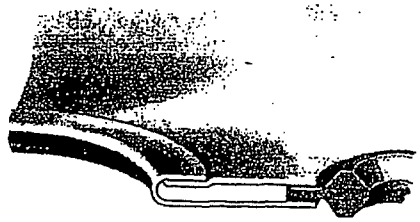
# TYPICAL CYLINDER HEAD GASKET CROSS SECTIONS



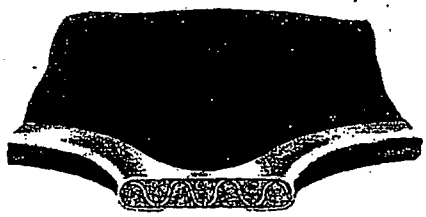
STEEL-FACED CORBESTOS *with Tin Plate Flange*



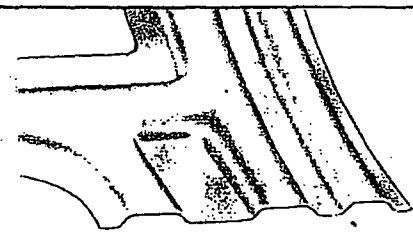
VICTOCOR 150 *with Tin Plate Flange*



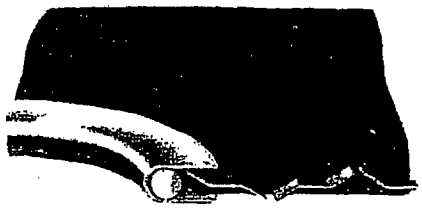
STEEL AND ASBESTOS LAYER *with Silicone Rubber Insert*



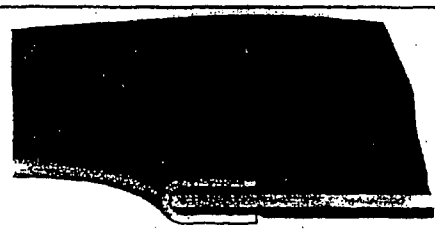
VICTOCOR 200 *with Webbed Flange*



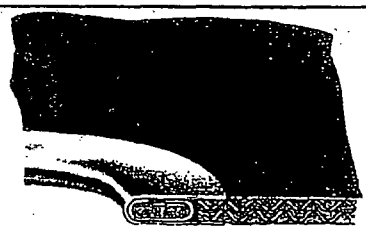
BEADED STEEL



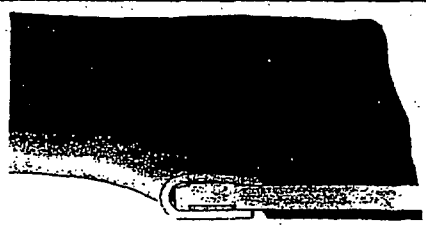
VICTOCOR 300 *with Stainless Steel Flange and Yieldable Fire ring*



SOLICOR 630 *with Tinplate Flange*



VICTOCOR 400 *with Asbestos filled Fire ring*



VICTOSOL *with Flange*


# GASKET MATERIALS

## HARD GASKET MATERIAL SELECTION GUIDE

To one unfamiliar with gasketing technology, the vast array of materials and gasket constructions available presents a confusing task to the designer of a new assembly. To make this job somewhat less puzzling, the following table identifies the materials commonly used in various applications. Where several materials are listed for a given application, the available choices can be narrowed by considering economic restrictions, performance requirements, and application limitations. Many of these materials are also available in varieties utilizing stainless steel for applications where a high degree of corrosion resistance is required.

| MATERIAL | APPLICATION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CYLINDER HEAD | | | | | | | | | MANIFOLDS | | |
| | PASSENGER CAR—GASOLINE | PASSENGER CAR—DIESEL | TRUCK—GASOLINE | TRUCK—DIESEL | TRACTOR—GASOLINE | TRACTOR—DIESEL | OFF HIGHWAY | MARINE | AIR COOLED | INTAKE | EXHAUST | HEAT SHIELDS |
| VICTOCOR 150 | X | X | X | X | X | X | X | X | | X | | |
| VICTOCOR 160 | X | X | X | X | X | X | X | X | | X | | |
| VICTOCOR 200 | X | X | X | X | X | X | X | X | | X | | |
| VICTOCOR 300 | X | X | X | X | X | X | X | | | | | |
| VICTOCOR 400 | | | | X | | X | X | | | X | | |
| VICTOCOR 470 | | X | | X | | X | X | X | | | | |
| SOLICOR | X | X | X | X | X | X | X | X | | X | | |
| VICTOSOL | | X | | X | | X | X | | | | | |
| CORBESTOS | | | | | | | | | X | X | X | X |
| METAL-ASBESTOS | X | | X | X | X | X | X | | X | | X | |
| BEADED METAL | X | X | X | | | | | X | | X | X | X |

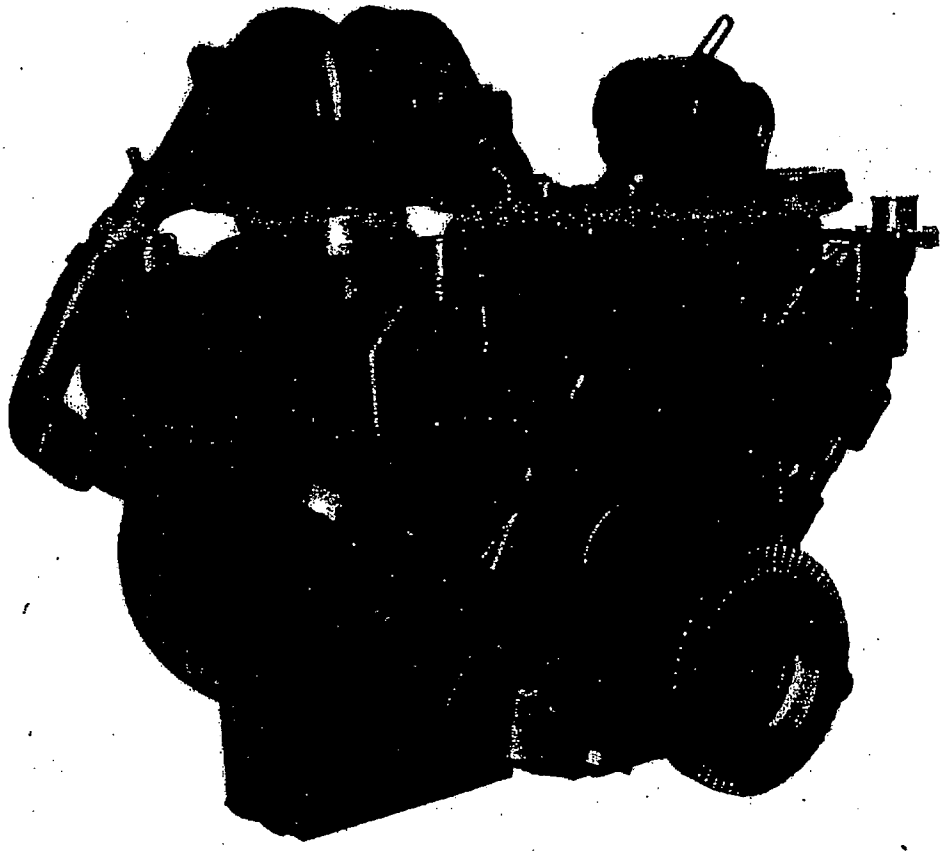
## SOFT GASKET MATERIAL SELECTION GUIDE

| MATERIAL | RELAXATION—ASTM METHOD B, 212°F, % MAX. | SEALABILITY—ASTM | | | QUALIFIED RECOMMENDED MAXIMUM TEMPERATURE, °F* | MEDIA TO BE SEALED** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | INTERNAL PRESSURE, in. Hg | EXTERNALLY APPLIED STRESS, psi | LEAKAGE, ml/hr, MAX. | | ALCOHOL | DUST—EXTERNAL | ETHYLENE GLYCOL | FREON 12 | FREON 22 | GASOLINE—AROMATIC | GREASE | KEROSENE | LUBRICANTS—E.P. | OIL—FUEL | OIL—HIGH ANALINE POINT | OIL—LOW ANALINE POINT | OIL—SYNTHETIC | WATER—EXTERNAL | WATER—INTERNAL |
| VICTOPAC 1 | 25 | 20 | 300 | 2 | 800 | S | S | S | F | P | F | S | F | F | P | P | P | C | S | S |
| VICTOPAC 14 | 25 | 20 | 300 | 2 | 800 | S | S | S | F | F | F | S | F | S | F | F | F | C | S | S |
| VICTOPAC 60 | 25 | 20 | 300 | 5 | 800 | S | S | S | S | S | S | S | S | S | S | S | S | C | S | S |
| VICTOPAC 65 | 20 | 20 | 300 | 2 | 800 | S | S | S | S | S | S | S | S | S | S | S | S | C | S | S |
| VICTOPAC 67 | 25 | 20 | 300 | 5 | 800 | S | S | S | S | S | S | S | S | S | S | S | S | C | S | S |
| VICTOPAC 70 | 25 | 20 | 300 | 15 | 800 | S | S | S | S | F | S | S | S | S | S | S | S | S | S | S |
| VICTOPAC 76 | 20 | 20 | 300 | 2 | 800 | S | S | S | S | S | S | S | S | S | S | S | S | C | S | S |
| VICTOPAC 85 | 30 | 20 | 500 | 5 | 1000 | F | S | F | F | F | S | S | S | S | S | S | S | C | F | F |
| VICTOPAC 100 | 15 | 20 | 2000 | 5 | 1100 | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| ASBESTOPRENE 233 | 40 | 10 | 1000 | 15 | 500 | F | S | F | P | P | F | S | F | F | F | F | F | C | S | S |
| ASBESTOPRENE 243 | 35 | 15 | 2000 | 10 | 600 | F | S | F | F | F | S | S | S | S | S | S | S | C | F | F |
| ASBESTOPAC 232 | 30 | 20 | 400 | 5 | 500 | S | S | S | P | P | S | S | S | S | S | S | S | C | S | S |
| ASBESTOPAC 242 | 25 | 20 | 800 | 5 | 600 | F | S | F | F | F | S | S | S | S | S | S | S | C | F | F |
| VICTOLEX 258 | 45 | 10 | 2000 | 30 | 300 | P | S | F | P | P | P | S | P | F | P | P | P | U | S | S |
| VICTOLEX 342 | 50 | 10 | 800 | 15 | 300 | F | S | S | F | F | S | S | S | S | S | S | S | C | S | S |
| VICTOLEX 423 | 40 | 20 | 1000 | 6 | 300 | F | S | S | F | P | S | S | S | S | S | S | S | C | S | S |
| VICTOLEX 433 | 45 | 20 | 1000 | 6 | 300 | F | S | S | F | P | U | S | U | F | P | P | P | U | S | S |
| VICTOLEX 867 | 40 | 20 | 1000 | 15 | 300 | F | S | S | F | F | S | S | S | S | S | S | S | F | S | S |
| VICTORITE B | 50 | 20 | 1000 | 6 | 250 | P | S | F | P | P | S | S | S | S | S | S | S | C | F | P |
| VICTORITE R | 50 | 20 | 1000 | 6 | 250 | P | S | F | P | P | S | S | S | S | S | S | S | C | F | P |

S—Satisfactory; F—Fair; P—Poor; U—Unsatisfactory; C—Call VICTOR

***Qualified Recommended Maximum Temperatures:** There are a number of factors involved in determining maximum service temperatures, such as flange design, bolting pattern, bolt torque, and operating conditions. The temperatures indicated represent operation under optimum conditions.

****Media to be Sealed:** Compatibility of the gasket meterial and the media to be sealed depends on factors similar to those shown above. Ratings shown in chart are under good installation conditions.



Victor

# VICTOR SOLICOR® and VICTOSOL MATERIALS

SOLICOR materials are made by bonding asbestos-elastomer facing materials to a solid steel core. The solid steel core contributes to a strong, uniform, and dimensionally stable material throughout the gasket, with high radial strength at combustion openings. The firm chemical bond assures complete adhesion of the facing to the core throughout the life of the gasket and provides outstanding sealing characteristics.

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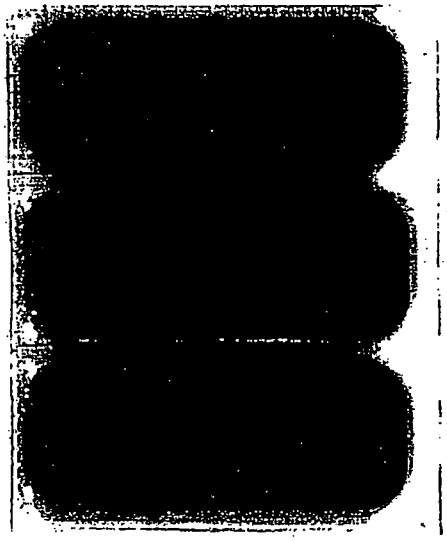
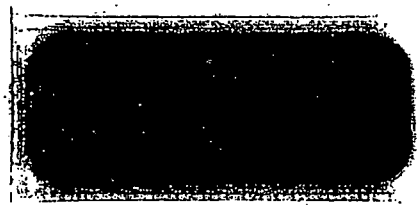


| | SOLICOR Grade No. |
|---|---|
| **SOLICOR 610** is composed of asbestos-nitrile elastomer facing chemically bonded to both sides of solid steel core. It is a thin, strong material, uniform throughout its area, and possessing good torque retention properties. The low-binder asbestos-elastomer facing is soft and conformable for good sealing, while the steel core imparts strength to the over-all construction. This material is highly resistant to oil, gasoline, water, antifreeze solutions, and gases. It is especially suitable for intake manifold gaskets. Material is generally supplied with VICTOR 597 Antistick Coating. The color is gray. | 610 |
| **SOLICOR 620** is made of a red asbestos-nitrile elastomer facing adhesive-bonded to both sides of solid tin plate steel. It is typically used for the intake manifold areas of valley cover ("turkey pan") gaskets. The conformable low-density facing material promotes good sealing in conjunction with the strength provided by the solid steel inner layer. This material has excellent resistance to all gases and fluids found in internal combustion engines. It is uncoated when used in valley cover gaskets. | 620 |
| **SOLICOR 630** is a hard gasket material composed of asbestos-nitrile elastomer facing adhesive-bonded to solid steel core. It has excellent resistance to oil, gasoline, water, antifreeze, and gases. This material seals under low initial stress and has low relaxation with excellent torque retention. Typical applications include cylinder head gaskets for both light and heavy duty service in gasoline and diesel engines, and manifold gaskets. Fire rings may be employed, depending on the finished gasket design and its use. The color is black. It is available with VICTOR 597 Antistick Coating. | 630 |



## VICTOSOL

**VICTOSOL** is a hard gasket material composed of asbestos-elastomer facing adhesive-bonded to solid steel core. VICTOSOL cylinder head gaskets are especially fabricated to include no facing material in the combustion sealing area, thus providing a solid steel combustion seal for heavy-duty diesel engines. Because of this, no fire rings need be employed. This product is customized for specific applications. A variety of facings are available with different binder types and other characteristics to provide the mechanical properties and necessary degree of resistance to oil, gasoline, water, antifreeze, gases, and heat for optimum performance in sealing a given engine. Two standard compositions are VICTOSOL 720 (nitrile binder) and VICTOSOL 770 (polyacrylic binder). The solid steel core contributes to a strong, uniform, and dimensionally stable material throughout the gasket, with high radial strength at combustion openings. The firm chemical bond assures complete adhesion of the facing to the core throughout the life of the gasket and provides outstanding sealing characteristics. Excellent retention of bolt torque is experienced when this low-relaxation material is used. VICTOSOL also is low in compressibility, typically less than 6% at 5000 psi. It is available with an antistick coating, assuring clean release from flange during disassembly. The color is black.

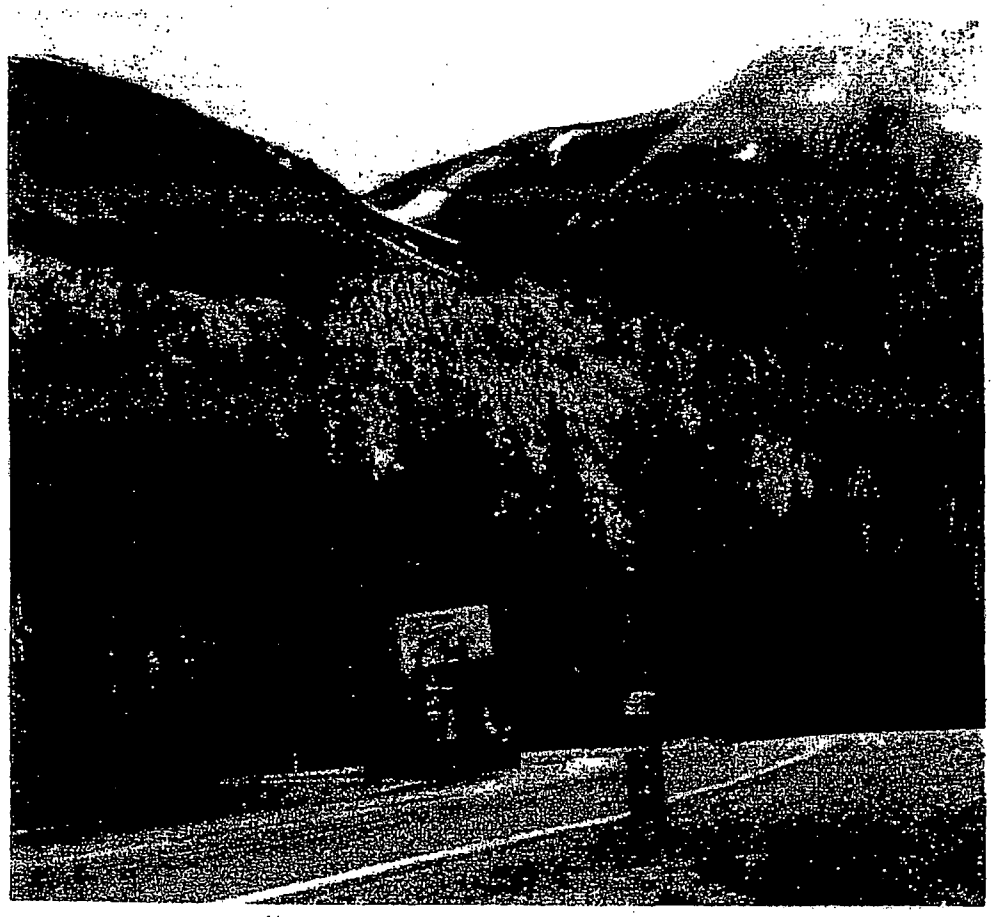
# SOLICOR PHYSICAL PROPERTIES

| Available thickness, In. | Creep Relaxation, ASTM F 38, Method B, 22 hr, 3000 psi, max., % at 70-85°F | at 212°F | at 300°F | at 400°F | Compressibility at 1000 psi, % | Recovery after 1000 psi, min., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | ASTM Fuel B aging, 22 hr, 70-85°F: Thickness change, max., % | Weight change, max., % | Water aging, 22 hr, 70-85°F Thickness change, max., % | Weight change, max., % | ASTM Oil #1 aging, 5 hr, 300°F: Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | ASTM Oil #3 aging, 5 hr, 300°F Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | Heat aging, 16 hr, 400°F: Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | Crush-Extrusion yield point on 1 in² area circular sample at 300°F, min., psi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .033/.038 | 20 | 30 | 40 | 50 | 6-12 | 40 | 18-28 | 40 | +8 | +10 | +6 | +15 | +5 | +15 | 15-25 | 45 | +10 | +15 | 15-25 | 45 | −5 | −5 | 8-18 | 50 | 40000 |
| .065/.072 | NA | NA | NA | NA | NA | NA | 14-22 | 40 | +12 | +15 | NA | NA | +10 | +20 | 14-24 | 40 | +15 | +20 | 17-27 | 40 | NA | −3 | 5-15 | 50 | NA |
| .040/.045 | 15 | 25 | 35 | 45 | 3-8 | 50 | 10-18 | 55 | +6 | +8 | +6 | +8 | +5 | +10 | 8-16 | 55 | +10 | +10 | 10-18 | 55 | −4 | −2 | 6-12 | 60 | 25000 |

NA—Not Applicable

Boiling fluid immersions, operating temperature range, and physical property testing methods same as for VICTOCOR grades; see notes following VICTOCOR table.

VICTOR PRODUCTS DIVISION DANA DANA CORPORATION

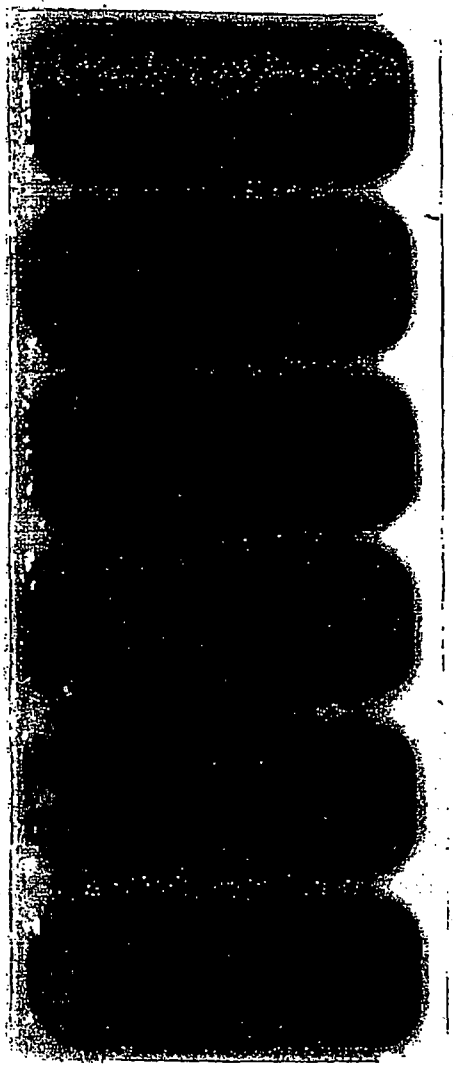


Victor

# VICTOCOR® MATERIALS

VICTOCOR is a trademark describing a family of gasket products made by combining rubber-asbestos facing materials to a steel core. A Victor development, the Victocor materials combine a resilient facing for sealability with the strength and stability of steel. In combination with a variety of flange materials and flange designs, Victocor gaskets provide a reliable seal on automotive, truck and off-highway equipment.

Victor



| VICTOCOR Grade No. | |
|---|---|
| 150 | **VICTOCOR 150** is composed of asbestos-nitrile elastomer facing mechanically clinched to both sides of perforated steel core. This red-colored material has excellent resistance to oil, gasoline, water, antifreeze solutions, and gases. Typical applications include cylinder head gaskets having flanges or fire rings, and intake manifold gaskets. Material is usually coated with VICTOR 597 Antistick Coating. |
| 160 | **VICTOCOR 160** consists of a gray asbestos-nitrile elastomer facing mechanically clinched to both sides of perforated steel core. This high-grade material has excellent resistance to oil, gasoline, water, antifreeze solutions, and gases. Typical applications include cylinder head gaskets having flanges or fire rings, and intake manifold gaskets. Material is usually coated with VICTOR 597 Antistick Coating. |
| 200 | **VICTOCOR 200** is composed of a red asbestos-nitrile elastomer facing chemically and mechanically bonded to both sides of perforated steel core. It has excellent resistance to oil, gasoline, water, antifreeze solutions, and gases. Typical applications are cylinder head and intake manifold gaskets for gasoline and diesel engines. The material is used in conjunction with combustion opening flanges and/or fire rings and other components, dictated by the requirements of the particular application. Material is generally supplied with VICTOR 597 Antistick Coating. |
| 300 | **VICTOCOR 300** is made of compressed asbestos-chloroprene elastomer facing mechanically clinched to both sides of perforated steel core. It has excellent resistance to oil, gasoline, water, and antifreeze solutions, as well as gases. Typical applications include cylinder head gaskets where very low relaxation is required in heavy duty applications, and in conjunction with yieldable fire rings. Material is generally supplied with VICTOR 597 Antistick Coating. |
| 400 | **VICTOCOR 400** is composed of three layers of asbestos-nitrile elastomer sheeting chemically and mechanically bonded to two layers of perforated steel core. This red-colored material has excellent resistance to oil, gasoline, water, antifreeze solutions, and gases. Typical applications are cylinder head and manifold gaskets for gasoline and diesel engines. The material is used in conjunction with combustion opening flanges and/or fire rings and other components, dictated by the requirements of the particular application, where increased thickness is required. Material is generally supplied with VICTOR 597 Antistick Coating. |
| 470 | **VICTOCOR 470** is composed of compressed asbestos-nitrile elastomer facing mechanically clinched to both sides of perforated steel core. This high-grade material has outstanding resistance to oil, gasoline, water, antifreeze solutions, and gases. Additionally, it is especially noted for providing a corrosion-free environment for the mating surfaces of the head and block, as well as for the metallic components of the gasket. Typical applications include cylinder head gaskets where very low relaxation is required, in heavy duty applications, and in conjunction with yieldable fire rings. Material is generally supplied with VICTOR 597 Antistick Coating. |

# VICTOCOR PHYSICAL PROPERTIES (cont. on back page)

| VICTOCOR Grade No. | Available thickness, in. | Creep Relaxation, ASTM F 38, Method B, 22 hr, 3000 psi, max., % at 70-85°F | at 212°F | at 300°F | at 400°F | Compressibility at 1000 psi, % | Recovery after 1000 psi, min., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | ASTM Fuel B aging, 22 hr, 70-85°F: Thickness change, max., % | Weight change, max., % | Water aging, 22 hr, 70-85°F Thickness change, max., % | Weight change, max., % | ASTM Oil #1 aging, 5 hr, 300°F: Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | ASTM Oil #3 aging, 5 hr, 300°F Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | Heat aging, 16 hr, 400°F: Thickness change, max., % | Weight change, max., % | Compressibility at 5000 psi, % | Recovery after 5000 psi, min., % | Crush-Extrusion yield point on 1 in² area circular sample at 300°F, min., psi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | .035/.040<br>.042/.047*<br>.050/.055<br>.055/.060<br>.065/.070 | 25 | 35 | 45 | 55 | 10-20 | 40 | 18-28 | 40 | +20 | +20 | +10 | +20 | +10 | +20 | 15-30 | 35 | +20 | +25 | 20-35 | 40 | −6 | −2 | 10-20 | 40 | 15000 |
| 160 | .035/.040<br>.042/.047*<br>.055/.060<br>.065/.070 | NA | 30 | NA | 55 | 10-20 | 40 | 18-28 | 40 | +15 | +20 | +5 | +15 | +10 | +20 | 15-30 | 35 | +15 | +20 | 20-35 | 40 | −5 | −2 | 10-20 | 40 | 25000 |
| 200 | .030/.035<br>.042/.047*<br>.055/.060<br>.065/.070<br>.075/.080 | 20 | 40 | 50 | 60 | 5-15 | 40 | 10-25 | 40 | +15 | +20 | +10 | +20 | +10 | +20 | 8-22 | 40 | +15 | +25 | 10-25 | 40 | −6 | −2 | 8-22 | 40 | 15000 |
| 300 | .030/.035<br>.050/.055<br>.060/.065*<br>.082/.087 | NA | NA | 45 | NA | 2-7 | 40 | 8-18 | 40 | +15 | +10 | +5 | +10 | +8 | +15 | 6-18 | 35 | +20 | +20 | 6-20 | 40 | −3 | −3 | 5-15 | 45 | 13000 |
| 400 | .055/.060<br>.068/.073<br>.073/.078*<br>.085/.090 | 40 | 55 | 75 | 80 | 5-15 | 40 | 10-25 | 40 | +15 | +20 | +5 | +20 | +5 | +20 | 5-20 | 40 | +10 | +20 | 10-30 | 40 | −6 | −2 | 5-15 | 45 | 15000 |
| 470 | .060/.065 | 20 | 30 | 40 | 50 | 2-7 | 40 | 8-18 | 40 | +10 | +8 | +5 | +8 | +5 | +10 | 6-16 | 40 | +10 | +10 | 6-16 | 40 | −3 | −3 | 6-16 | 50 | 20000 |

NA—Not Applicable

*Properties shown in above table are based on material of this commonly used thickness. Some properties vary with respect to thickness, and the individual Engineering Specification sheets should be consulted for details on other thicknesses.

# VICTOCOR® PHYSICAL PROPERTIES

All VICTOCOR grades shown in the foregoing table will also meet the following requirements:

**Boiling fluid immersions:**

Limited softening and no disintegration or separation of facing from core when immersed in the following fluids for 16 hours at boiling temperatures:

Water
50% Ethanol — 50% Water
50% Ethylene Glycol — 50% Water

**Corrosion and Adhesion:**

ASTM F 64, effect of antistick coated gasket material, on low carbon steel, cast iron, brass, aluminum, or stainless steel, 70 hours, 250°F:

| | | |
|---|---|---|
| Corrosion rating, max. | 1 | (No corrosion) |
| Adhesion rating, max. | 1 | (Complete release) |

**Operating Temperature Range:**

Limits shown for continual usage. Will withstand temperatures outside this range for lesser durations.

Maximum +500°F Minimum −60°F

VICTOCOR physical property testing for original properties and properties after fluid and heat aging is conducted as follows:

Compressibility and recovery per ASTM F 36, .250 in. diameter penetrator, 5 lb. preload; single thickness of material. Fluid immersions per ASTM F 104. All samples conditioned at 212°F for one hour before testing. All thicknesses measured on stand micrometer using 9 oz. load and .250 in. diameter (.050 $in^2$ area) presser foot.

Victor

# CORBESTOS® MATERIALS

Several combinations of steel and asbestos are identified as Corbestos gasket materials. Typically used as cylinder head gaskets in air cooled engines and as manifold gaskets in numerous applications, Corbestos provides reliable performance at moderate cost.

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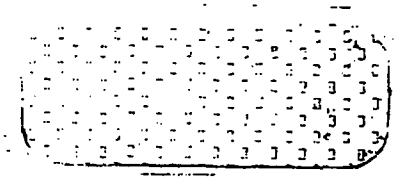

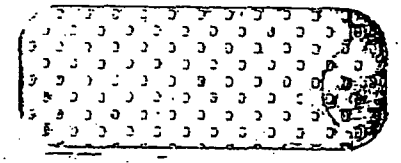

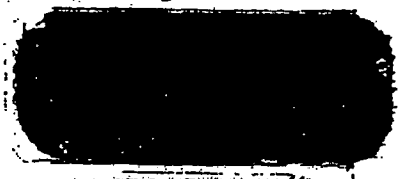

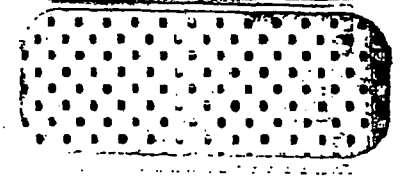

The physical properties shown were obtained by the applicable procedures shown in parenthesis and listed on "Test Procedures" page.

| | Available Thickness |
|---|---|
| **DENSE STEEL-FACED CORBESTOS** is composed of outer layers of perforated tin plate steel clinched to an inner layer of untreated asbestos. It is especially suitable for sealing gases in such applications as exhaust manifolds, heat shields, turbochargers, and cylinder heads of air-cooled engines. It is intended for use under high flange loads. It is not suitable for sealing liquids. | .030/ .040/. .055/. .060/. |
| **STEEL-FACED CORBESTOS** is composed of outer layers of perforated tin plate steel clinched to an inner layer of untreated asbestos. It is especially suitable for sealing gases in such applications as exhaust manifolds, heat shields, turbochargers, and cylinder heads of air-cooled engines. It is more compressible than Dense Steel-Faced Corbestos, and is intended for use under moderate flange loads. It is not suitable for sealing liquids. | .045/. .060/. |
| **LO-VOL*, DOUBLE-SIDED CORBESTOS** is a hard gasket material composed of untreated asbestos facing clinched to both sides of perforated steel core. It is especially suitable for sealing gases in such applications as carburetor, exhaust manifold, and turbocharger gaskets. It is not suitable for sealing liquids. Material is generally supplied with a thin layer of graphite coating. | From to .09 |
| **DOUBLE-SIDED CORBESTOS** is composed of organically treated asbestos facing clinched to both sides of perforated steel core. It has good resistance to oil, gasoline, water, and antifreeze solutions, as well as exhaust gases. It is an economical general purpose gasket material. Typical applications include intake and exhaust manifold, carburetor, and turbocharger gaskets. It can also be formed to special shapes, or laminated to high thicknesses. | From to .11( |
| **SINGLE-SIDED CORBESTOS** is a hard gasket material composed of organically treated asbestos facing clinched to one side of perforated tin plate steel. It has good resistance to oil, gasoline, water, and antifreeze solutions, as well as exhaust gases. It is a low-cost general purpose gasket material. Typical applications include exhaust manifold, heat shield, and turbocharger gaskets. | From . to .06 |

(a) No disi
(b) No disi
*Low Vola

| Available Thickness | Load Deflection, Compression under load of 5000 psi per Victor load deflection test. | Compressibility at 5000 psi (10) % | Recovery after 5000 psi (10) Min. % | Immersion effect after 24 hrs. at 70-85°F. % Max. | | | Maximum Weight loss after ignition at 1500° F. | Operating Temperature | Water Resistance |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Weight increase, ASTM Fuel B | Weight increase, ASTM Oil #3 | Weight Increase, Water | | | |
| .030/.035<br>.040/.045<br>.055/.060<br>.060/.065 | 5-15% | — | — | — | — | — | 20% | 1500°F | (a) |
| .045/.050<br>.060/.065 | 10-25% | — | — | — | — | — | 20% | 1500°F | (a) |
| From .040 to .095 | — | 10-25 | 30 | — | — | — | 20% | 1500°F | (a) |
| From .035 to .110 | — | 10-25 | 30 | 15 | 20 | 15 | 40% | 1500°F | (b) |
| From .030 to .065 | — | 20-30 | 30 | 15 | 20 | 15 | 40% | 1500°F | (b) |

(a) No disintegration after immersion for 24 hrs. in water at 70-85°F.
(b) No disintegration after immersion for 2 hrs. in boiling water.
*Low Volatility

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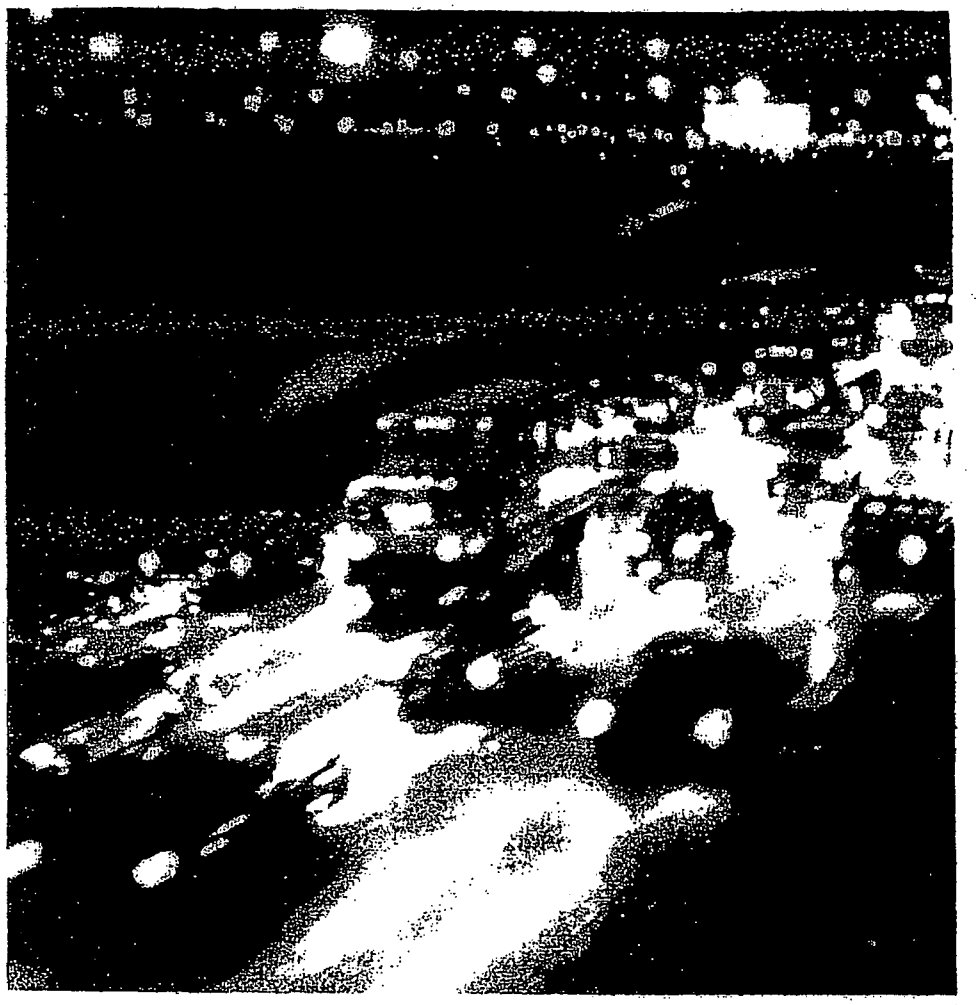

Victor

# METAL GASKET MATERIALS

METAL GASKET MATERIALS — Many different metals are used as components in Victor gasket materials. The functions of these metallic components can include sealing, reinforcement of soft layers, desired thermal characteristics, and resistance to chemical attack by the liquids and gases being sealed.

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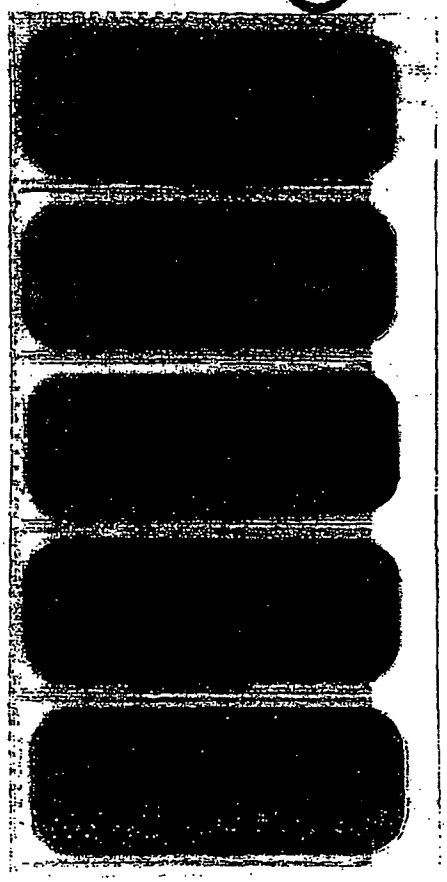

The physical properties shown were obtained by the applicable procedures shown in parenthesis and listed on "Test Procedures" page.

**COLD ROLLED LOW CARBON STEEL AND BLACK PLATE** have essentially the same chemical composition and can be produced to have the same physical characteristics, although made by different manufacturing processes. For gasketing applications, cold rolled steel is used when thicknesses over .015" are required, while black plate is used in thicknesses under .015". Various tempers of these steels are available to give characteristics ranging from drawing quality to great stiffness. Principal gasketing applications include beaded cylinder head gaskets and manifold gaskets.

**TIN PLATE** consists of black plate steel which has been electrolytically coated with a very thin layer of tin. Tempers can range from a soft drawing quality grade to a rephosphorized steel having great stiffness. Tin plate is useful in applications requiring corrosion and rusting resistance, when in contact with aqueous or acidic solutions. It is employed in layer-type constructions; as perforated core clinched to soft components; and in gasket flanges.

**STAINLESS STEEL** refers to various steel alloys containing large amounts of chromium and often other elements, which impart a great amount of resistance to corrosive media as well as high strength and high heat resistance. A wide variety of compositions is available, depending on the desired end use. In gasket applications, stainless steel is employed in layer-type constructions; as perforated core clinched to soft components; as beaded steel gaskets; and in gasket flanges and fire rings.

**COPPER** is especially useful in situations where ductility and conformity to adjacent surfaces are important. Various tempers of copper may be employed depending on the desired stiffness, It is more resistant to corrosion than ordinary steel when in contact with the atmosphere, aqueous solutions, and various chemical solutions. Compared to other metals, it has a high thermal conductivity. Copper is frequently used in layer-type gaskets, and for grommets and washers.

**ALUMINUM** is a light weight metal having generally good corrosion resistance to various media. as well as excellent formability properties. Many different alloyed compositions and tempers are available for specific end use characteristics. Gasket applications for aluminum include layer gaskets and flanges.

| | Density lb/ft³ | Melting Point | Thermal Conductivity Btu/Ft.-Hr.-°F | Tensile Strength P.S.I. | Yield Strength P.S.I. |
|---|---|---|---|---|---|
| | 500 | 2500 °F | 26 | 50,000 | 30,000 |
| | 500 | 2500 °F | 26 | 50,000 | 30,000 |
| | 500 | 2500 °F | 9 | 90,000 | 40,000 |
| | 550 | 1980 °F | 220 | 40,000 | 35,000 |
| | 170 | 1220 °F | 118 | 13,000 | 5,000 |

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Victor

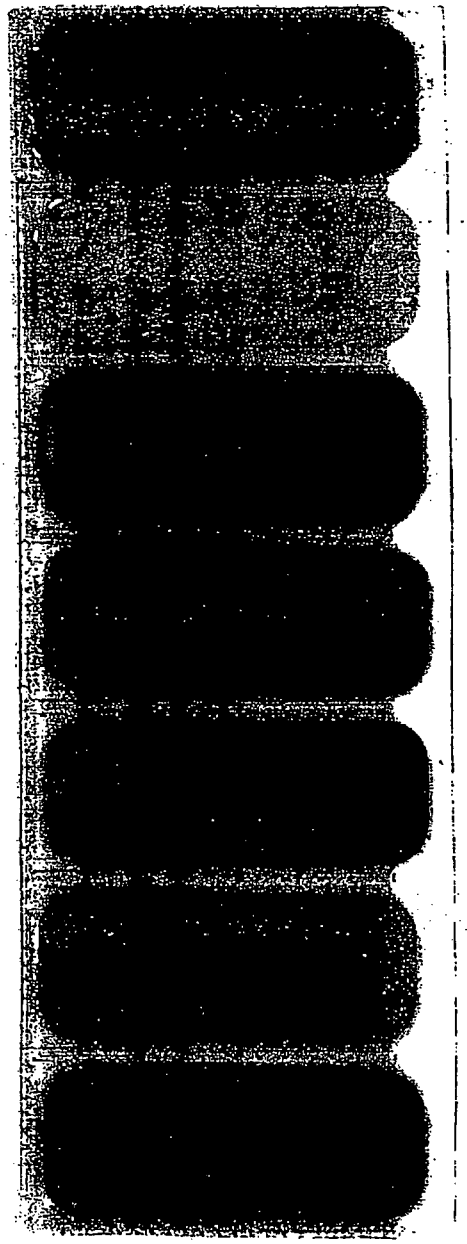
# VICTOPAC,® ASBESTOPRENE® AND ASBESTOPAC® MATERIALS

The VICTOPAC® family of "Compressed Asbestos Sheet Packings" are made from chrysotile asbestos fibers and elastomeric binders. These high density materials are made by a calender-sheeter process.

The ASBESTOPRENE® and ASBESTOPAC® materials are composed of chrysotile asbestos fibers and selected Victoprene® rubber latexes. The asbestos fibers are deposition coated with the specified latex in a papermill beater. The coated fibers are then formed into a continuous sheet on a paper making machine. The latex locks the fibers into a uniform and resilient sheet. These materials are for use where good engine coolant, oil and aromatic fuel resistance is required and temperatures to 500°F. are anticipated.

Mar '75

Victor



All tests based on .031 in. thickness — Properties of other thicknesses may vary slightly from those shown for .031 in.

Available in the following thicknesses & tolerances (inches).

| | | | | | |
|---|---|---|---|---|---|
| .016 | —.002 | +.005 | .047 | —.005 | +.005 |
| .031 | —.005 | +.005 | .062 | —.008 | +.008 |

The physical properties shown were obtained by the applicable procedures shown in parenthesis and listed on "Test Procedures" page.

| | Compressibility at 1000 psi (1) — % | Recovery after 1000 psi |
|---|---|---|
| **VICTOPAC 1** is produced with a styrene-butadiene binder. Although the binder is considered low in resistance to petroleum products, it has excellent resistance to engine coolants. The material will withstand high fluid and flange pressures, and in adequately bolted installations, heat to 800°F. It is intended for sealing on moderately rough flange surfaces. | 5-10 | |
| **VICTOPAC 14** is formulated with a special blend of elastomers specifically selected for excellent resistance to engine coolants and uniform swelling in fuel and oil. The swelling characteristic helps maintain the seal in applications where distorted mating surfaces, milling grooves, or unequal flange loads are encountered. It has excellent resistance to extrusion and torque loss at high and low flange loadings. | 5-10 | |
| **VICTOPAC 60** is made with a chloroprene binder. It is intended for use in applications where resistance to petroleum products and engine coolants is required. It withstands high fluid and flange pressures, and in adequately bolted installations, withstands heat to 800°F. It is also used for sealing gases. Because of the binder's resistance to ozone, it has excellent shelf life. | 5-10 | |
| **VICTOPAC 65** is intimately bound with a chloroprene binder. It is intended for use in applications where good resistance to petroleum products and engine coolants is required. It withstands high fluid pressures and extremely high flange pressures. It is specifically designed for applications where superior bolt load retention characteristics are required. In adequately bolted installations, it withstands heat to 800°F. It is normally coated with Victor 999 antistick. | 2-7 | |
| **VICTOPAC 70** is manufactured with an acrylonitrile butadiene binder. It is intended for use in applications where maximum resistance to petroleum products and engine coolants is required. It is desirable that the flange finishes be better than average and the bolting adequate. Under such conditions it will withstand high fluid and flange pressures and heat to 800°F. It has very good shelf life. | 5-10 | |
| **ASBESTOPRENE 233** is made with an acrylonitrile-butadiene latex binder. It is given a light calendering to create a medium density sheet. It is for use where medium bolting pressures and average flange finishes are available. | 20-30 | |
| **ASBESTOPAC 232** is also made with an acrylonitrile-butadiene copolymer. It is given a series of controlled calenderings to create a medium high density sheet. It is for use where medium high bolting pressures and smooth flange finishes are available. This material is normally coated with Victor 999 antistick. | 10-20 | |

| | | | | Immersion Effect after 5 hrs. at 300°F. in ASTM Oil #3 (3) | | | Immersion Effect after 5 hrs. at 70-85°F. in ASTM Fuel B (3) | | Immersion Effect after 22 hrs. at 70-85°F. in Water (4) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Recovery after 1000 psi (1) — Min. % | Compressibility at 5000 psi (2) — % | Recovery after 5000 psi (2) — Min. % | Tensile Strength (3) — Min. psi | Compressibility — Max. % | Tensile Loss — Max. % | Thickness Increase — % | Thickness Increase — % | Weight Increase — Max. % | Thickness Increase— Max. % | Weight Increase—Max. % | Sealability (5) Internal press. 20" Hg. — Min. psi | Stress Relaxation (7) typical — % | Dimensional change (9) typical — inches per inch |
| 40 | 7-17 | 40 | 2000 | — | 70 | 20-50 | 15-35 | 40 | 7 | 10 | 125 | 18 | .0025 |
| 40 | 7-17 | 40 | 2500 | — | 90 | 60-85 | 25-40 | 25 | 7 | 10 | 125 | 12 | .001 |
| 40 | 7-17 | 40 | 2000 | 30 | 50 | 15-30 | 10-25 | 30 | 7 | 10 | 125 | 13 | .001 |
| 40 | 5-15 | 40 | 2400 | 30 | 40 | 15-30 | 10-25 | 30 | 7 | 10 | 125 | 12 | .001 |
| 40 | 7-17 | 40 | 2000 | 20 | 30 | 0-13 | 0-15 | 20 | 7 | 10 | 125 | 19 | .001 |
| 35 | 30-50 | 20 | 1200 | 50 | 25 | 0-10 | 0-10 | 50 | 5 | 25 | 1000 | 25 | .002 |
| 40 | 20-30 | 40 | 1500 | 40 | 20 | 0-20 | 0-15 | 35 | 10 | 25 | 400 | 20 | .001 |

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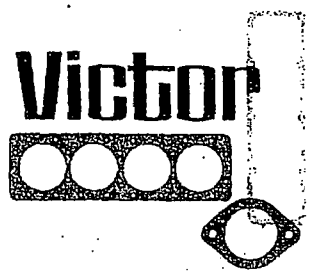
# CORAMIC®

## A HIGHLY STABLE MATERIAL FOR APPLICATIONS UP TO 1260°C (2300°F)






## CORAMIC® MATERIALS

Coramic 2300 is a high-temperature metal-reinforced gasket material developed for sealing engine components subjected to severe thermal operating conditions. It is composed of ceramic fibers held together with a unique binder and reinforced with an inner layer of perforated stainless steel to impart high radial strength to the sheet. It is for use in applications where extreme heat resistance is a major requirement. It will withstand up to 1260°C (2300°F) in continuous usage, far exceeding the limitations of asbestos-containing products.

Coramic 2300 is recommended for sealing hot gases in engine exhaust systems, turbochargers, and other high temperature applications where thermal stability is an absolute requirement. Coramic gaskets can be furnished with heat resistant metal flanges to enhance sealability in critical areas. This material is not intended for liquid sealing applications.

For more information on the Victor "Coramic" gasket to meet your specific application, write:

Dana Corporation, Victor Products Division
P.O. Box 1333
Chicago, Illinois 60690

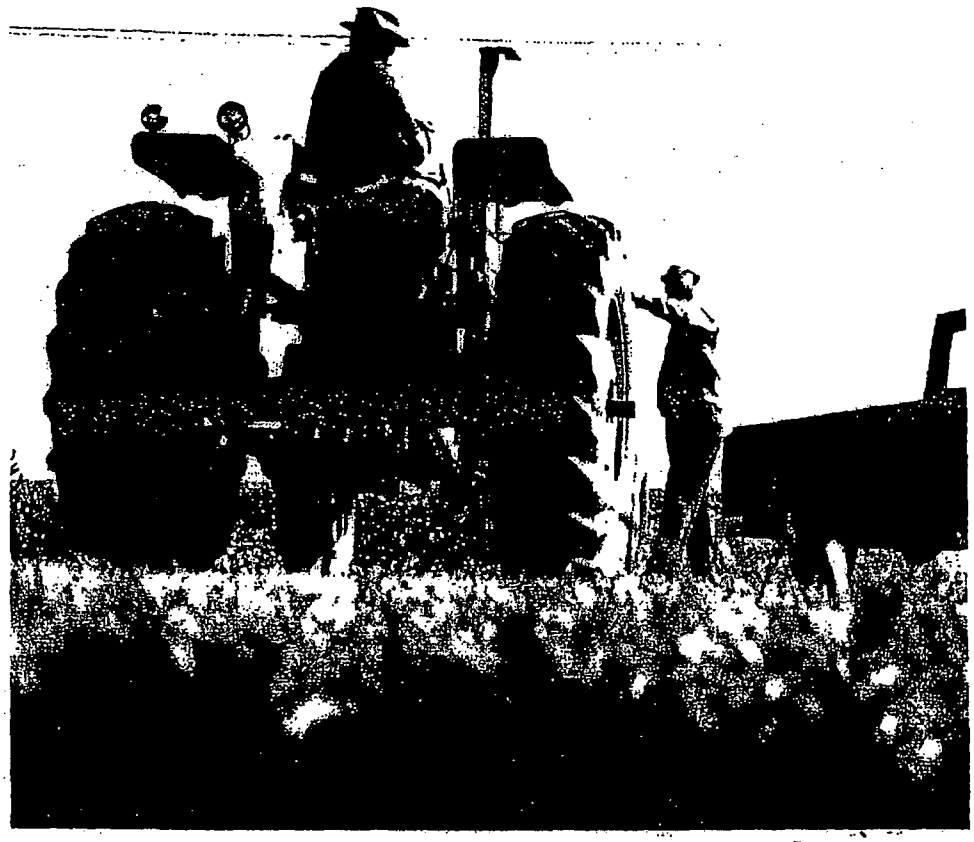

# CORAMIC® MATERIALS

## CORAMIC 2300 PHYSICAL PROPERTIES

| | |
|---|---|
| Available thickness, in. | .050/.055 |
| Creep Relaxation, ASTM F 38, Method B, 22 hr., 3000 psi, 204.4°C (400°F*), max., % | 35 |
| Compressibility and Recovery | |
| Compressibility at 1000 psi, % | 3-7 |
| Recovery after 1000 psi, min., % | 40 |
| Compressibility at 5000 psi, % | 7-14 |
| Recovery after 5000 psi, min., % | 40 |
| Heat Aging, 1 hour, 815.6°C (1500°F) | |
| Compressibility at 1000 psi, % | 4-9 |
| Recovery after 1000 psi, min., % | 40 |
| Compressibility at 5000 psi, % | 9-16 |
| Recovery after 5000 psi, min., % | 40 |
| Ignition Loss on ceramic/binder portion of material subjected to 815.6°C (1500°F) for 1 hour, % | 14-18 |
| Operating Temperature Range | |
| Maximum | +1260°C (+2300°F) |
| Minimum | −51.10C (−60°F) |

Compressibility and Recovery tests are conducted per ASTM F 36 using a .250 in. diameter penetrator, 5 lb preload, and single thickness of material.

*Maximum Limitation of ASTM test equipment.



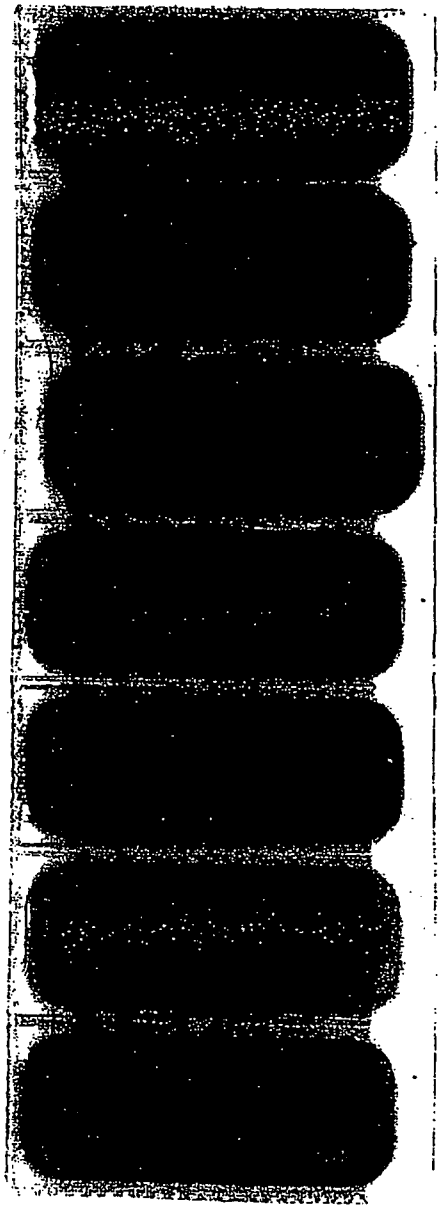
Victor

# VICTOLEX® AND VICTORITE® MATERIALS

VICTOLEX® gasketing materials combine cellulose fibers and latex. The cellulose fibers are deposition coated with latex by a patented process. These coated fibers are then formed into a sheet on a paper making machine. The latex locks the fibers into a compact uniform and resilient sheet. The material has good shelf life.

The VICTORITE® group of gasketing materials are also known as "Treated Plant Fiber Sheet Packings." The high absorbency basic paper is first saturated with a glue-glycerine solution. Next, the saturant is stabilized and made insoluble with a tanning agent treatment. Then the sheet is oven dried.

Victor



All tests based on .031 in. thickness — Properties of other thicknesses may vary slightly from those shown for .031 in.

Available in the following thicknesses & tolerances (inches).

| | | | | | |
|---|---|---|---|---|---|
| .016 | —.0035 | +.0035 | .047 | —.005 | +.005 |
| .031 | —.005 | +.005 | .062 | —.005 | +.005 |

The physical properties shown were obtained by the applicable procedures shown in parenthesis and listed on "Test Procedures" page.

| | Compressibility at 1000 psi (1) — % |
|---|---|
| **VICTOLEX 258** is made with a blend of synthetic latex binders. As a general purpose paper gasketing material it has medium compressibility and acceptable torque retention properties. | 17-27 |
| **VICTOLEX 342** is made with a nitrile butadiene latex binder. As a general purpose paper gasketing material it has low compressibility and acceptable torque retention properties. | 10-20 |
| **VICTOLEX 423** is made with a nitrile butadiene latex binder and incorporates cork in addition to the cellulose fibers to create a softer, more conformable sheet. It is a general purpose gasket material suitable for applications where the bolt loading is low. | 30-45 |
| **VICTOLEX 433** is made with a non-oil resistant latex binder and incorporates cork in addition to the cellulose fibers to create a softer, more conformable sheet. It is a general purpose gasket material suitable for applications where the bolt loading is low. | 30-45 |
| **VICTOLEX 867** is made with a nitrile butadiene latex binder. As a high density paper gasketing material it has low compressibility and good torque retention properties. For use where flange finishes are good and bolt loading is very adequate. | 5-15 |
| **VICTORITE B** is a general purpose low cost sheet for use where oil, gasoline and grease are to be contained. It is also suitable against a large number of organic liquids and solvents. | 25-40 |
| **VICTORITE R** is a general purpose low cost sheet for use where oil, gasoline and grease are to be contained. It is also suitable against a large number of organic liquids and solvents. It contains cork particles to give it higher compressibility and better conformability where the bolt loading is low. | 40-55 |

| | | | Immersion Effect after 22 hrs. at 70-85°F. in ASTM Fuel B (4) | | Immersion Effect after 22 hrs. at 70-85°F. in ASTM Oil #3 (4) | | Immersion Effect after 22 hrs. at 70-85°F. in Water (4) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Compressibility at 1000 psi (1) — % | Recovery after 1000 psi (1) — Min. % | Tensile Strength (3) — Min. psi | Thickness Increase — Max. % | Weight Increase — Max. % | Thickness Increase — Max. % | Weight Increase — Max. % | Thickness Increase — Max. % | Weight Increase — Max. % | Sealability (6) Internal press. 20" Hg. — Min. psi | Stress Relaxation (8) typical — % | Dimensional change (9) typical — inches per inch |
| 17-27 | 40 | 1600 | 30 | 65 | 30 | 80 | 55 | 80 | 500 | 24 | .030 |
| 10-20 | 40 | 2700 | 20 | 30 | 15 | 30 | 50 | 60 | 500 | 21 | .035 |
| 30-45 | 30 | 800 | 25 | 75 | 15 | 70 | 25 | 50 | 500 | 22 | .040 |
| 30-45 | 30 | 700 | 35 | 95 | 30 | 105 | 30 | 60 | 500 | 26 | .035 |
| 5-15 | 55 | 4000 | 10 | 25 | 5 | 25 | 40 | 40 | 500 | 17 | .035 |
| 25-40 | 40 | 2000 | 5 | 15 | 5 | 15 | 30 | 90 | 250 | 34 | .025 |
| 40-55 | 40 | 1000 | 5 | 30 | 5 | 30 | 30 | 100 | 500 | 34 | .030 |

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