JM Clipper Corporation

GASKET MATERIALS

JM CLIPPER

ISO 9001 CERTIFIED

The Tuff Sheet™ Family of Gaskets Materials

JM Clipper is proud to introduce a new family of compressed non-asbestos and PTFE gasket materials that we call the TUFF SHEET product line. Our goal for introducing the TUFF SHEET products is to offer our customers premium grade materials at a lower cost to the end user. In today's economy, we are all faced with increased pressure to reduce price on the products that we manufacture, while maintaining the quality and integrity of those products.

The products that are in the TUFF SHEET family are 978-C, 1078, NA-60 Service and Tuff-TFE 2000. These four sheets represent JM Clipper's new generation of compressed non-asbestos and PTFE sheet products. The 978-C, 1078 and NA-60 Service are all nitrile based sheets that were developed to perform in a wide range of general service applications. Tuff-TFE 2000 is a filled PTFE sheet that was designed to perform in aggressive applications.

You can now cover almost all applications with only two gasket materials. Choose one of the nitrile sheets for those less aggressive applications and Tuff-TFE 2000 for the more aggressive service.

Fugitive Emissions

It pays to select the best gasket and to follow good installation practice!

Aside from the obvious responsibility of each manufacturing facility to reduce costly and environmentally destructive leakage from the process system, there is the considerable cost of testing and record maintenance to consider.

The 1990 Clean Air Act requires all facilities, that handle any of the 189 Hazardous Air Pollutants (HAP), to identify—on site or on plant drawings—all connections and flanges that are involved with HAP. Each of these connections and flanges is to be sniffed for leakage, and that leakage recorded. If more than ***one half of one percent*** of these connections have leakage in excess of 500 ppm, ***all*** connections must have an annual check. If the test shows less than a half percent exceed the 500 ppm figure, the facility can move to a test every two years. At the end of two years, compliance with the 500 ppm maximum allows the test period to increase to four years. Failure to meet the standard, at any time, will result in a reduction of the test period to either a (very costly) two or one year schedule again.

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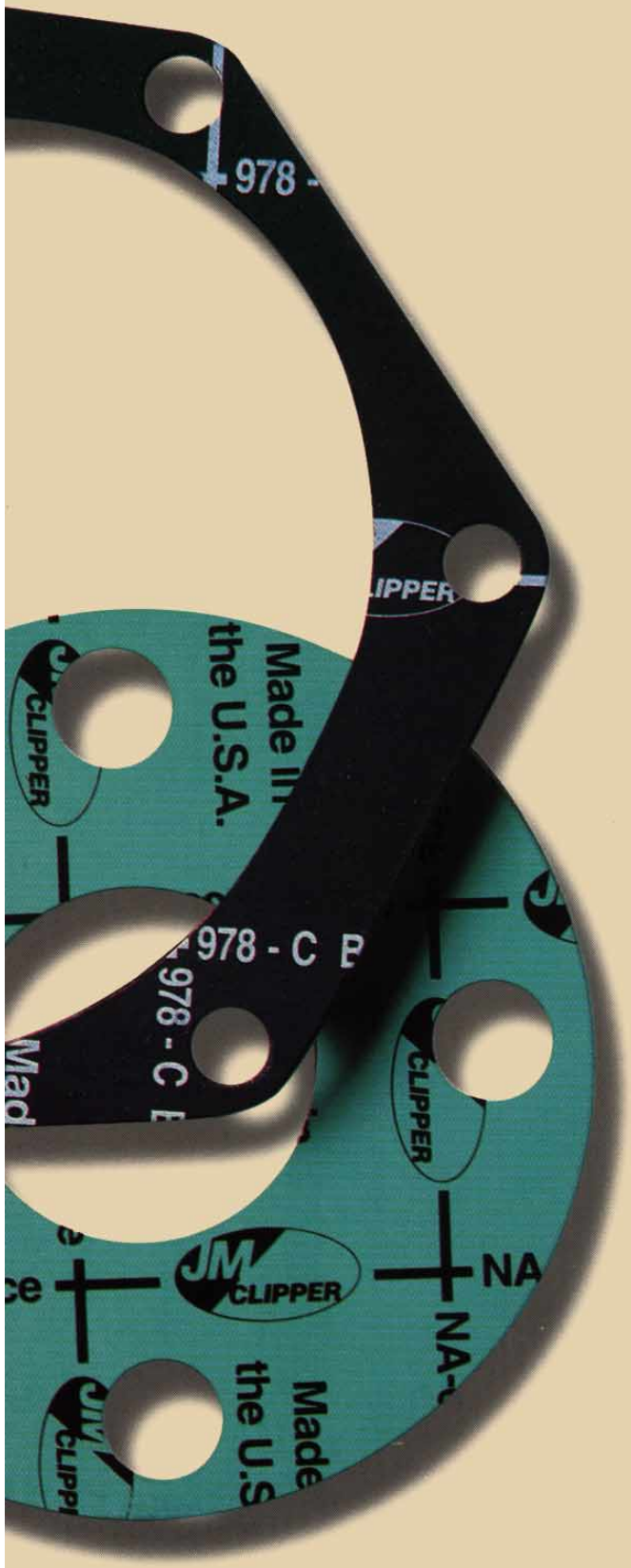


Choose two of these four Styles of Tuff-Sheet To Handle Most Gasket Applications

Choose one of the compressed sheets; 978-C (black); 1078 (white); or NA-60 Service (green) for mild chemical and general service, then add Style 2000 for the chemical extremes and you can maintain a minimum inventory of non-metallic gaskets for all types of service.

Style 978-C Black Gold® is a great success story. ***It's economical and it works when others won't.*** It handles chemicals well, has great sealing properties, and it performs well in high temperature, high pressure, saturated steam service. It's a third-generation, non-asbestos material that comes closest to the all-around high performance of asbestos materials that we were used to in the old days. *(See page 11 for steam test comparison with asbestos reinforced sheet.)*

Style 978-C uses an NBR binder. Keep it out of the highly aggressive chemicals, and it can be used widely in most applications on all equipment. Black Gold is a natural in the petroleum industry, but it has also been highly successful in pulp and paper service. It is recommended for broad service in all industries. Style 978-C is fully branded and coated with a high temperature parting agent.

Style NA-60 Service® If your present gasket material tends to give you problems meeting leakage standards, here is the material to use. Excellent sealability, low creep, and great performance in steam and a broad range of chemicals. It's a forgiving material that can be relied on for process piping or machinery. This new, high performance, general service, NBR sheet also is the best value, by far, of any of the quality gasket sheet on the market today. It's the economy champ of quality compressed gasket sheet. Style NA-60 Service is green in color, fully branded and coated with a high temperature parting agent.

Style 1078 Whitetrile® is an off-white version of 978-C. Like 978-C and NA-60 Service, it is a forgiving, easy handling sheet with great sealability and the same broad service capability.

Use Whitetrile when color contamination is a concern. It's a general service gasket material that is also especially good for intricate machinery gaskets. It cuts cleanly, strips well, and has the strength necessary for narrow flange widths. Like the other compressed sheets, Style 1078 Whitetrile is coated with a high temperature parting agent and fully branded with a cure date, as well as the JM Clipper logo.

Tuff-TFE™2000 picks up where other gasket materials leave off. It's a very high quality, PTFE-based gasket material that handles the tough chemical problems along with steam and almost any general service application. In its field, it's a stand-out because of its **lower cost**, and **superior sealability**. It's a natural choice when fugitive emissions are a concern.

This gold color gasket material is recommended for use with all types of machinery and process piping and equipment. It also meets the FDA requirements for use in food service. Tuff-TFE fabricates readily into clean, intricate gaskets, does not stick to flanges and can be used at temperatures as low as minus 350° F (–212°C). It's the material to select when looking for a single gasket to use throughout the plant.

Style 2000 is available in 1/16" & 1/8" thick; 60" x 60" or, 60" x 120" sheets. See page 9 for a list of chemical compatibility.

SERVICE PARAMETERS					
Style		978-C	NA-60	1078	2000
Maximum Pressure (P)	psi	1000	1000	1000	1200
	bar	69	69	69	83
Maximum Temperature (T)	°F	700	700	700	500
	°C	370	370	370	260
Maximum P x T	(psi x °F)	350,000	350,000	350,000	350,000

Note: See page 7 for sheet sizes of compressed gasket materials.

Compressed Non-Asbestos Gasket Sheet

For many years, this first generation family of compressed, non-asbestos gasket materials has served the diverse needs of industry. These are the original materials developed to replace the asbestos-based gasket materials. Although these styles are still successfully used in their special areas, our continuing development program has produced materials—such as our Tuff Sheet products—that have improved service envelopes at greater economy. Each of these materials is branded with the JM Clipper logo, and each is coated with a high-temperature parting agent.

Style 940 & 970 Red Devil® are high-tensile, compressed SBR and aramid fiber sheets. Style 970 is double-pressed to enhance its physical properties even more. The Red Devil styles are good, general - purpose materials, that offer extras such as suitability for use as extremely large gaskets and pads, small, thin, intricate gaskets, or dielectric materials*. Both styles are a distinctive red color.

*Electrical resistance is 150,000 megohms at 1/16" thick and 300,000 megohms at 1/8" thick.

Style 960 Omni-Night® is a black, SBR/aramid fiber sheet that is recommended where a lower cost SBR sheet is desired. It is a general service material that can be used in a wide range of chemicals.

Style 961 Omni-Light® is essentially an off-white version of Style 960, and can be used in the same service when the dark color of Style 960 is objectionable.

Style 976 White Night® is an off-white gasketing material that is designed for service in freon-type refrigerants and high aniline-point oils. It is a CR/aramid fiber sheet. Style 976 is also recommended for applications in ammonia gas, fuels, mild acids, mild alkalis, water, and silicate esters.

Style 986 Yellow Jacket® uses an EPDM binder and high-temperature fiber to create a gasket material for more severe applications. It can be used in steam, alkalis, brake fluids, phosphate esters, dilute acids, and animal and vegetable oils. Style 986 is yellow in color.

SERVICE PARAMETERS FOR ALL 5 STYLES:	
Maximum Pressure (P) (psi)	1000
Maximum Temperature (T) (°F)	600
Maximum P x T	350,000

Rubber and Vegetable Fiber Sheet

Style 104-C is a high-tensile, black, neoprene rubber sheet that is press-vulcanized to a plate finish. It is recommended for service in oil, gasoline, petroleum solvents, propane, butane, hydrogen, etc.

Temperature Limit	*250°F*
Pressure Limit	*200 psi (50 psi in steam)*
Durometer Hardness	*55-65*

Available 36" wide in thicknesses of 1/16", 3/32",1/8",3/16",1/4"

Style 105, a black, neoprene-rubber diaphragm sheet, is reinforced with a medium-weight duck. Style 105 is recommended for broad diaphragm application in oil and gasoline service where uniform structural strength is desired.

Temperature Limit	*250°F*	
Durometer Hardness	*65-75*	
Average Burst Rating Over 2" Opening	*1-ply*	*185 psi*
	2-ply	*285 psi*
	3-ply	*375 psi*
	4-ply	*425 psi*

Available 56" wide in thicknesses of 1/16",3/32",1/8",3/16",1/4"

Style 107 Liberty® — high grade, red rubber material for general service. It is suitable for medium pressure hydraulic applications such as hot and cold water, air and saturated steam. Style 107 is a relatively light weight material that remains soft and pliable, yet does not extrude in joints.

Liberty sheet is made from a special heat-resistant SBR rubber compound. It has a fine, cloth finish.

Durometer Hardness	*75-85*
Temperature Limit	*180°F*
Pressure Limit	*200 psi*
Pressure Limit, Steam	*50 psi*

Available 36" wide in thicknesses of 1/16",3/32",1/8",3/16",1/8"

Style 711 Seigelite® is made from plant fiber, impregnated with a glue/glycerin compound. It is a tough and resilient sheet that is recommended for sealing flanges handling gasoline, benzene, oil, greases, and hot or cold water. Seigilite will operate in temperatures to 250°F and, when cold, pressures to 500 psi.

Available 36" wide in thicknesses of .010",1/64",.020",1/32",1/16",1/8"

TYPICAL PROPERTIES — Gasket Sheet — 1/32" Thick

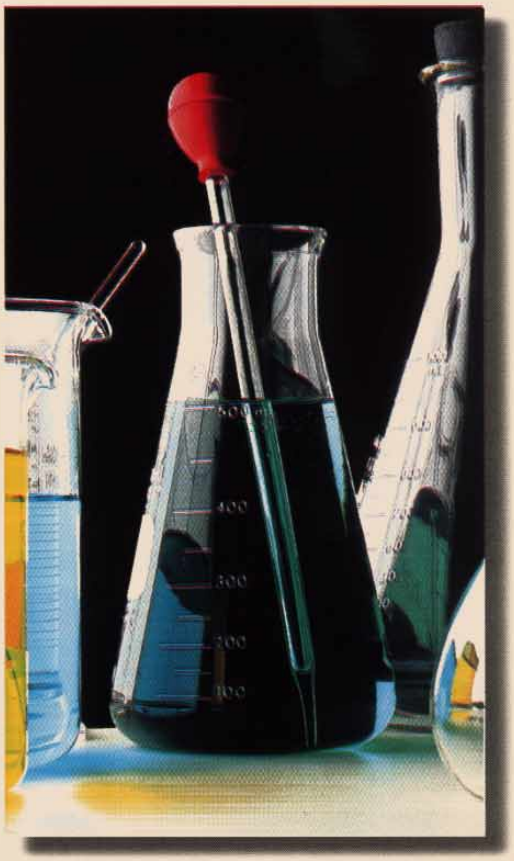
Style	978-C	NA-60	1078	2000 (1/16" Thick)
Compressibility (%)	7-17	7-17	10-25	25-35
ASTM F-36				
Recovery (% min.)	40	40	40	40
ASTM F-36				
Sealability (ml/min)	0.063	0.001	0.070	0.002
ASTM F-37 S_g = 3000 psi P = 30" Hg				
Creep Relaxation (%)	31.5	27.0	31.6	72.0
ASTM F-38				
Fluid Resistance				
ASTM F-146, 5 hrs #3 Oil @ 300° F				
Thickness Increase (%)	0-10	0-10	0-10	0.0
Weight Increase (% max)	5.0	20.0	20.0	0.4
Fuel B @ 75-85° F				
Thickness Increase (%)	0-10	0-10	0-10	0.2
Weight Increase (%)	6.0	20	17.7	0.5
Tensile Strength (psi)	2200	1900	2200	2200
ASTM F-152 Avg.				
Density (gr/cm^3)	1.80	1.87	1.44	2.16

NOTE: The test values shown here are typical average values and subject to change. They should not be used for specifications.

AVAILABLE SIZES

Style		NA-60	940	960	961	970	976	978C	986	1078	2000
Thickness	1/64"	•	•	•	•	•	•	•	•	•	
	1/32"	•	•	•	•	•	•	•	•	•	
	1/16"	•	•	•	•	•	•	•	•	•	•
	1/8"	•	•	•	•	•	•	•	•	•	•
Sheet Size	40x42"	•	•	•	•	•	•	•	•	•	
	40x63"	•	•	•	•	•	•	•	•	•	
	40x126"	•	•	•	•	•	•	•	•	•	
	50x51"	•	•	•	•	•	•	•	•	•	
	50x76 ½"	•	•	•	•	•	•	•	•	•	
	50x153"	•	•	•	•			•	•	•	
	60x60"										•
	60x63"	•	•	•	•	•	•	•	•	•	
	60x120"										•
	60x126"	•	•	•	•	•	•	•	•	•	
	75x76 ½"	•	•	•	•	•	•	•	•	•	
	75x153"	•	•	•	•			•	•	•	
	100x153"	•	•	•	•			•	•	•	
	120x126"	•	•	•	•			•	•	•	
	150x153"	•	•	•	•			•	•	•	

Product Development Quality Control



Gasket materials, like many products that perform a critical function, require much time and effort at product development, technical refinement, process control and quality assurance. At JM Clipper's Texas facility, such is the case. We thoroughly evaluate our products before introducing them to our customers and then maintain the quality level after they have been introduced to the market.

Because of the broad and critical service requirements of the various seals that are manufactured at the Texas plant, our well equipped laboratory and performance testing facility routinely conducts — not only industry standard testing — but also custom designed dynamic and static performance tests at varying pressure and temperature. Using the data developed in these testing programs, plus data from end-use testing, product performance-envelopes are established.

For example, in addition to the many routine performance tests, gasket materials are evaluated in the lab for their dynamic response to rising and falling temperatures under preset bolt loading. Also, catastrophic failure (blow-out) is examined while the gasket is under gradually increasing temperature and pressure—both when the gasket is installed dry and when it is installed "lubricated". Even though this type of laboratory testing cannot exactly duplicate field applications, it does provide a basis for comparison and performance expectation.

As proof of our commitment to maintain a high product-performance level with each and every shipment, the JM Clipper plant is approved to the quality control standard **MIL-I-45208A**, and is certified to the international quality standard **ISO-9001**.

Tuff - TFE 2000 Chemical Compatibility

A= Excellent, B=Good, C=Conditional, X=Not Recommended, Z=Insufficient Data

Abietic Acid	A	Butane	A	Diazinon	A	Hexachloroethane	A
Acetic Acid	A	Butyl Acetate	A	Dibutyl Phthalate	A	Hexane	A
Acetic Anhydride	A	Butyl Acrelate	A	Dibutyl Sebacate	A	Hydraulic Oil	A
Acetone	A	Butyl Alcohol, Butanol	A	Diesel Oil	A	Hydrazine	A
Acetylene	A	Butyl Amine	A	Diethyl Carbonate	A	Hydrobromic Acid	A
Acrylic Anydride	A	Butyl Methacrylate	A	Dimethyl Hydrazine		Hydrochloric Acid (-)150F	A
Air	A	N-Butyl Ether	A	Unsymmetrical	A	Hydrochloric Acid (+)150F	C
Allyl Acetate	A	Calcium Bisulfite	A	Dimethyl Formamide	A	Hydrocyanic Acid	A
Allyl Methacrylate	A	Calcium Carbonate	A	Dioxane	A	Hydrofluoric Acid	
Aluminum Chloride	A	Calcium Chloride	A	Dioxolane	A	Hot, Cold, all conc.	X
Aluminum Fluoride	A	Calcium Hydroxide	A	Dipentene	A	Anydrous	X
Aluminum Hydroxide	A	Calcium Hypochlorite	A	Dow Therm A	A	Hydrofluosilicic Acid	X
Aluminum Nitrate	A	Calcium Sulfide	A	Dow Therm E	A	Hydrogen Gas, Cold	A
Aluminum Sulfate	A	Caliche Liquors	A	Epoxy Resins	A	Hydrogen Gas, Hot	X
Alums	A	Cain Sugar Liquors	A	Ethane	A	Hydrogen Fluoride	X
Ammonia, Liquid	A	Carbolic Acid, Phenol	A	Ethers	A	Hydrogen Peroxide 10-90%	A
Ammonia, Gas, Cold	A	Carbon Bisulfide	A	Ethyl Acetate	A	Hydrogen Sulfide,	
Ammonia, Gas, Hot	A	Carbon Dioxide, Dry	A	Ethyl Acrylate	A	Dry, Cold	A
Ammonium Chloride	A	Carbon Dioxide, Wet	A	Ethyl Alcohol	A	Dry, Hot	C
Ammonium Hydroxide	A	Carbon Disulfide	A	Ethyl Benzene	A	Wet, Cold	A
Ammonium Nitrate	A	Carbon Monoxide	A	Ethyl Cellulose	A	Wet, Hot	C
Ammonium Phosphate		Carbon Tetrachloride	A	Ethyl Chloride	A	Iodine	A
Mono-basic	A	Carbonic Acid	A	Ethyl Ether	A	Iodine Pentafluoride	X
Dibasic	A	Castor Oil	A	Ethyl Hexoate	A	Isobutane	A
Tribasic	A	Cetane, Hexadecane	A	Ethylene	A	Isophorone	A
Ammonium Sulfate	A	China Wood Oil	A	Ethylene Bromide	A	Isopropyl Acetate	A
Ammonium Sulfide	A	Chlorine, Dry	A	Ethylene Dichloride	A	Isopropyl Alcohol	A
Amyl Acetate	A	Chlorine, Wet	A	Ethylene Glycol	A	Isopropyl Chloride	A
Amyl Alcohol	A	Chlorine Dioxide	A	Ethylene Oxide	A	Isopropyl Ether	A
Aniline, Oil	A	Chlorine Trifluoride	X	Ferric Chloride	A	Jet Fuel	A
Aniline, Dyes	A	Chloroazotic Acid	A	Ferric Phosphate	A	Kerosene	A
Aqua Regia	A	Chloronitrous Acid	A	Ferric Sulfate	A	Lacquers	A
Arsenic Acid	A	Chlorinated Solvents, Dry	A	Fluorine, Gas	X	Lacquer Solvents	A
Asphalt	A	Chlorinated Solvents, Wet	A	Fluorine, Liquid	X	Lactic Acid	A
Barium Chloride	A	Chloroacetic Acid	A	Fluorine Dioxide	X	Linseed Oil	A
Barium Hydroxide	A	Chloroethylene	A	Formaldehyde	A	Lime Saltpeter	A
Barium Salt	A	Chloroform	A	Formic Acid	A	Liquid Petroleum Gas	A
Barium Sulfide	A	Chlorosulfonic Acid	A	Freon	A	Liquimoly	A
Beer	A	Chromic Acid	A	Fuel Oil	A	Lubricating Oils	A
Beet, Sugar, Liquors	A	Chromic Anydride	A	Fuel Oil Acid	A	Lye Solutions	A
Benzene, Benzol	A	Chromium Trioxide	A	Furfural	A	Magnesium Chloride	A
Benzine, Naphtha	A	Citric Acid	A	Gasoline, Sour	A	Magnesium Hydroxide	A
Benzonitrile	A	Copper Acetate	A	Gasoline, Refined	A	Magnesium Salt	A
Benzyl Alcohol	A	Copper Chloride	A	Gelatin	A	Magnesium Sulfate	A
Benzyl Chloride	A	Copper Salt	A	Glucose	A	Mercuric Chloride	A
Black Sulfate Liquor	A	Copper Sulfate	A	Glue	A	Mercury	A
Bleach, Liquors	A	Corn Oil	A	Glycerine, Glycerol	A	Methane	A
Borax	A	Cottonseed Oil	A	Glycol	A	Methacylic Acid	A
Boric Acid	A	Creosote, Coal Tar	A	Grain Alcohol	A	Methyl Chloride	A
Brine	A	Creosote,Wood	A	Grease	A	Methyl Ethyl Ketone	A
Bromine	A	Creosylic Acid	A	Green Sulfate Liquor	A	Methyl Methacrylate	A
Bromine Trifluoride	X	Cyclohexane	A	Hannifin Lube A	A	Milk	A
Bromine Water	A	Cyclohexanone	A	Helium	A	Mineral Oils	A
Butadiene	A	Diacetone	A	Heptane	A	Molten Alkali Metals	A

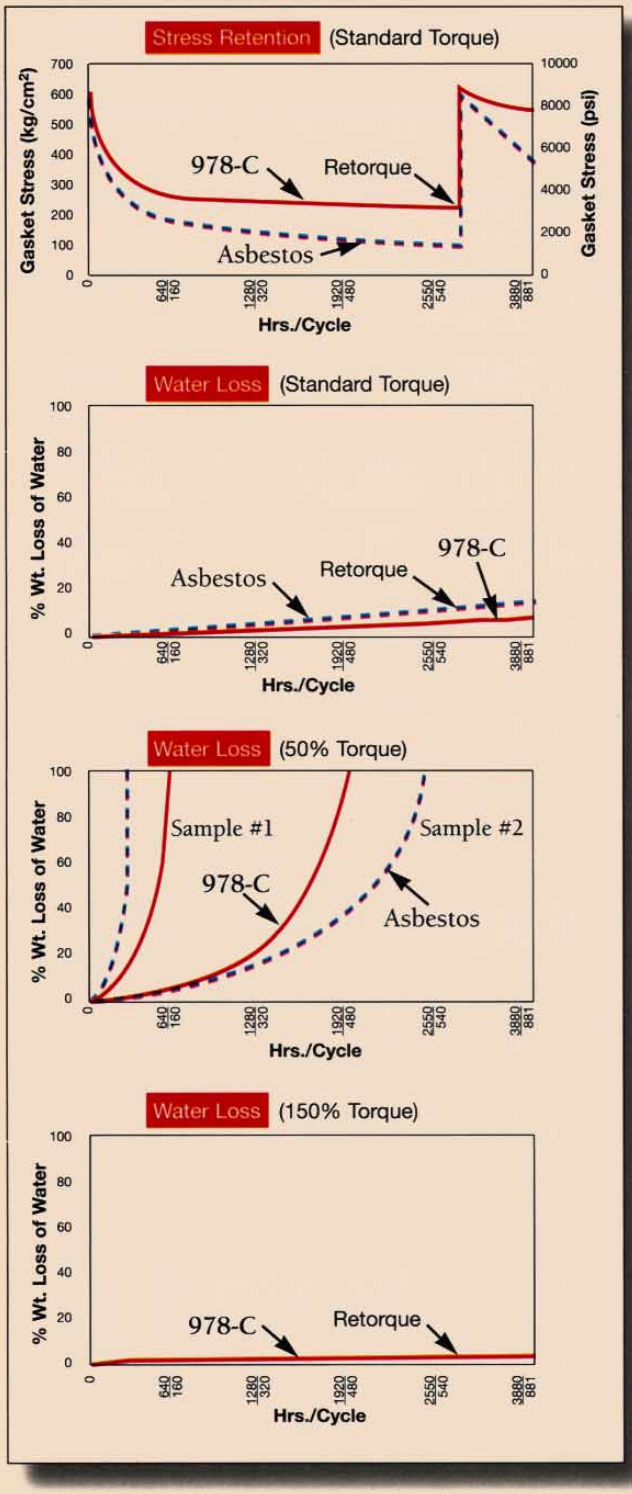
Muriatic Acid	A	Perchloric Acid	A	Salt Water	A	10-75% Cold	A
Naphtha	A	Perchloroethylene	A	Sewage	A	10-75% Hot	A
Naphthalene	A	Pentachlorobenzamide	A	Silicone Greases	A	75-90% Cold	A
Naphthols	A	Petroleum Oils, Crude	A	Silicone Oils	A	75-95% Hot	C*
Natural Gas	A	Phenol	A	Silver Nitrate	A	Fuming	C*
Nickel Acetate	A	Phosphoric Acid	A	Soap Solutions	A	Tannic Acid	A
Nickel Chloride	A	Phosphorous Pentachloride	A	Soda Ash, Sodium Carbonate	A	Tar	A
Nickel Salts	A	Phthalic Acid	A	Sodium Bicarbonate	A	Tetrachloroacetic Acid	A
Nickel Sulfate	A	Pinene	A	(Baking Soda)		Tetrachloroethylene	A
Nitric Acid (Crude)	A	Piperidene	A	Sodium Bisulfate	A	Tung Oil	A
Nitric Acid < 30%	A	Polyacrylonitrile	A	Sodium Chloride	A	Turbine Oil	A
Nitric Acid > 30%	A	Potash, Potassium	A	Sodium Cyanide	A	Turpentine	A
Nitric Acid, Red Fuming	A	Potassium Acetate	A	Sodium Dioxide	A	Varnish	A
Nitrobenzine	A	Potassium Bichromate	A	Sodium Hydroxide	A	Vegetable Oil	A
Nitrocalcite	A	Potassium Chloride	A	Sodium Nitrate	A	Vinegar	A
Nitrogen	A	Potassium Chromate, Red	A	Sodium Peroxide	A	Vinyl Chloride	A
Nitrogen Tetroxide	A	Potassium Cyanide	A	Sodium Phosphate		Water, Tap	A
Nitromethane	A	Potassium Dichromate	A	Mono-Basic	A	Water, Distilled	A
Nitromuriatic Acid	A	Potassium Permangenate	A	Dibasic	A	Water, Return Condensate	A
Nitrohydrochloric Acid	A	Potassium Sulfate	A	Tribasic	A	Water, Sea	A
Norwegian Saltpeter	A	Produce Gas	A	Sodium Sulfate	A	Whiskey & Wines	A
N-Octadecyl Alcohol	A	Propane	A	Sodium Sulfide	A	Wood Alcohol	A
Oleic Acid	A	Propylene	A	Soybean Oil	A	Xylene, Para-Xylene	A
Oleum Spirits	A	Propyl Oxide	A	Steam <500F	A	Xylol	A
Oxalic Acid	A	Propyl Nitrate	A	Styrene	A	Zinc Acetate	A
Oxygen	A	Prussic Acid		Sulfur Chloride	A	Zinc Chloride	A
Palmitic Acid	A	(Hydrocyanic Acid)	A	Sulfuric Acid		Zinc Sulfate	A
Paint Thinner	A	Pyridine	A	10% Cold	A		
Paraffin	A	Saltpeter (Potassium Nitrate)	A	10% Hot	A		

GENERAL CHEMICAL RESISTANCE PROPERTIES

E = Excellent G = Good F = Fair P = Poor

Elastomer	SBR	EPDM	Neoprene	Nitrile
Oil & Gasoline	P	P	F-G	G-E
Animal & Veg Oils	F	G	G	G-E
Alcohols	G	F-G	G-E	F-G
Alkalis	F	G-E	E	G-E
Acids	F-G	G	G	G
Solvents: Aliphatic Hydrocarbon	P	P	G	E
Solvents: Aromatic Hydrocarbon	P	P	P-F	F-G
Solvents: Oxygenated	G	G-E	P-F	P

*The Effect Of Bolt Torque On Gaskets In A Simulated Steam Test.**



A steam-cell test was designed to determine inservice gasket-stress retention and water loss of various fiber-reinforced gasket materials in saturated steam. The purpose of the test is to help predict the capability of a gasket material to withstand steam over a period of time.

As part of the test, the effect of retorquing, half-torquing and torquing to one and one-half times the standard torque was examined. Bolt stress was measured with an ultrasonic bolt sensor. Water loss was determined directly through a cumulative weight measurement.

Procedure: Two cells were used for each gasket tested, with the gaskets initially loaded to 8700 psi. The cells were cyclically heated, putting even greater demands on the gasket. One complete cycle consisted of two hours at 250°C (steam pressure 580 psi) and two hours ramping down and back up. The cells were subjected to 880 temperature cycles plus an additional 360 hours at temperature without cycling, for a cumulative 3880 hours of exposure. One of the two cells was retorqued to the original stress after 800 cycles. Every 80 cycles, measurements were taken of both retained gasket stress and water loss.

The test was conducted on high-performance aramid fiber reinforced and asbestos fiber reinforced gaskets. The test results of JM Clipper 978-C (an aramid fiber reinforced material) and the best performing asbestos reinforced material are shown here.

The best brands of aramid fiber reinforced gaskets in this test compared favorably with the best brands of asbestos fiber reinforced gaskets. Retorquing improved the performance of both and, whereas a low initial gasket stress led to early failure of both, an excessive stress on the JM Clipper 978-C actually improved performance and resulted in no detrimental effect on the gasket.

*DuPont Advanced Fiber Systems. "A Steam Service Gasket Qualification Test Fixture and Procedure." Presented by Dr. Arnold Frances at the 5th Annual Technical Symposium of the Fluid Sealing Association.

Gasket Installation Tips

1) Be *very* sure all flange surfaces are clean and functional. Use adequate lighting so the surfaces can be examined properly. Look for traces of old gasket material, nicks, scratches, cracks, warping, or corrosion. Depending on the severity, any one of these problems can cause an unstoppable leak.

2) As a general rule, the gasket ID should be slightly larger than the inside bore. Remember—with pipe flanges, different flange types can have different ID's for the same pipe size.

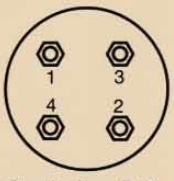
3) Don't rely on the flange bolts to force sprung flanges back to parallel or in-line. Try to line up the flanges before bolting up.

4) Clean back-side spot faces and clean and lubricate (well) all bolts or studs.

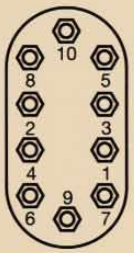
5) Always use a torque wrench or similar device to apply *sufficient and equal* force to all bolts.

6) For the initial snug-up, follow a tightening sequence similar to the diagrams below. *Apply one-half the final torque.* The idea is to iron the gasket outward from the center of its sides.

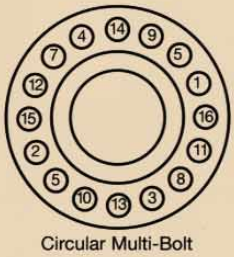
7) Apply a final, uniform torque in any sequence. Make sure each bolt is pulling the same load.



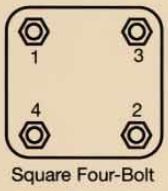
Circular Four-Bolt



Non-Circular Multi-Bolt



Circular Multi-Bolt



Square Four-Bolt

WATER HEADS & EQUIVALENT PRESSURES

Head		Pressure	
feet	meters	psi	bar
5	1.52	2.17	0.15
10	3.05	4.33	0.30
15	4.57	6.50	0.45
20	6.10	8.67	0.60
25	7.62	10.83	0.75
30	9.14	13.00	0.90
35	10.67	15.17	1.05
40	12.19	17.33	1.20
45	13.72	19.50	1.34
50	15.24	21.67	1.49
60	18.29	26.00	1.79
70	21.34	30.33	2.09
80	24.38	34.66	2.39
90	27.43	39.00	2.69
100	30.48	43.33	2.99
125	38.10	54.16	3.73
150	45.72	65.00	4.48
175	53.34	75.83	5.23
200	60.96	86.66	5.98
225	68.58	97.49	6.72
250	76.20	108.33	7.47
275	83.82	119.16	8.22
300	91.44	129.99	8.96
325	99.06	140.82	9.71
350	106.68	151.66	10.46
375	114.30	162.49	11.20
400	121.92	173.32	11.95
425	129.54	184.15	12.70
450	137.16	194.99	13.44
475	144.78	205.82	14.19
500	152.40	216.65	14.94
550	167.64	238.32	16.43
600	182.88	259.98	17.93
650	198.12	281.65	19.42
700	213.36	303.31	20.91
750	228.69	324.98	22.41
800	243.84	346.64	23.90
850	259.08	368.31	25.39
900	274.32	389.97	26.89
950	289.56	411.64	28.38
1000	304.80	433.30	29.88

STEAM TABLE

Gauge Pressure		Temp		Gauge Pressure		Temp		Gauge Pressure		Temp		Gauge Pressure		Temp	
psi	bar	°F	°C	psi	bar	°F	°C	psi	bar	°F	°C	psi	bar	°F	°C
0	0.00	212	100	53	3.65	301	149	132	9.10	356	180	305	21.03	423	217
1	0.07	216	102	54	3.72	302	150	134	9.24	357	181	315	21.72	426	219
2	0.14	219	104	55	3.79	302	150	136	9.38	359	182	325	22.41	429	221
3	0.21	222	106	56	3.86	303	151	138	9.51	360	182	335	23.10	431	222
4	0.28	225	107	57	3.93	304	151	140	9.65	361	183	345	23.79	434	223
5	0.34	228	109	58	4.00	305	152	142	9.79	362	183	355	24.48	437	225
6	0.41	230	110	59	4.07	306	152	144	9.93	363	184	365	25.17	439	226
7	0.48	233	112	60	4.14	307	153	146	10.07	364	184	375	25.86	442	228
8	0.55	235	113	61	4.21	308	153	148	10.20	365	185	385	26.54	444	229
9	0.62	237	114	62	4.27	309	154	150	10.34	366	186	395	27.23	447	231
10	0.69	240	116	63	4.34	310	154	152	10.48	367	186	405	27.92	449	232
11	0.76	242	117	64	4.41	311	155	154	10.62	368	187	415	28.61	451	233
12	0.83	244	118	65	4.48	312	156	156	10.76	368	187	425	29.30	454	234
13	0.90	246	119	66	4.55	312	156	158	10.89	369	187	435	29.99	456	236
14	0.97	248	120	67	4.62	313	156	160	11.03	370	188	445	30.68	458	237
15	1.03	250	121	68	4.69	314	157	162	11.17	371	188	455	31.37	460	238
16	1.10	252	122	69	4.76	315	157	164	11.31	372	189	465	32.06	462	239
17	1.17	254	123	70	4.83	316	158	166	11.45	373	189	475	32.75	464	240
18	1.24	255	124	71	4.90	317	158	168	11.58	374	190	485	33.44	467	242
19	1.31	257	125	72	4.96	317	158	170	11.72	375	191	505	34.82	471	244
20	1.38	259	126	73	5.03	318	159	172	11.86	376	191	525	36.20	475	246
21	1.45	261	127	74	5.10	319	159	174	12.00	377	192	545	37.58	478	248
22	1.52	262	128	75	5.17	320	160	176	12.13	378	192	565	38.96	482	250
23	1.59	264	129	76	5.24	321	161	178	12.27	378	192	585	40.33	486	252
24	1.65	265	129	77	5.31	321	161	180	12.41	379	193	605	41.71	489	254
25	1.72	267	131	78	5.38	322	161	182	12.55	380	193	625	43.09	493	256
26	1.79	268	131	79	5.45	323	162	184	12.69	381	194	645	44.47	496	258
27	1.86	270	132	80	5.52	324	162	186	12.82	382	194	685	47.23	503	262
28	1.93	271	133	82	5.65	325	163	188	12.96	383	195	725	49.99	509	265
29	2.00	273	134	84	5.79	327	164	190	13.10	384	196	765	52.75	515	268
30	2.07	274	134	86	5.93	328	164	192	13.24	384	196	805	55.50	521	272
31	2.14	275	135	88	6.07	330	166	194	13.38	385	196	845	58.26	526	274
32	2.21	277	136	90	6.21	331	166	196	13.51	386	197	885	61.02	532	278
33	2.28	278	137	92	6.34	332	167	198	13.65	387	197	925	63.78	537	281
34	2.34	279	137	94	6.48	334	168	200	13.79	387	197	965	66.53	542	283
35	2.41	281	138	96	6.62	335	168	205	14.13	389	198	985	67.91	544	284
36	2.48	282	139	98	6.76	336	169	210	14.48	391	199	1,035	71.36	550	288
37	2.55	283	139	100	6.89	338	170	215	14.82	393	201	1,085	74.81	556	291
38	2.62	284	140	102	7.03	339	171	220	15.17	395	202	1,135	78.26	561	294
39	2.69	285	141	104	7.17	340	171	225	15.51	397	203	1,185	81.70	567	297
40	2.76	287	142	106	7.31	341	172	230	15.86	399	204	1,235	85.15	572	300
41	2.83	288	142	108	7.45	343	173	235	16.20	401	205	1,285	88.60	577	303
42	2.90	289	143	110	7.58	344	173	240	16.55	402	206	1,335	92.05	582	306
43	2.96	290	143	112	7.72	345	174	245	16.89	404	207	1,385	95.49	587	308
44	3.03	291	144	114	7.86	346	174	250	17.24	406	208	1,435	98.94	591	311
45	3.10	292	144	116	8.00	348	176	255	17.58	407	208	1,485	102.39	596	313
46	3.17	293	145	118	8.14	349	176	260	17.93	409	209	1,585	109.28	604	318
47	3.24	294	146	120	8.27	350	177	265	18.27	411	211	1,685	116.18	613	323
48	3.31	295	146	122	8.41	351	177	270	18.62	412	211	1,785	123.07	621	327
49	3.38	297	147	124	8.55	352	178	275	18.96	414	212	1,885	129.97	628	331
50	3.45	298	148	126	8.69	353	178	280	19.31	415	213	1,985	136.86	635	335
51	3.52	299	148	128	8.83	354	179	285	19.65	417	214				

STYLE NUMBER INDEX

ASTM F 104 LINE CALL OUT (1/32" thick)

BY LINE CALL OUT		BY MATERIAL STYLE	
F455111A9B9E11M6	2000 (1/16")	NA-60	F712130A9B5E32M4
F712111A9B3E11M6T	978-C	940	F715400A9B5E05M6
F712130A9B5E32M4	NA-60	960	F714300A9B5E04M5
F714000A9B6E31M5	986	961	F715351A9B4E05M4
F714130A9B5E32M6	1078	970	F714400A9B5E05M6
F714300A9B5E04M5	960	976	F714330A9B6E04M6
F714330A9B6E04M6	976	978-C	F712111A9B3E11M6T
F714400A9B5E05M6	970	986	F714000A9B6E31M5
F715351A9B4E05M4	961	1078	F714130A9B5E32M6
F715400A9B5E05M6	940	2000 (1/16")	F455111A9B9E11M6

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JM Clipper Corporation
P.O. Drawer 2340
Nacogdoches, TX 75963-2340
Phone: 1-800-233-3900
In Texas: 936-560-8900
Fax: 936-560-8998

Redmond Plastics Division
P.O. Box 6
Marion, NY 14505

NOTE:
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