

SUBMITTAL INFORMATION

"BOLTS, NUTS AND FLAT WASHERS"
"ABSTRACT OF ASTM A307 GRADE A AND B"
CARBON STEEL BOLTS AND STUDS, 60,000 PSI TENSILE STRENGTH

GRADE: LOW CARBON STEEL

CHEMICAL REQUIREMENTS:

	<u>GRADE A</u>	<u>GRADE B</u>
PHOSPHOROUS MAX %	0.06	0.04
SULFUR, MAX %	0.15	0.05

CHEMICAL ANALYSES SHALL BE PERFORMED IN ACCORDANCE WITH ASTM A751.

MECHANICAL REQUIREMENTS:

	<u>MIN.</u>	<u>MAX.</u>
HARDNESS - BRINELL	121	241
- ROCKWELL	69	100
TENSILE STRENGTH (KSI)	60	100
ELONGATION IN 2 IN., %	18	

DIMENSIONS:

UNLESS OTHERWISE SPECIFIED, THREADS SHALL BE THE COARSE THREAD SERIES AS SPECIFIED IN THE LATEST ISSUE OF ANSI/ASME B1.1, PAGE A-26. HAVING A CLASS 2a TOLERANCE. GRADE A BOLTS SHALL BE HEX BOLTS WITH DIMENSIONS AS GIVEN IN THE LATEST ISSUE OF ANSI/ASME B18.2.1, PAGE C-1. UNLESS OTHERWISE SPECIFIED GRADE B BOLTS SHALL BE HEAVY HEX BOLTS.

IDENTIFICATION SYMBOL: "A 307 A" OR "A 307 B"

NUTS:

NUTS SHALL CONFORM TO ASTM A563 "CARBON AND ALLOY STEEL NUTS" AND SHALL CONFORM IN DIMENSIONS PRESCRIBED IN ANSI/ASME/ASME B18.2.2. UNLESS OTHERWISE SPECIFIED, FINISHED HEX NUTS WILL BE SUPPLIED WITH GRADE A 307, A BOLTS AND THE HEAVY SERIES WILL BE SUPPLIED WITH GRADE A 307, B BOLTS.

OTHER:

BOLTS AND NUTS MAY BE SUPPLIED IN PLAIN, ZINC PLATED, HOT-DIPPED OR MECHANICALLY GALVANIZED FINISHES.

FLAT WASHERS:

ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

ADDITIONAL INFORMATION:

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM A 307, DTD 1994, AND ASTM A 563, DTD 1996.

SUBMITTAL INFORMATION

"STUDS, BOLTS, NUTS AND FLAT WASHERS"
"ABSTRACT OF ASTM A193/ASTM A194"
"GRADE B7"

GRADE: CHROMIUM-MOLYBDENUM (AISI) 4140

CHEMICAL REQUIREMENTS:

	<u>RANGE</u>	<u>VARIATION</u>
CARBON,	0.37 - 0.49	0.02
MANGANESE	0.65 - 1.10	0.04
PHOSPHOROUS, MAX	0.35	0.005 OVER
SULFUR, MAX	0.040	0.005 OVER
SILICON	0.15 - 0.35	0.02
CHROMIUM	0.75 - 1.20	0.05
MOLYBDENUM	0.15 - 0.25	0.02

MECHANICAL REQUIREMENTS:

	UP TO 2-1/2" DIA. <u>MINIMUM</u>
TENSILE STRENGTH (KSI)	125
YIELD STRENGTHS (KSI)	105
ELONGATION (%)	16
REDUCTION OF AREA (%)	50

IDENTIFICATION SYMBOL: B7

OTHER:

ALL BOLTS, NUTS & STUDS, SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B1.1, PAGE A-26, CLASS 2a FIT, SIZES 1 IN. AND SMALLER IN DIAMETER WITH THE COARSE-THREAD SERIES, AND 1-1/8 IN. AND LARGER IN DIAMETER WITH THE 8-PITCH-THREAD SERIES.

BOLT HEADS SHALL BE IN ACCORDANCE WITH THE DIMENSIONS OF ASNI/ASME B18.2.1, PAGE C-1, THE HEAVY HEX SERIES BOLTS SHALL BE USED. NUTS SHALL CONFORM TO ASTM A 194, THE HEAVY HEX SERIES NUTS GRADE 2H SHALL BE USED.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM 193/A193M, DTM 1997 (ALLOY STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICES) AND IN ASTM A194/A194M, DTD 1997 (CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-TEMPERATURE SERVICE).

FLAT WASHERS:

ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

SUBMITTAL INFORMATION

"HIGH STRENGTH BOLTS FOR STRUCTURAL STEEL JOINTS" "ABSTRACT OF ASTM A325"

GRADE: TYPE 1, MEDIUM CARBON STEEL

CHEMICAL REQUIREMENTS: (BASED UPON HEAT ANALYSIS)

	<u>TYPE 1</u>
CARBON	0.30 MIN
MANGANESE	0.50 MIN
PHOSPHOROUS	0.04 MIN
SULFUR	0.05 MIN

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>	<u>MAXIMUM</u>
HARDNESS – BRINELL	223	331
- ROCKWELL	19	35
TENSILE STRENGTH (KSI)	105	120
ELONGATION IN 2 IN., (%)	14	

DIMENSIONS: BOLTS WITH HEX HEADS SHALL BE FULL-BODY BOLTS CONFORMING TO THE DIMENSIONS FOR HEAVY HEX STRUCTURAL BOLTS SPECIFIED IN ANSI/ASME B18.2.1. THREADS SHALL BE UNIFIED COARSE THREAD SERIES AS SPECIFIED IN ANSI/ASME B1.1 WHEN SPECIFIED, 8 PITCH THREADS SERIES MAY BE USED ON BOLTS OVER 1 INCH IN DIAMETER. COMMON BOLT SIZES AND TOTAL THREAD LENGTHS ARE AS FOLLOWS:

5/8"-11	1.25"
3/4"-10	1.38"
7/8"-9	1.50"
1"-8	1.75"

IDENTIFICATION SYMBOL: "A325"

NUTS: ASTM A194/A194M, COVERS SEVERAL GRADES OF CARBON AND ALLOY STEEL NUTS. TWO OF ITS GRADES (2) AND (2H) ARE FREQUENTLY USED WITH HIGH STRENGTH STRUCTURAL BOLTS.

OTHER: BOLTS AND NUTS MAY BE SHIPPED IN PLAIN, ZINC PLATED, HOT-DIPPED OR MECHANICALLY GALVANIZED FINISHES.

FLAT WASHERS: ALL WASHERS SHALL BE HARDENED STEEL CONFORMING TO F436.

ADDITIONAL INFORMATION: ADDITIONAL INFORMATION CAN BE FOUND IN ASTM A325, DTD 1997 AND IFI "COMMENTARY ON HIGH STRENGTH BOLTING"

SUBMITTAL INFORMATION

"BOLTS, NUTS AND FLAT WASHERS" "ABSTRACT OF ASTM A193/ASTM A194" "GRADE B8" T-304

GRADE: UNSTABILIZED 18 CHROMIUM, 8 NICKEL, (AISI TYPE 316)

CHEMICAL REQUIREMENTS:

	<u>RANGE</u>	<u>VARIATION</u>
CARBON MAX	0.08	0.01 OVER
MANGANESE	2.00	0.04 OVER
PHOSPHOROUS, MAX	0.045	0.01 OVER
SULFUR, MAX	0.03	0.005 OVER
SILICON	1.00	0.005 OVER
CHROMIUM	16.00 - 20.00	0.20
NICKEL	8.00 - 10.5	0.15

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>
TENSILE STRENGTH (KSI)	75
YIELD STRENGTHS (KSI)	30
ELONGATION (%)	30
REDUCTION OF AREA (%)	50
HARDNESS (BRINELL)	223
HARDNESS (ROCKWELL)	B96

NOTES: MATERIALS ARE CARBIDE SOLUTION TREATED

IDENTIFICATION SYMBOL: B8

OTHER:

ALL BOLTS, NUTS & STUDS, UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B1.1, PAGE A-26, CLASS 2a FIT.

BOLT HEADS SHALL BE IN ACCORDANCE WITH THE DIMENSIONS OF ANSI/ASME B18.2.1, PAGE C-1. UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER, THE HEAVY HEX SCREWS SERIES SHOULD BE USED. NUTS SHALL CONFORM TO ASTM 194, UNLESS OTHERWISE SPECIFIED, THE HEAVY HEX SERIES SHALL BE USED.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM 193/A193M, DTD 1997 (ALLOY STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICES) AND IN ASTM A194/A194M, DTD 1997 (CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-TEMPERATURE SERVICE).

FLAT WASHERS: ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

SUBMITTAL INFORMATION

"STAINLESS STEEL BOLTS,
HEX CAP SCREWS, AND STUDS
STAINLESS STEEL NUTS"
"ABSTRACT OF ASTM A193/ASTM A194"
"T-304"

GRADE: UNSTABILIZED 18 CHROMIUM, 8 NICKEL, (AISI TYPE 304)

CHEMICAL REQUIREMENTS:

	<u>PERCENT MAXIMUM</u>
CARBON MAX	0.08
MANGANESE	2.00
PHOSPHOROUS, MAX	0.045
SULFUR, MAX	0.03
SILICON	1.00
CHROMIUM	16.00 - 20.00
NICKEL	8.00 - 10.5

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>
TENSILE STRENGTH (KSI)	75
YIELD STRENGTHS (KSI)	30
ELONGATION (%)	25
HARDNESS (ROCKWELL)	B95 - C32

NOTES: HEADED AND ROLLED FROM ANNEALED STOCK THUS REQUIRING A DEGREE OF COLD WORK (CW.) SIZES 0.75 IN. AND LARGER MAY BE HOT WORKED.

IDENTIFICATION SYMBOL: BOLTS - T-304, 18 -8, F593 C OR D, OR TWO "SLASH MARKS",
NUTS - T-304, 18 -8, F594 C OR D

OTHER:

ALL BOLTS, NUTS & STUDS, UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B18.2.1, PAGE C-1, FOR HEX CAP SCREWS (FINISHED HEX BOLTS.) UNLESS OTHERWISE SPECIFIED, THE DIMENSIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ANSI/ASME B 18.2.2, PAGE D-1, FOR HEX NUTS.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM F593, DTD 1993 (STAINLESS STEEL BOLTS, HEX CAP SCREWS, AND STUDS) AND IN ASTM F594, DTD 1993 (STAINLESS STEEL NUTS.)

FLAT WASHERS:

ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

SUBMITTAL INFORMATION
"STAINLESS STEEL BOLTS,
HEX CAP SCREWS, AND STUDS
"STAINLESS STEEL NUTS"
"ABSTRACT OF ASTM F593 & F594"
"T-316"

GRADE: 18 CHROMIUM, 10 NICKEL, 2 MOLYBDENUM (AISI TYPE 316)

CHEMICAL REQUIREMENTS:

	<u>PERCENT MAXIMUM</u>
CARBON MAX	0.08
MANGANESE	2.00
PHOSPHOROUS, MAX	0.045
SULFUR, MAX	0.03
SILICON	1.00
CHROMIUM	16.00 - 18.00
NICKEL	10.00 - 14.00
MOLYBDENUM	2.00 - 3.00

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>
TENSILE STRENGTH (KSI)	75
YIELD STRENGTHS (KSI)	45
ELONGATION (%)	25
HARDNESS (ROCKWELL)	B95 - C32

NOTES: HEADED AND ROLLED FROM ANNEALED STOCK THUS REQUIRING A DEGREE OF COLD WORK (CW) SIZES 0.75 IN. AND LARGER MAY BE HOT WORKED.

IDENTIFICATION SYMBOL: BOLTS - T-316, 316, F593, G OR H
NUTS - T-304, 316, F594 ,G OR H

OTHER:

ALL BOLTS, NUTS & STUDS, UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B18.2.1, PAGE C-1.

FOR HEX CAP SCREWS (FINISHED HEX BOLTS.) UNLESS OTHERWISE SPECIFIED THE DIMENSIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ANSI/ASME B 18.2.2, PAGE D-1, FOR HEX NUTS.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM F593, DTD 1993 (STAINLES STEEL BOLTS, HEX CAP SCREWS, AND STUDS) AND IN ASTM F594, DTD 1993 (STAINLESS STEEL NUTS.)

FLAT WASHERS:

ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

SUBMITTAL INFORMATION

"BOLTS, STUDS, NUTS AND FLAT WASHERS"
"ABSTRACT OF ASTM A193/ASTM A194"
"GRADE B8M" T-316

GRADE: 18 CHROMIUM, 10 NICKEL, 2 MOLYBDENUM (AISI TYPE 316)

CHEMICAL REQUIREMENTS:

	<u>RANGE</u>	<u>VARIATION</u>
CARBON MAX	0.08	0.01 OVER
MANGANESE	2.00	0.04 OVER
PHOSPHOROUS, MAX	0.045	0.10 OVER
SULFUR, MAX	0.03	0.005 OVER
SILICON	1.00	0.05 OVER
CHROMIUM	16.00 - 18.00	0.20
NICKEL	10.00 - 14.00	0.15
MOLYBDENUM	2.00 - 3.00	0.10

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>
TENSILE STRENGTH (KSI)	75
YIELD STRENGTHS (KSI)	45
ELONGATION (%)	30
REDUCTION OF AREA (%)	50
HARDNESS (BRINELL)	223
HARDNESS (ROCKWELL)	B96

NOTES: MATERIALS ARE CARBIDE SOLUTION TREATED

IDENTIFICATION SYMBOL: B8M

OTHER:

ALL BOLTS, NUTS & STUDS, UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B1.1, PAGE A-26, CLASS 2a FIT.

BOLT HEADS SHALL BE IN ACCORDANCE WITH THE DIMENSIONS OF ANSI/ASME B18.2.1, PAGE C-1. UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER, THE HEAVY HEX SCREWS SERIES SHOULD BE USED. NUTS SHALL CONFORM TO ASTM 194, UNLESS OTHERWISE SPECIFIED, THE HEAVY HEX SERIES SHALL BE USED.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM 193/A193M, DTD 1997 (ALLOY STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICES) AND IN ASTM A194/A194M, DTD 1997 (CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-TEMPERATURE SERVICE).

FLAT WASHERS: ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

SUBMITTAL INFORMATION

"STUDS, NUTS AND FLAT WASHERS"
"ABSTRACT OF ASTM A193/ASTM A194"
"GRADE B8M" CLASS 2 T-316

GRADE: 18 CHROMIUM, 10 NICKEL, 2 MOLYBDENUM (AISI TYPE 316)

CHEMICAL REQUIREMENTS:

	<u>RANGE</u>	<u>VARIATION</u>
CARBON MAX	0.08	0.01 OVER
MANGANESE	2.00	0.04 OVER
PHOSPHOROUS, MAX	0.045	0.10 OVER
SULFUR, MAX	0.03	0.005 OVER
SILICON	1.00	0.05 OVER
CHROMIUM	16.00 - 18.00	0.20
NICKEL	10.00 - 14.00	0.15
MOLYBDENUM	2.00 - 3.00	0.10

MECHANICAL REQUIREMENTS:

	<u>MINIMUM</u>
TENSILE STRENGTH (KSI)	110
YIELD STRENGTHS (KSI)	95
ELONGATION (%)	15
REDUCTION OF AREA (%)	45
HARDNESS (BRINELL)	321

NOTES: MATERIALS ARE CARBIDE SOLUTION TREATED AND STRAIN HARDENED

IDENTIFICATION SYMBOL: B8M

OTHER:

ALL STUDS, BOLTS, NUTS & STUDS, UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER SHALL BE THREADED IN ACCORDANCE WITH ANSI/ASME B1.1, PAGE A-26, CLASS 2a FIT.

BOLT HEADS SHALL BE IN ACCORDANCE WITH THE DIMENSIONS OF ANSI/ASME B18.2.1, PAGE C-1. UNLESS OTHERWISE SPECIFIED IN THE PURCHASE ORDER, THE HEAVY HEX SCREWS SERIES SHOULD BE USED. NUTS SHALL CONFORM TO ASTM 194, UNLESS OTHERWISE SPECIFIED, THE HEAVY HEX SERIES SHALL BE USED.

ADDITIONAL INFORMATION CAN BE FOUND IN ASTM 193/A193M, DTD 2001 (ALLOY STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICES) AND IN ASTM A194/A194M, DTD 2001 (CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-TEMPERATURE SERVICE).

FLAT WASHERS: ALL WASHERS SHALL BE OF THE SAME MATERIAL AS THE NUTS.

Cloth Inserted Rubber

SBR CI

General Purpose

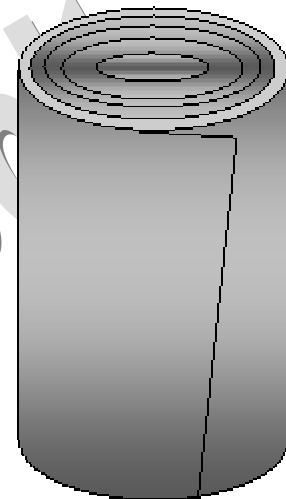
Where a fabric reinforced rubber is required

Generally Resistant to

Most moderate chemicals wet or dry organic Acids, Alcohols, Ketones, Aldehydes.

Generally Attacked By

Ozone, Strong Acids, Fats, Oils, Greases and Most Hydrocarbons.



Color	Finish	Duro	Tensile	Elongation	Temperature
Black	Smooth	75-85	500 PSI	NA	250 ° F. (125 ° C.)

Service Is Our Business

Note: This material is good for potable water

Viton

Commercial Grade Low Durometer

General Purpose

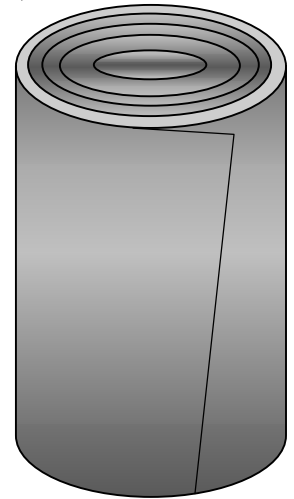
Specialty Elastomers

Generally Resistant to

All Aliphatic, Aromatic and Halogenated Hydrocarbons,
Acids, Animal and Vegetable Oils.

Generally Attacked By

Ketones, Low Molecular Weight Esters or Nitro Containing
Compounds.



Color	Finish	Duro	Tensile	Elongation	Temperature
Black	Smooth	55-65	800 PSI	250%	450 ° F. (235 ° C.)

Service Is Our Business

Neoprene

General Purpose

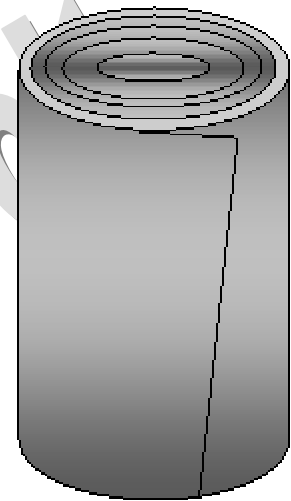
Oil Resistance

Generally Resistant to

Moderate chemicals and Acids, Ozone, Oils, Fats, Greases, many oils and Solvents.

Generally Attacked By

Strong Oxidizing Acids, Esters, Ketones, Chlorinated, Aromatic, and Nitro Hydrocarbons



Color	Finish	Duro	Tensile	Elongation	Temperature
Black	Smooth	50/60	1000 PSI	250%	250 ° F. (125 ° C.)

Service Is Our Business

Note: This material is good for potable water

EPDM

Commercial Grade

General Purpose

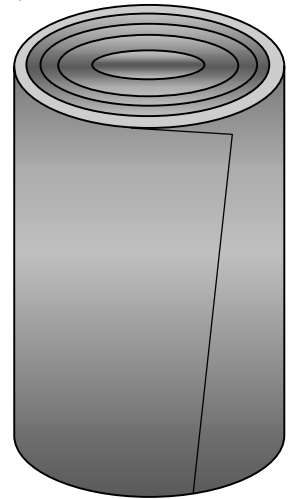
Non-Oil Resistance

Generally Resistant to

Sunlight and Ozone, Animal and Vegetable Oils,
And Strong Oxidizing Chemicals.

Generally Attacked By

Mineral Oils and Solvents, Aromatic Hydrocarbons



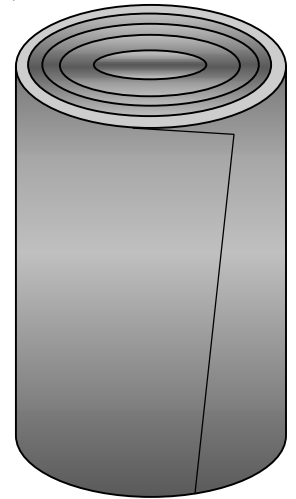
Color	Finish	Duro	Tensile	Elongation	Temperature
Black	Smooth	70	1000 PSI	300%	300 ° F. (150 ° C.)

Service Is Our Business

Asbestos

General Purpose
Hot Water, and Steam Service

Generally Resistant to
General chemicals, Water, Saturated steam, Industrial gases,
Brine, Concentrated Alkalies, Mild organic acids,
Neutral solutions, Refrigerants, Air, Aromatic solvents.



Color	Finish	Duro	Vacuum	Elongation	Temperature
Black/White			1450 PSI		-40F (-40C) 1000F (540C)

**Service is
Our Business**

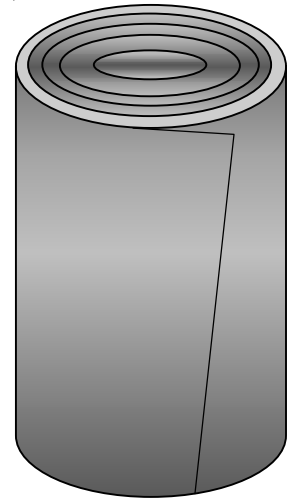
Non Asbestos

General Purpose

Process Industries, Waste Water Industries

Generally Resistant to

Animal and Vegetable Oils, Synthetics oils, General chemicals,
Water,
Brine, Concentrated Alkalies, Petroleum and derivatives
Neutral solutions, Refrigerants, Air, Aromatic solvents.



Color	Finish	Duro	Vacuum	Elongation	Temperature
Green			1370 PSI		-45F (40) 700F (371C)

**Service is
Our Business**