DURA-Flow 800 ™

SPECIFICATION FOR

1-½", 1-¾", 2-½" & 3"

DOUBLE JACKET MUNICIPAL FIRE HOSE
DURA-CORD® FIBER CONSTRUCTION
ULTRA-SHIELD™ IMPREGNATED OUTSIDE JACKET
LIGHTWEIGHT *Friction Fighter*™ TPU LINER

NORTH AMERICAN FIRE HOSE

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DURA-FLOW 800 ™
FIRE HOSE SPECIFICATION

DURA-FLOW 800 ™ Specification for 1½", 1¾", 2½" and 3" double jacket premium municipal attack grade fire hose featuring 100% **DURA-CORD®** high pressure air-jet entangled filament nylon (type 6-6) warp yarn in both the inner and outer jackets, with a light weight thermoplastic polyurethane (TPU) lining and an impregnated outside jacket. Alternate constructions, such as 100% polyester constructions, or inferior polyamide products that are not produced with 100% **DURA-CORD®** high pressure air-jet entangled filament nylon (type 6-6) warp yarn do not meet the intention of this specification and will not be considered. In addition, all hose and couplings shall be manufactured entirely in the United States of America.

Scope: The fire hose to be supplied under this specification shall be a premium quality, abrasion resistant, all synthetic double jacket, TPU lined, attack grade fire hose designed for ease of handling and use. The heavy duty construction shall also be engineered for prolonged storage and for extended service life. All hose supplied shall meet or exceed the requirements of NFPA 1961, Standard on Fire Hose (2007 Edition), for attack hose.

Quality Control: The producer shall maintain total quality control over the entire manufacturing process from the procurement of premium quality raw materials, through the weaving, extrusion, curing and coupling attachment processes. The quality of the coupled hose assemblies shall be validated during the 100% hydrostatic testing procedures, as well as through the other physical laboratory testing methods. A quality control procedure system shall be maintained by the manufacturer and shall be available for inspection and audit by the purchasing authority. When requested at the time of order placement, hydrostatic test reports of the coupled hose assemblies shall be provided to the purchaser, and shall be preserved on file for a period of five years. The Fire Department also reserves the right to request one sample cut from each 5,000 feet of delivered hose. The sample will be a minimum length necessary to conduct ozone resistance, accelerated aging, adhesion and liner tensile tests by the manufacturer. The results of these tests, along with the samples are to be forwarded to the Fire Department.

Lot Acceptance Inspection: The Fire Department shall have the option of sending two inspectors to the point of manufacture of the fire hose to witness the physical and hydrostatic lot acceptance tests.

Also, the manufacturer shall provide a coupling attachment hands-on instructional class at the hose manufacturing site at the time of the lot acceptance testing, if requested.

Warranty: The manufacturer shall certify that the fire hose proposed shall meet the requirements and specifications as herein set forth. The manufacturer shall also, as part of his proposal, warranty such fire hose for a period of three (3) years against failure due to defects in material and workmanship, and shall provide for the replacement of any such hoses as may be defective in this respect at no additional cost to the Fire Department.

Country-of-Origin: The Country-of-Origin for both the fire hose and couplings provided to this specification shall be the United States of America. The hose will be marked in 1" indelible letters "MADE IN USA" in accordance with the NFPA 1961 Standard for Fire Hose (latest edition). Also, the couplings shall be stamped in 1/8" letters "MADE IN USA" in accordance with the NFPA 1963 standard.

If noncompliance with the Federal Trade Commissions *Made in USA* standard, or any other country-of-origin mislabeling is suspected, the FTC requests that the following action be taken:

> Information about possible illegal activity helps law enforcement officials target companies whose practices warrant scrutiny. If you suspect noncompliance, contact the Division of Enforcement, Bureau of Consumer Protection, Federal Trade Commission, Washington, DC 20580, (202) 326-2996, or send an e-mail to MUSA@ftc.gov. If you know about import or export fraud, call Customs' toll-free Commercial Fraud Hotline, 1-800-ITS-FAKE. Examples of fraudulent practices involving imports include removing a required foreign origin label before the product is delivered to the ultimate purchaser (with or without the improper substitution of a Made in USA label) and failing to label a product with a required country of origin.

Lining: The inner lining shall be a single ply polyurethane extrusion, and shall be unaffected by ozone deterioration. The finished form shall be free of pits or other imperfections and shall have a smooth bore. The lining shall be adhered to the inner jacket by means of a co-extruded polyurethane resin which is evenly and consistently applied to the entire cross section. Solvent based or liquid adhesives are not acceptable due to their poor aging and short service life characteristics.

The material used to manufacture the polyurethane lining shall be approved under NSF Standard 64, "Listed Drinking Water System Components - Health Effects" to ensure that the hose can be used for the emergency conveying of potable drinking water. Rubber lined hose, and hose produced from any non-approved material is not acceptable for conveying potable drinking water do to potential health risks involved

The polyurethane liner must conform to the following properties:

Nominal Diameter	Min. Liner Thickness	Max. Liner Thickness	Min. Liner Tensile Strength	Min. Liner Elongation @ break	Liner Shore Hardness "D" Scale
1½"	.015"	.018"	3500 psi	400%	40 ±2
1¾"	.015"	.018"	3500 psi	400%	40 ±2
2½"	.020"	.023"	3500 psi	400%	40 ±2
3"	.020"	.023"	3500 psi	400%	40 ±2

Adhesion: The adhesion between the liner and the inside jacket shall be such that the rate of separation of a 1½" wide strip cut transversely, shall not be greater than 1" per minute, over a ten minute period, under a weight of 12 pounds.

Accelerated Aging: Lining specimens shall be subjected to ASTM-D 573 "Test Methods for Rubber Deterioration in an Air Oven". Specimens shall be exposed to 70 degrees C ± 1 Degree for a duration of 96 hours, and shall normalize for 24 hours before testing. The tensile and elongation of the liner shall not be less that 75% of the initial values.

Ozone Resistance: Lining specimens shall be subjected to ASTM-D1149 (Latest Revision). Specimens shall be made in accordance with ASTM-D518 procedure "C" and shall be elongated 15%. Ozone concentrations shall be 100 ± 5 parts per hundred million by volume. Temperature shall be 100 degrees F. Time shall be 100 hours. There shall be no appearance of cracking when viewed under a 7 power magnifying glass at any time during or after the test.

Jacket Construction: The DURA-CORD® high pressure air-jet entangled filament nylon (type 6-6) warp yarns and filament polyester filler yarns shall be of adequate number, size and strength to meet the hydrostatic requirements of this specification. Also, in order to ensure that the maximum abrasion resistance, durability, service life expectations, and performance margin of safety are achieved, the warp and filler yarns must comply with the minimum requirements contained in table 1:

Nominal Diameter	Inside Jacket				Outside Jacket			
	DURA-CORD® Warp Yarn Denier	Number of Warp Ends	Filler Yarn Denier	Filler Picks per Inch	DURA-CORD® Warp Yarn Denier	Number of Warp Ends	Filler Yarn Denier	Filler Picks per Inch
1½"	4,000	190	7,000	9-1/2	4,000	224	8,000	8
1¾"	4,000	213	7,000	9-1/2	4,000	256	8,000	8
2½"	4,000	277	7,000	9-1/2	4,000	362	8,000	8½
3"	5,400	250	9,000	9-1/2	5,400	298	11,000	8

Jacket Construction (continued): The warp yarn in both the inner and outer jackets shall be constructed with Dura-Cord® high pressure air-jet entangled filament Polyamide (Nylon 6-6), no exceptions. Delivered hose and/or samples may be tested by a lab designated by the fire department for conformance to the Dura-Cord® high pressure air-jet entangled filament nylon (type 6-6) warp yarn requirements. Failure to conform with this requirement will result in rejection of the bid and/or the return of all hose delivered at the vendor's expense. The filler yarn in both jackets shall be high tensile strength, low elongation continuous filament polyester yarn.

To further enhance the low friction loss characteristics of the hose construction, the inside jacket must be constructed with a reversed twill weave, which results in a smoother waterway surface than can be achieved with a regular twill or square weave. This reversed twill weave is another component of the *Friction Fighter*™ system for friction loss reduction in fire hose.

The outside and inside jacket fit is critical to the finished hose. After the initial proof test pressure, there shall be no excess outer jacket bagginess. The jackets must fit snugly inside one another under zero pressure or under proof and service test pressures.

Impregnation: The outside jacket shall be pressure impregnated with a high performance, high solids, 100% polyurethane Ultra-Shield™ coating matrix which thoroughly saturates and encapsulates the individual fiber bundles. The colored impregnation shall be heat set at temperatures not less than 275ºF in a two-stage process to enhance the inherent abrasion resistance, durability, and environmental resistance of the two component polyurethane blend.

Coatings formulated from Acrylic materials (as used in house paints), natural or synthetic lattices, or dried with ambient temperatures which do not heat set the polymer to the fibers are not acceptable.

Hydrostatic Test: Every length of hose submitted under this specification shall be subjected to the Hydrostatic Proof Pressure Test at 800 psi in accordance with the procedures and requirements of NFPA 1961 (Latest edition). This 100% hydrostatic testing will be conducted on hose equipped with couplings to be delivered on the order. Test measurements shall include the determination of elongation, twist, warp, rise and kink test, as well as visual inspection for leakage or coupling slippage under pressure. Any lengths of hose that do <u>not</u> meet the NFPA 1961 (Latest Edition) requirements for attack hose shall be rejected, tagged and placed into a separate holding area.

Burst Test: Two individual three foot long sections of hose shall be removed from full lengths of every finished hose lot and shall be subjected to a burst pressure test. The minimum burst pressure achieved shall not be less than 1200 psi or that lot shall be rejected.

Hose Length: The average length of all hose within a lot shall not be less than the nominal hose length requested (50', or 100'). Also, no individual length shall be less than 1 foot under the nominal length (e.g. 49' or 99'), except lengths which have had samples removed for burst or physical testing, which shall not be less than 2 feet under the nominal length (e.g. 48' or 98').

Water Absorption: A 50 foot length of hose, offered to meet this specification, conditioned in an oven at 158 ± 5 degrees F for 72 hours and cooled to room temperature shall then be totally submerged in water for 1 hour, removed from the water and allowed to drip dry for 10 minutes. The difference in weight before and after immersion shall not exceed 7% of the original weight before immersion.

Hose Weight: The hose minimum weight, which defines the strength, durability and longevity of service for a construction, along with the hose maximum weight, which defines the ease of deployment, handling and maneuverability, shall conform to the following table:

Weight in Lbs. per 50' cpld light weight aluminum

Hose Nominal Diameter	1½"	1¾"	2½"	3"
Minimum	11.0	14.0	21.0	29.0
Maximum	13.0	16.0	23.0	31.0

Coil Diameter: The coil diameter of a 50 foot length of hose coupled with light weight couplings shall not exceed the values listed in the following table:

Hose Nominal Diameter	1½"	1¾"	2½"	3"
Coil Diameter	16"	16"	17"	17"

Markings: Beginning at a point not less than 4 feet from each end, each length shall be

stenciled in indelible letters at least 1" high with the trade name of the hose, hose length, diameter, service test pressure, the hose manufacturer's identification, "Made in" plus the country of origin identification, and the manufacturing date. In addition, the hose must be marked with the following in ½" high letters, in order to ensure that only the highest quality warp yarn materials are used: "Made with 100% Dura-Cord® Warp".

For North American Fire Hose Corporations Dura-Built [tm] product, this stencil will read as follows:

DURA-FLOW 50' 1-3/4" SERVICE TEST TO 400 PSI PER NFPA 1962 NAFH

MADE IN USA (DATE: MM-YY)

MADE WITH 100%
DURA-CORD WARP

Couplings:

The couplings must be made of 6061-T6 seamless extruded aluminum complying with ASTM B-221. Non-seamless extrusions, such as "port-hole" or "structural" extrusions, have several mechanical bonds or seams running down the entire length of the extruded tube and provide inferior and inconsistent strength characteristics to the finished coupling. Also, non-seamless extrusions are not rated for burst pressure and are not recommended by the aluminum extrusion manufacturers (e.g. ALCOA) for pressure applications.

All coupling components must be "Hardcoat Anodized" in accordance with MIL-A-8625, Type III, Class 1. The "Hardcoat Anodize" process creates a hard aluminum oxide coating which improves the abrasion, corrosion and electrolysis resistance of the completed fitting, while also preventing excessive wear on the male and female threads. Dye anodize, plain anodize, conventional anodize, along with paint or powder coated processes provide inferior protection to the couplings and do not meet the requirements of this specification.

All couplings shall be American made, with the words "Made In USA", as well as the manufacturer's name permanently stamped into the coupling before hardcoat anodizing.

The male and female coupling bowls, along with the male coupling lugs, shall incorporate the "LA Taper" to allow the coupling to be more easily moved over and around edges and corners. The threads shall have a blunt start Higbee cut, with Higbee indicators on both the male and female lugs. Swivels must be attached with either metal rings or metal bearings to improve swivel retention under pressure. Swaged swivels are not acceptable.

The gaskets must be lathe cut to insure precise dimensional consistency, in order to insure leak free performance for the life of the coupling. Inferior, low cost molded gaskets are not acceptable. The tail and swivel gaskets shall be composed of synthetic rubber or ozone

resistant EPDM. The swivel gasket hardness shall be 60 +/- 5 durometer, Shore “A”, while the tail gasket shall be 70 +/- 5 durometer, Shore “A”.

The expansion rings shall be fabricated from soft annealed seamless 85/15 red brass per UNS 23000 for maximum expansion without danger of cracking or breaking. The rings must have chamfered edges to prevent cutting of the hose liner, and shall be free from scale, grooving, indentations, cracks, scores, dents, and burrs.

Couplings must meet or exceed NFPA Standard 1963 (Standard Fire Hose Connections, latest edition), and Military Standard A-A-59227 (Coupling Assembly, Fire Fighting Hose).

A Certificate of Origin for the couplings must be provided with each delivery to the fire department, if requested. Also, if requested at the time of order placement, certifications shall be provided for conformance to the following standards: ASTM B-221, Federal Spec. A-A-59227A, A-A-55535, MIL-A-8625 Type III Class 1, and NFPA 1963.

Place of Delivery: Hose supplied under the terms of this contract shall be delivered, at no additional charge to the Fire Department.

Complete detailed specifications, including a written warranty, along with a 12 inch sample of the hose proposed to meet this specification, shall be submitted with the hose bid.

Exceptions to Specifications: Any and all exceptions to these specifications must be noted in detail below. Failure to note these exceptions shall be cause for rejecting and returning any hose supplied at no cost or obligation to the Fire Department.