

Marelon[®] - Marine Grade Plumbing Systems

- Non-Corrosive
- Non-Conductive
- Fire Resistant
- Impact Resistant (exceeds U.L., ABYC and ISO standards)
- Operating temperature range -40° to 200° F
- U.V. Stabilized
- Light Weight

In the late 1970's we undertook a search for a material that could replace the traditional bronze plumbing components used in boats. The frequency of severe and often catastrophic corrosion and the problem of conductivity in bronze had long been a source of frustration for yacht designers and boat builders. Also, owners had to deal with the risks and cost of the ancient metal in their modern boats. The inherent tendency for bronze to degrade through electrolysis was increasingly becoming a safety issue in the recreational marine industry.

Our development of Marelon[®] plumbing components eliminated the corrosion/electrolysis issues with a superior engineered composite polymer material. It is also less than half the weight of comparable bronze fittings, U.V. stabilized, and will not support combustion - making Marelon[®] a logical choice for today's modern composite hull forms (fiberglass, carbon and Kevlar laminates) in recreational and performance powerboats and sailboats.

Over the last quarter century there have been many thousands of Marelon[®] installations exposed to the extremes of Alaskan waters and Northern European cruising and fishing grounds and the heat and vibration found in engine compartments.

Information supplied:

- Certification summary
- ISO 9093-2 Certification
- ISO and ABYC certificates
- Comparison Chart
- Marelon vx Bronze weights
- Physical properties
- Chemical Resistance
- USCG Imana Labs Fire Test
- Marelon[®] Exceeds American Boat and Yacht Council



Marelon[®] - Marine Grade Plumbing Systems cont.

CERTIFICATE SUMMARY

Marelon[®] plumbing components meet many “certifications” however only the Integrated Plumbing Systems (“93” series) carries any of the official certifications as required by law (U.L. label) and ISO Certification. The following may help answer the questions on compliance that routinely come up with builders concerning Marelon[®].

U.S.C.G.

Their only interest in plumbing has to do with “vessels for hire” or the charter trade. The Coast Guard does not forbid non-metallic valves and thru-hulls; they simply do not have a standard for them. Marelon[®] valves and thru-hulls have been approved on charter vessels on a “case by case” basis by the local district officer. This year, the Coast Guard office in Washington was supplied with all the U.L. data sheets. While the USCG policy does not affect any of our OEM valves, they can create an obstacle to the boat owner or custom builder trying to get a vessel certified for charter use. We believe they are moving toward an overall approval system based on the U.L. standards. Note: Marelon[®] ball valves did pass the USCG fire test.

A.B.S.

(American Bureau of Shipping) – We had “type” approval for commercial vessels to 100 feet and non-metallic yachts to 150 feet. The ABS has since pulled out of any “approval” of non-commercial vessels. They no longer have anything to do with recreational boating.

A.B.Y.C.

(American Boat and Yacht Council) – They have accepted as their own, the U.L. standard for seavalves. We meet and exceed these standards by a wide margin. The ABYC is recognized within our industry as a “standards” writing body. They do not “approve” anything, they only “recommend”. Unfortunately, they are not widely known by the buying public. They should be. The ABYC has done a lot of good for the public, yet they rarely get any recognition. The ABYC & NMMA has now taken over for the U.L.

Marine U.L.

(Underwriters Laboratories) – The U.L. developed a new set of standards for recreational boats. The ABYC generally parallels these standards. The tests performed to these standards are the same for bronze, stainless or plastic. We exceed these standards with the Marelon[®] Integrated valve systems. Of all the “standards” we have seen worldwide to date, the U.L. standard is the most comprehensive and stringent of them all. The U.L. has giving the recreational marine testing/certification process over to the ABYC and NMMA.

Marelon[®] - Marine Grade Plumbing Systems cont.

CERTIFICATE SUMMARY cont.

C E (International Marine Certification Institute)

Based in Belgium, the IMCI is an "International" independent organization that serves the interests of the European and International recreational boating industry. With the establishment of the European Communities Directive for Recreational Craft (94/25/EC) the IMCI provides a certification service to manufacturers who wish to market their boats and other components to the European market. The IMCI has a Board of 24 Directors from 14 countries and was founded by Lars Granholm in 1992. Lars held this position until 2000 when Ulrich Heinemann took his place. In 1996, the IMCI was recognized by the EU (European Commission Notified Body) as "0609" meaning simply that anyone covered under the IMCI standards could display the "CE" mark which allows free and open access to all EU countries.

Since 1996, the only categories of products that are covered or recognized by the CE or IMCI are:

- Ignition protected equipment for inboard and stern-drive engines
- Start-in-gear protection devices for outboard engines
- Steering wheels, steering mechanisms and cable assemblies
- Fuel tanks and fuel hoses
- Prefabricated hatches and port-lights

Note that the boat-builder is ultimately responsible for compliance with the CE directives and obtaining the CE mark.

What this means to Forespar and Marelon[®]...not a thing! Nothing we currently make falls under the CE requirements.

N.M.M.A. Certification

The only product Forespar makes that meets any of the NMMA's programs is the ML-2 combination bow/deck light under NMMA code #240300 ML-2. As with the CE, the NMMA so far, has not established any "standards" for seacocks or thru-hulls.

I.S.O. International Standards Organization

This organization is again comprised of an International body to create "standards" for manufactured products. This was started in 1999 (or earlier) and was finally ratified in 2002. As currently written, Marelon[®] ball valves and thru-hulls comply (see the attached sheet for details) with ISO 9093-2 as to physical properties and strength.

All Marelon Integrated Systems valves are ISO Certified per the IMCI directive as of March of 2009. Copy of Certificate can be sent if needed.

Again, the current U.S. Marine U.L. testing standards are the toughest and most comprehensive standard to meet. Marelon[®] is up to the task!

The reason for this information is because there is a lot of misunderstanding of who approves what and what the approvals are for and what it all means. This misunderstanding can keep a Marelon sample on a buyer's desk from going any further in the sales/acceptance process. It may be wise to "Clear the decks" about the "standards" question early on in the presentation of Marelon[®] products.



FORESPAR MARELON BALL VALVES & THRU-HULL

A.B.Y.C. H-27
SEACOCKS, THRU-HULL CONNECTIONS AND DRAIN PLUGS
AND
ISO/DIS 9093-2 STANDARD
SMALL CRAFT - SEACOCKS & THRU-HULL FITTINGS - NON-METALLIC

THE FORESPAR MARELON BALL VALVES AND THRU-HULL FITTINGS MEET AND EXCEED
THE ABYC H-27 AND ISO 9093-2 STANDARDS AS PRESENTLY WRITTEN IN
ALL RESPECTS.

As to Physical Property Requirements:

	ABYC Standard	ISO Standard	Marelon Properties
Tensile Strength:	75 mPa 10,900 psi	60mPa 9,715psi	121mPa 17,500psi
Flexural Mod.:	3480mPa 505,000psi	2700mPa 391,500psi	4826mPa 700,000psi
Impact Strength:	None	9Kj/m	117j/m

As to Strength Test: 2224N 500lbs. 1500N 337lbs. 2224N 500lbs.

MARELON COMPARISON CHART									
	U.V.	Corrosion Resistance	Abrasion Resistance	Tensile Strength**	Flexural Modulus***	ABYC * Requirement	U.L. * Requirement	Total Score	
	Degradation								
MARELON	10	10	10	27,000psi	1,300,000mPa	10	10	70	
				10	10				
NYLON 101	6	10	5	12,000psi	410,000mPa	0	0	35	
				10	4				
ACETAL	5	10	6	10,000psi	450000mPa	0	0	31	
				5	5				
PVC	3	10	2	5015psi	434,000mPa	0	0	21	
				3	3				
POLYPROPYLENE	8	10	7	4150psi	75,000mPa	0	0	29	
				2	2				
BRONZE	10	4	10	35,000psi	15,000,000mPa	10	10	64	
				10	10				
BRASS	10	0	10	45,000psi	11,000,000mPa	0	0	40	
				10	10				
Marelon is a registered trademark of Forespar Products Corp.									
* Minimum physical properties required for approval are:									
	Tensile strength 10,900psi 75mPa								
	Flexural modulus 500,000psi 3480mPa								
	** Value by test to ASTM D638 (American Society of Testing & Materials)								
	*** Value by test to ASTM D790 (American Society of Testing & Materials)								

Forespar[®]

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MARELON vs. BRONZE WEIGHTS

		MARELON WEIGHT		BRONZE WEIGHT	
PART # - DESCRIPTION	OUNCES	POUNDS	OUNCES	POUNDS	
906024	3/4" THRU HULL WITH NUT	1.6	0.11	8	0.5
906026	1" THRU HULL WITH NUT	2.4	0.15	14	0.875
906028	1-1/4" THRU HULL WITH NUT	3.2	0.2	22	1.375
906030	1-1/2" THRU HULL WITH NUT	4.8	0.3	32	2
906032	2" THRU HULL WITH NUT	7.2	0.45	44	2.75
906059	3/4" SCOOP SCREEN T-HULL	3.2	0.2	15	0.937
906060	1-1/4" SCOOP SCREEN T-HULL	5.6	0.35	20	1.25
931143	3/4" SEA VALVE W/T-HULL & BARB	10.4	0.65	48	3.01
931144	1" SEA VALVE W/T-HULL & BARB	17.6	1.1	72	4.5
931145	1-1/4" SEA VALVE W/T-HULL & BARB	17.6	1.1	100.5	6.281
931146	1-1/2" SEA VALVE W/T-HULL & BARB	27.2	1.7	164	10.2
931148	2" SEA VALVE W/T-HULL & BARB	28	1.75	209	13.06

SAVE FUEL! GO FASTER! GO FARTHER!

MARELON IS THE WEIGHT SAVINGS CHAMPION!

Forespar®

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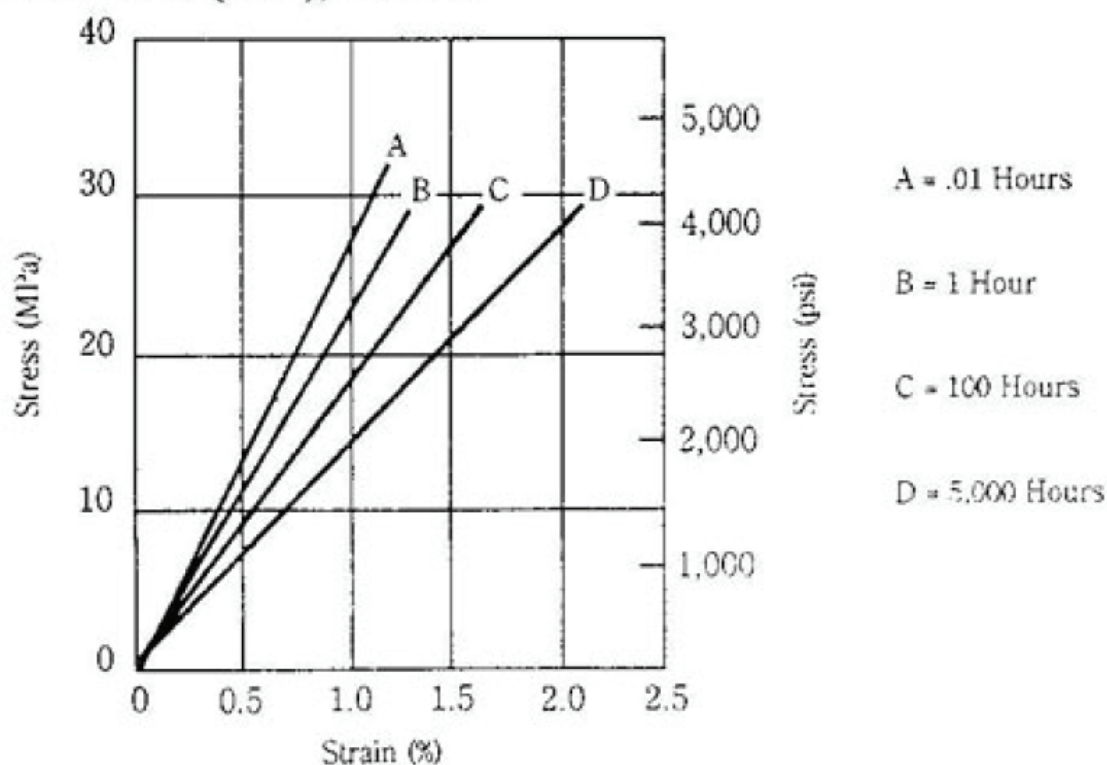
www.forespar.com

sales@forespar.com

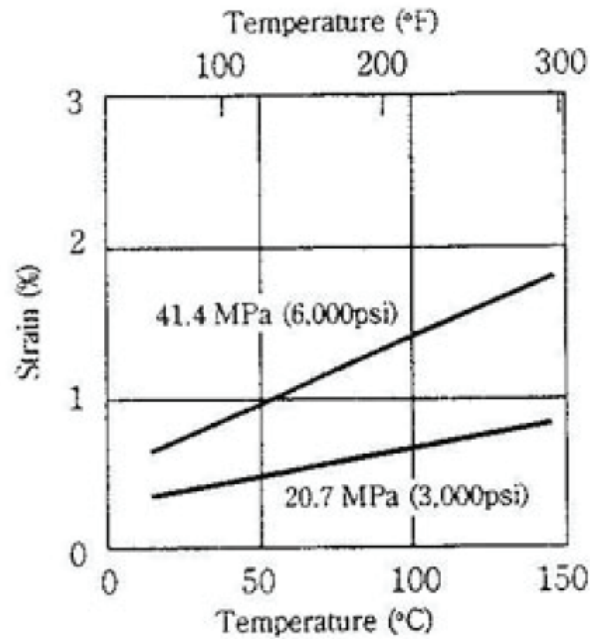
Marelon[®] Physical Properties

<u>Property</u>	<u>ASTM Method</u>	<u>Units</u>	<u>Value</u> <u>50% RH</u>
Tensile Strength	D-638	psi	8,700
Elongation	D-638	%	14.0
Izod Impact Strength	D-256	ft lb/in	4.0
Unnotched			20.0
Flexural Modulus	D-790	psi	320,000
Combustibility	UL-94		94 HB
Specific Gravity	D-792		1.19
Glass Content		%	14

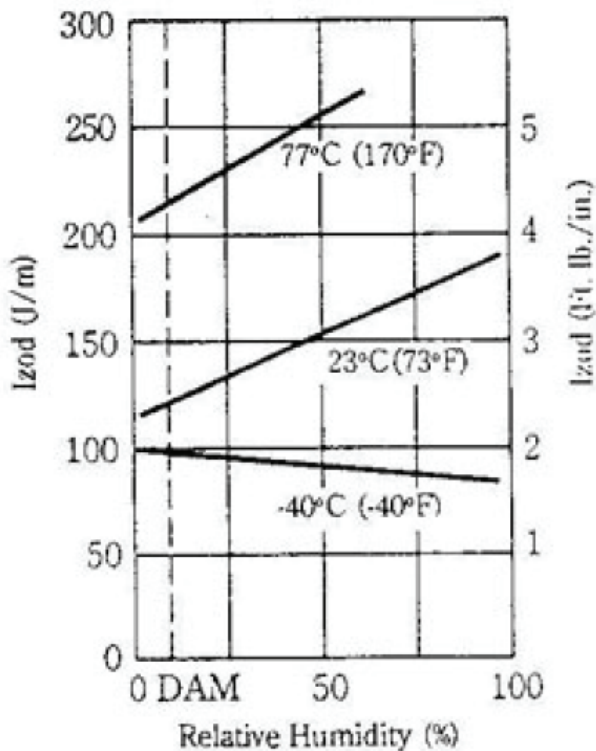
ISOCHRONOUS STRESS VS. STRAIN MARELON[®] 23°C (73°F), 50% RH



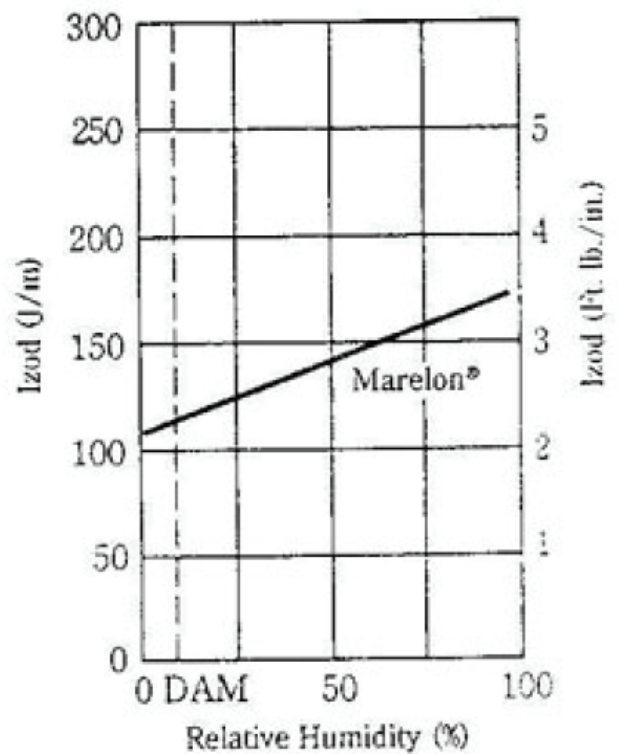
CREEP VS. TEMPERATURE AT 10,000 HOURS, GLASS-REINFORCED MARELON[®]

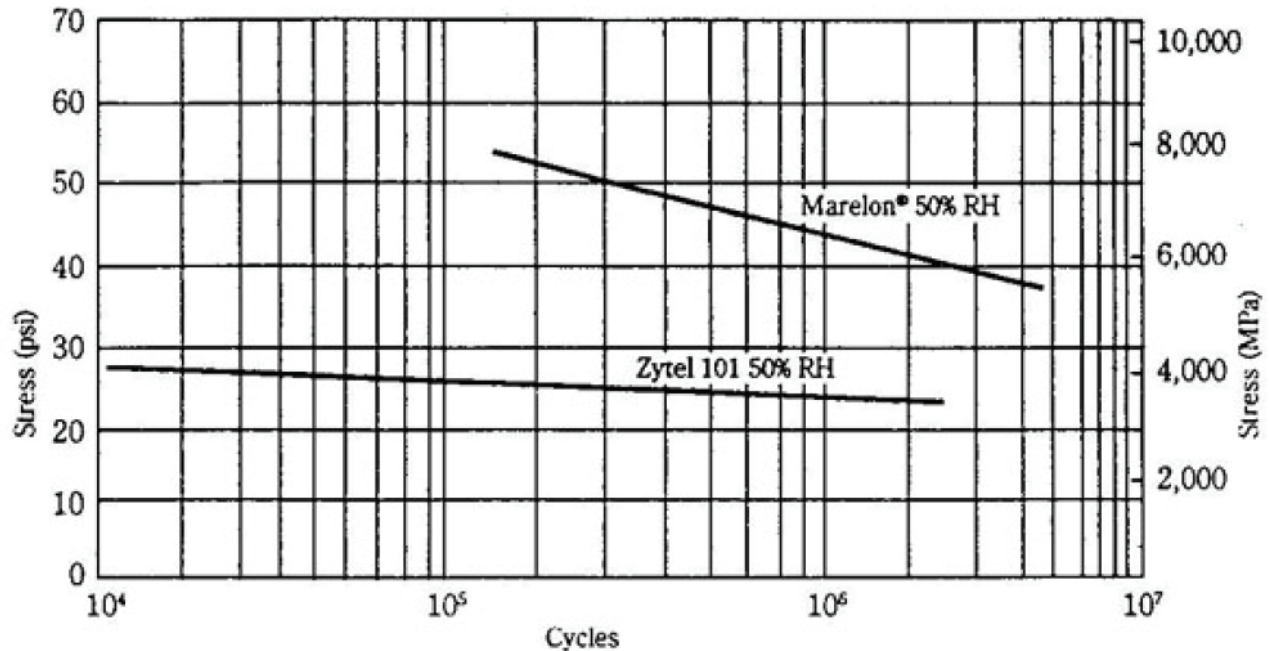


IZOD IMPACT RESISTANCE VS. TEMPERATURE AND HUMIDITY



IZOD IMPACT RESISTANCE VS. RELATIVE HUMIDITY, 23° (73°F) 305MM (1/8") BAR NOTCHED.



**FATIGUE RESISTANCE, TENSION-COMPRESSION 1800 CYCLES/MIN,
MARELON[®] VS. ZYTEL 101****Marelon[®] is:**

- Non Corrosive
- Non Conductive
- Fire Resistant
- High Impact Resistant
- Temp. -40°F to 176°F
-40°C to +80°C
- U.V. Resistant

CHEMICAL RESISTANCE CHART

NOTE! THIS CHART SHOULD BE USED AS A GUIDE ONLY.
 IT IS RECOMMENDED THAT PRACTICAL TESTS BE CARRIED OUT ON FITTINGS INTENDED FOR USE WITH SPECIFIC
 CHEMICALS. ADDITIONAL INFORMATION MAY ALSO BE OBTAINED FROM OUR OFFICES.

		UNACCEPTABLE	POOR	FAIR	GOOD	EXCELLENT
Aliphatic Solvents	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Aromatic Solvents	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Chlorinated solvents	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Esters & Ketones	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Halogens	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Strong Acids	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Strong Bases	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Strong Oxidants	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____
Weak Bases And Salts	1	_____	_____	_____	_____	_____
	2	_____	_____	_____	_____	_____
	3	_____	_____	_____	_____	_____
	4	_____	_____	_____	_____	_____

CHEMICAL RESISTANCE CHART

1—NYLON
 2—ACETAL
 3—POLYPROPYLENE
 4—KYNAR[®]

*TRADEMARK
 PENN WALT CORP.

INTERMODAL MATERIAL
AND
NAUTICAL/NUCLEAR ANALYSIS**IMANNA**
LABORATORY INC.**CERTIFICATION TEST REPORT**P.O. Box 560933 • Rockledge • FL 32956-0933
407-632-2008 • FAX 407-690-3360Fores Mfg., Corp.
22322 Gilberto
Rancho Santa Margarita, CA 92688REPORT NO. 12490-1
IMANNA JOB NO. 12490
CUSTOMER P.O. NO. VerbalMANUFACTURER Forespar[®]

CONTRACT N/A

DATE July 27, 1993

8
PAGE REPORTCERTIFICATION TEST REPORT
12490-1 OF
USCG FIRE TEST ON
¾" MANUAL SHUT-OFF FUEL VALVE
FOR

FORES MANUFACTURING

1. SPECIMEN

The test specimen is a ¾" manually operated fuel supply shut-off valve. The valve is made of Marelon[®] synthetic material. The valve has a hose barb for ¾" hose on each end.

2. MODEL NUMBER

Forespar[®], R C Marine ¾" , Marelon[®], Part No. 934143.

3. REQUIREMENTS

The requirements of this effort are to perform a 2½ minute fire test in accordance with the USCG requirements utilizing the Fire Test Chamber method. The test is to determine the acceptability of the unit for use in a permanently installed gasoline fuel system in a marine application.

4. PROCEDURES

The procedure used in performing this test program is the USCG Fuel Systems Standard Test Procedure, specifically Lab Examination No. 14, Titled Fire Test of Fuel System Components.

The procedure utilizes a Fire Test Chamber, and requires that the temperature within 1" of the component hit 1200°F at some point in time within the 2½ minute fire.

STATE OF FLORIDA
COUNTY OF BREVARD

ROBERT L. WHITE

being duly sworn,
deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

SUBSCRIBED and sworn to before me this 27 day of July, 1993.
Notary Public in and for the County of Brevard, State of Florida.

My Commission expires May 3 1997

Imanna shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Imanna's providing the services covered by this report.

IMANNA LABORATORY, INC.

TEST BY

ROBERT L. WHITE

PROJ. ENGINEER

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PAGE NO. 2
TEST REPORT NO. 12490-1

5. TESTING SEQUENCE

- A. Receiving Inspection
- B. Fire Test
- C. Post Fire Inspection

6. RESULTS

The results of the tests indicate that the component does meet the requirements of the USCG regulation for fire resistance in its current design configuration. The valve showed no signs of fuel leakage following the fire test, when the unit was leak tested with a 36" head pressure of gasoline.

6.1 RECEIVING INSPECTION

The units which were received appeared to be complete in all respects. Each valve was fitted with a ¾" hose barb fitting on the inlet and the outlet. The valves were 90° ball valves, with the flow direction marked on the handle. The end fittings were installed using Stainless Steel through-bolts with Lock nuts.

6.2 FIRE TEST

The unit was placed in a Fire test chamber and tested in accordance with the USCG Procedure. During the test period, the temperature increased to a maximum of 1275°F, but remained at approximately 850°F to 980°F for most of the time.

6.3 POST FIRE INSPECTION

The post fire inspection and leak check indicated that no leak was present on the test article.

7. OBSERVATIONS AND COMMENTS

The results presented herein apply only to the test specimen, as prepared and as tested. Test equipment used in the performance of this test was calibrated to standards traceable to the N.I.S.T.