

BASIS OF COST ESTIMATES

**REPAIR TANK 19, RED HILL
FISC PEARL HARBOR, HAWAII**

BASIS OF COST ESTIMATES

1. Pricing was developed from quotes of venders and suppliers, R.S. Means Construction Cost Data 1998, and local pricing information.
2. Cost Estimates were prepared using the "SUCCESS Estimating & Cost Management System" computer program.
3. All estimates were prepared based using an "escalated from date" of May 1998.
4. Escalation rate was developed from NAVFAC Construction Cost Index dated February 1998 and an assumed bid opening date of April 1999 as follows:

Composite Tank Concept

Project duration: 14 mos
Escalated from: May 1998
Escalated to: November 2000

Escalation Factor = $3476/3400 = 1.02$

Bladder Tank Concept

Project duration: 7 mos
Escalated from: May 1998
Escalated to: August 1999

Escalation Factor = $3463/3400 = 1.02$

Repair Existing Tank Concept

Project duration: 12 mos
Escalated from: May 1998
Escalated to: October 1999

Escalation Factor = $3476/3400 = 1.02$

CONTRACTOR MARKUP REPORT
 SUBMITTAL: FACD
 SOFTWARE VERSION: SUCCESS.2.1
 REPORT WRITER VERSION: R&R 6.0

CONSTRUCTION CONTRACT: PRL 98-9
 DATABASE USED :EEI
 PRINTING DATE :05/27/98
 PAGE NUMBER :1
 ESTIMATE NAME : RHT19-comp

PROJECT: Red Hill Tank 19 - Composite Tank
 LOCATION: FISC Pearl Harbor, HI
 ESTIMATOR: EEI
 PROJECT SIZE: 1.00LS
 AUTHORIZED CONSTRUCTION FUNDS:

CAT CODE: N/A
 UIC:
 PROJECT #:
 DATE OF ESTIMATE: 5/26/98
 BID DATE: 4/99

TYPICAL FOR
 ALL ALTERNATIVES

CONTRACTOR	DESCRIPTION	MATERIAL	LABOR	EQUIPMENT
P	Prime Contractor		①	
	WORKER'S COMPENSATION/UNEMPL/SOC. SEC TAXES	0.00	45.00	0.00
	HAWAII COST ADJUSTMENT	0.00	31.00	0.00
	PRIME OVERHEAD	10.00	10.00	10.00
	PRIME PROFIT	6.00	6.00	6.00
	PRIME HOME OFFICE	3.00	3.00	3.00
	BOND	2.00	2.00	2.00
	ESCALATION	1.02	1.02	1.02
	ESTIMATING CONTINGENCY	5.00	5.00	5.00
	HI GET	4.17	4.17	4.17
	SALES TAX	0.50	0.00	0.50
	COMPOSITE MARKUPS FOR P			
	MATERIAL COMPOSITE MARKUP	1.360		
	LABOR COMPOSITE MARKUP	2.571		
	EQUIPMENT COMPOSITE MARKUP	1.360		
S	Subcontractors			
	SUBCONTRACTOR OVERHEAD	10.00	10.00	10.00
	SUBCONTRACTOR PROFIT	6.00	6.00	6.00
	SUBCONTRACTOR HOME OFFICE	3.00	3.00	3.00
	COMPOSITE MARKUPS FOR S			
	MATERIAL COMPOSITE MARKUP	1.201		
	LABOR COMPOSITE MARKUP	1.201		
	EQUIPMENT COMPOSITE MARKUP	1.201		

BASE BID MARK UPS

- ① TAKEN FROM PACDIV WAGE RATE CALCULATION SHEET
 45% = AVERAGE OF STRUCT. IRONWORKER & TRADE AVERAGE RATE
- ② FROM PACDIV COST BRANCH SAMPLE ESTIMATE
- ③ SELECTED 2% BECAUSE OF CONSTRUCTION COST
- ④ CALCULATED FROM NAVFAC INDEX INFORMATION
- ⑤ ESTIMATE PERFORMED IN SUCCESS 3.1 USING NAVFAC-01 FORMS
- ESTIMATE DETAIL - WHERE POSSIBLE, ESTIMATE IS ANNOTATED SHOWING CREW MAKE-UP.

CONTRACTOR MARKUP REPORT
SUBMITTAL: FACD
SOFTWARE VERSION: SUCCESS 2.1
REPORT WRITER VERSION: R&R 6.0

CONSTRUCTION CONTRACT: PRL 98-9
DATABASE USED :EEI
PRINTING DATE :05/27/98
PAGE NUMBER :1
ESTIMATE NAME :RHT19-CT Add

PROJECT: Red Hill Tank 19 - ~~Comp. Tank~~ Additive Bid Items
LOCATION: FISC Pearl Harbor, HI
ESTIMATOR: EEI
PROJECT SIZE: 1.00LS
AUTHORIZED CONSTRUCTION FUNDS:

CAT CODE: N/A
UIC:
PROJECT #:
DATE OF ESTIMATE: 5/26/98
BID DATE: 4/99

TYPICAL FOR
ALL ALTERNATIVES

CONTRACTOR	DESCRIPTION	MATERIAL	LABOR	EQUIPMENT
P	Prime Contractor		①	
	WORKER'S COMPENSATION/UNEMPL/SOC. SEC TAXES	0.00	32.00	0.00
	HAWAII COST ADJUSTMENT	0.00	31.00	0.00
	PRIME OVERHEAD	10.00	10.00	10.00
	PRIME PROFIT	6.00	6.00	6.00
	PRIME HOME OFFICE	3.00	3.00	3.00
	BOND	1.00	1.00	1.00 ②
	ESCALATION	1.02	1.02	1.02
	ESTIMATING CONTINGENCY	5.00	5.00	5.00
	HI GET	4.17	4.17	4.17
	SALES TAX	0.50	0.00	0.50
	COMPOSITE MARKUPS FOR P			
	MATERIAL COMPOSITE MARKUP	1.347		
	LABOR COMPOSITE MARKUP	2.318		
	EQUIPMENT COMPOSITE MARKUP	1.347		
S	Subcontractors			
	SUBCONTRACTOR OVERHEAD	10.00	10.00	10.00
	SUBCONTRACTOR PROFIT	6.00	6.00	6.00
	SUBCONTRACTOR HOME OFFICE	3.00	3.00	3.00
	COMPOSITE MARKUPS FOR S			
	MATERIAL COMPOSITE MARKUP	1.201		
	LABOR COMPOSITE MARKUP	1.201		
	EQUIPMENT COMPOSITE MARKUP	1.201		

ADDITIVE BID ITEM MARK-UPS

① SELECTED FROM WAGE RATE CALCULATION SHEET

32% = AVERAGE OF ALL TRADES. THIS IS A DECREASE FROM BASE BID RATE. ADDITIVES ARE LESS COMPLEX, WITH SMALL EMPHASIS ON STRUCT. IRON WORKERS.

② ALSO A CHANGE FROM BASE BID RATES. ADDITIVES ARE LESS COMPLEX AND SMALLER TO OVERALL PROJECT CONSTRUCTION AMOUNT.

ALL OTHER VALUES - SEE "BASE BID" EXPLANATION

NAVFAC Construction Cost Index Historical and Projected February 1998

Fiscal													% Increase
Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	(FY)
1986	2441	2446	2439	2440	2446	2447	2458	2479	2493	2499	2498	2504	(
1987	2511	2511	2511	2515	2510	2518	2523	2524	2525	2536	2557	2565	2.44
1988	2569	2564	2589	2574	2576	2586	2591	2592	2595	2538	2611	2612	1.83
1989	2612	2616	2617	2619	2613	2616	2620	2621	2626	2631	2640	2668	2.14
1990	2672	2675	2679	2673	2674	2684	2684	2697	2725	2725	2721	2729	2.25
1991	2728	2730	2719	2719	2716	2726	2736	2723	2733	2757	2792	2785	2.05
1992	2786	2791	2784	2780	2779	2799	2809	2828	2838	2845	2854	2857	2.55
1993	2867	2873	2875	2886	2886	2916	2976	3071	3066	3038	3014	3009	5.32
1994	3016	3029	3046	3071	3106	3116	3127	3125	3115	3107	3109	3116	3.55
1995	3116	3109	3110	3112	3111	3103	3100	3096	3095	3114	3121	3109	-0.22
1996	3117	3131	3128	3127	3131	3135	3148	3161	3178	3190	3218	3239	4.15
1997	3277	3295	3302	3323	3324	3316	3364	3377	3396	3392	3385	3378	4.25
1998	3372	3376 p	3380 p	3384 p	3388 p	3392 p	3396 p	3400 p	3404 p	3408 p	3412 p	3416 p	1.12
1999	3420 p	3424 p	3428 p	3433 p	3437 p	3441 p	3446 p	3450 p	3454 p	3458 p	3463 p	3467 p	1.45
2000	3472 p	3476 p	3481 p	3486 p	3490 p	3495 p	3500 p	3504 p	3509 p	3514 p	3518 p	3523 p	1.62
2001	3528 p	3533 p	3538 p	3543 p	3548 p	3553 p	3558 p	3563 p	3568 p	3573 p	3578 p	3583 p	1.7
2002	3588 p	3594 p	3599 p	3604 p	3609 p	3614 p	3619 p	3624 p	3629 p	3634 p	3640 p	3645 p	1.73
2003	3650 p	3655 p	3660 p	3665 p	3671 p	3676 p	3681 p	3686 p	3691 p	3697 p	3702 p	3707 p	1.7

Projected indices are followed by the letter "p".

Escalation Factor = $\frac{\text{Index of the "escalated to" date}}{\text{Index of the "escalated from" date}}$

Historical indices are based upon the Engineering News Record Building cost index.

All indices are based upon fiscal year rates.

Projected indices are based on official OASD projected rates as follows:

Fiscal Year	% Per Year	% Per Month
1998	1.40	0.117
1999	1.50	0.125
2000	1.60	0.133
2001	1.70	0.142
2002	1.70	0.142
2003	1.70	0.142

For more information contact Mr. Tony Hinson, NAVFAC, DSN 221-7958; Commercial (703) 325-7958.

WAGE RATE CALCULATIONS

EFFECTIVE 02/17/98

LOCATION: STATE OF HAWAII

SOURCE: STATE OF HI, DEPT OF LABOR & INDUSTRIAL RELATIONS

OPERATION SHIFTS

8 HOURS/DAY - 40 HOURS/WEEK

BULLETIN NO 446

CLASSIFICATION	BASIC	OVERTIME		TAXES & INS			FRINGE		TRAVEL	TOTAL HOURLY (h + i + j)
	HOURLY	% OF	AMT.	SUB-	% OF	AMT.	SUB-	OR		
	WAGE	(b)	(d)	TOTAL	(e)	(g)	TOTAL	SUB-		
(a)	RATE	(c)	(d)	(b + d)	(f)	(g)	(e + g)	BENE- FITS	SIST (j)	(k)
ASBESTOS WORKER	26.00	-	-	26.00	35.85	9.32	35.32	14.24	-	49.56
ASPHALT PAVING	25.49	-	-	25.49	28.05	7.15	32.64	11.73	-	44.37
BOILER MAKER	26.25	-	-	26.25	26.65	7.00	33.25	13.76	-	47.01
CARPENTER	26.65	-	-	26.65	39.35	10.49	37.14	13.60	-	50.74
CEMENT MASON; CMU	25.37	-	-	25.37	35.92	9.11	34.48	11.15	-	45.63
DIVER	39.18	-	-	39.18	70.35	27.56	66.74	13.73	-	80.47
DRAPERY INSTALLER*13.60	-	-	-	13.60	25.55	3.47	17.07	1.20	-	18.27
DRYWALL INSTALLER	26.65	-	-	26.65	25.56	6.81	33.46	13.42	-	46.88
ELECTRICIAN	28.74	-	-	28.74	25.13	7.22	35.96	13.37	-	49.33
ELEVATOR CONSTRUCT	32.88	-	-	32.88	22.65	7.45	40.33	6.40	-	46.73
EQPT OPERATOR 1	24.49	-	-	24.49	28.05	6.87	31.36	13.73	-	45.09
EQPT OPERATOR 3	24.77	-	-	24.77	28.05	6.95	31.72	13.73	-	45.45
EQPT OPERATOR 5	25.35	-	-	25.35	28.05	7.11	32.46	13.73	-	46.19
EQPT OPERATOR 7	26.32	-	-	26.32	28.05	7.38	33.70	13.73	-	47.43
EQPT OPERATOR 9	26.64	-	-	26.64	28.05	7.47	34.11	13.73	-	47.84
EQPT OPERATOR 12	27.49	-	-	27.49	28.05	7.71	35.20	13.73	-	48.93
FENCE ERECTOR*	9.33	-	-	9.33	31.47	2.94	12.27	1.65	-	13.92
FLOOR COVERING	22.90	-	-	22.90	36.52	8.36	31.26	14.00	-	45.26
GLAZIER	22.05	-	-	22.05	31.33	6.91	28.96	16.38	-	45.34
HELICOPTER PILOT	28.66	-	-	28.66	31.85	9.13	37.79	13.73	-	51.52
IRONWORKER, REBAR	23.90	-	-	23.90	28.97	6.92	30.82	16.61	-	47.43
IRONWORKER, STRUCT	23.90	-	-	23.90	56.49	13.50	37.40	16.61	-	54.01
LABORER 1*	20.70	-	-	20.70	27.16	5.62	26.32	10.04	-	36.36
LABORER 2*	19.10	-	-	19.10	27.16	5.19	24.29	10.04	-	34.33
LABORER 6, LT CLUP*13.10	-	-	-	13.10	27.16	3.56	16.66	5.79	-	22.45
LANDSCAPER 1	16.51	-	-	16.51	22.55	3.72	20.23	4.42	-	24.65
LATHER	26.60	-	-	26.60	26.08	6.94	33.54	12.95	-	46.49
PAINTER	24.75	-	-	24.75	25.56	6.33	31.08	15.20	-	46.28
PAINTER, SPRAY	25.25	-	-	25.25	25.56	6.45	31.70	15.20	-	46.90
PAINTER, SANDBLAST	25.25	-	-	25.25	25.56	6.45	31.70	15.20	-	46.90
PLASTERER	25.91	-	-	25.91	38.66	10.02	35.93	11.15	-	47.08
PLUMBER; SPRINKLER	28.30	-	-	28.30	22.01	6.23	34.53	12.05	-	46.58
ROOFER	24.10	-	-	24.10	56.02	13.50	37.60	10.35	-	47.95
SHEETMETAL WORKER	28.52	-	-	28.52	26.04	7.43	35.95	14.01	-	49.96
TERRAZZO SETTER	25.37	-	-	25.37	23.13	5.87	31.24	11.15	-	42.39
TILE SETTER, CERAM	25.37	-	-	25.37	23.13	5.87	31.24	11.15	-	42.39
TRADE AVERAGE	26.12	-	-	26.12	31.52	8.36	34.48	13.03	-	47.51

* NOT INCLUDED IN AVERAGE

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL		# of pages - 1
To <i>Kathy Gardner</i>	From <i>M. Wasko</i>	
Dept/Agency <i>Enterprise Engrg</i>	Phone # <i>474-3940</i>	
Fax # <i>563-3835</i>	Fax # <i>471-5870</i>	
NSN 7540-01-317-7368		5099-101 GENERAL SERVICES ADMINISTRATION

ENTERPRISE**ENGINEERING, INC.**

3335 ARCTIC BOULEVARD
ANCHORAGE, ALASKA 99503
TEL (907) 563-3835 FAX (907) 563-3817

JOB _____

SHEET NO. _____

OF _____

CALCULATED BY _____

KLG

DATE

5/24/98

CHECKED BY _____

DATE _____

SCALE _____

ADDITIONAL ESTIMATE NOTES:

ESTIMATE DETAIL

- WHERE INDICATED AS QUOTE, INFORMATION GENERALLY INCLUDES LABOR, EQUIP & MATERIAL WITH LABOR MARK-UPS. VALUE IS IN EITHER EQUIPMENT OR LABOR COLUMN TO AVOID FURTHER MARK-UP.
- LABOR RATES INCLUDE FRINGE BENEFITS

MEMBRANE LINER INFORMATION

SEAMAN CORPORATION XR-5® CHEMICALLY RESISTANT GEOMEMBRANE

PRODUCT FEATURES

1. COMPOSITE DESIGN —

High strength from polyester base fabric,
environmental and chemical resistance from
Ethylene Interpolymer Alloy (EIA) coating

2. HEAT RESISTANCE —

Has contained salt water up to 100°C for years

3. CHEMICAL RESISTANCE —

EIA coating provides wide range of compatibility
including acids, oils, and methane

4. HEAT WELDABLE —

Thermal weldable for seams as strong as the
membrane. Factory panels over 15,000 square
feet for less field seaming

5. STABILITY —

Low thermal expansion-contraction properties

* XR-5 IS A REGISTERED TRADEMARK OF SEAMAN CORPORATION

SECTION A - PHYSICAL PROPERTIES

PART A-1: MATERIAL SPECIFICATIONS

8130 XR-5*: Property	Test Method	Requirement
1. Thickness	ASTM D-751	30 mils minimum (8130) 40 mils nominal (8138)
2. Weight	ASTM D-751	30.0 ± 2 oz./sq. yd. (8130) 38.0 ± 2 oz./sq. yd. (8138)
3. Tear Strength	ASTM D-1117 Trap Tear	35 lbs./35 lbs. (min.)
4. Breaking Yield Strength	ASTM D-751 Grab Tensile	550 lbs./550 lbs. (min.)
5. Low Temperature	ASTM D-2136 4 hrs. - 1/4" mandrel	-30°F. No cracking
6. Dimensional Stability (each direction)	ASTM D-1204 212°F. - 1 hr.	1% max.
7. Hydrostatic Resistance	ASTM D-751 Method A	800 psi (min.)
8. Blocking Resistance 180°F.	ASTM D-751	#2 Rating max.
9. Adhesion - Ply. lbs./in. of width	ASTM D-413 2" per min.	15 lbs./in. (min.) or film tearing bond
10. Adhesion - heat sealed seam lbs./in. of width	ASTM D-751	35lbs./2" dielectric weld (min.)
11. Dead Load Seam shear strength	(Mil-T-52983 E Modified Para. 4.5.2.19 2" overlap seam, 4 hours)	Must withstand 210 lbs./in. @ 70°F. 105 lbs./in. @ 160°F.
12. Bonded Seam Strength	ASTM D-751, seam strength as modified by NSF 54	550 lbs. (min.)
13. Abrasion Resistance (Taber Method)	Method 5306 Fed. Std. 191a H-18 Wheel 1000 gm. load	2000 cycles (min.) before fabric exposure 50 mg./100 cycles max. wt. loss
14. Weathering Resistance	Carbon-Arc Atlas Weather-o-meter	8,000 hrs. (min.) No appreciable changes or stiffening or cracking of coating
15. Water Absorption	ASTM D-471, Section 12 7 Days	0.025 kg./m ² max. @ 70°F. 0.14 kg./m ² max. @ 212°F.
16. Wicking	Shelter-Rite procedure	1/4" (max.)
17. Puncture Resistance	ASTM D-4833	250 lbs. (min.)
18. Bursting Strength	ASTM D-751 Ball Tip	650 lbs. (min.) 800 lbs. (typ.)
19. Coefficient of Thermal Expansion/Contraction	ASTM D-696	8 X 10 ⁻⁶ in/in °F. (max.)
All Values As Produced		

SECTION B — CHEMICAL/ENVIRONMENTAL RESISTANCE

PART B-1: XR-5[®] FLUID RESISTANCE GUIDELINES

The data below is the result of laboratory tests and is intended to serve only as a guide. No performance warranty is intended or implied. The degree of chemical attack on any material is governed by the conditions under which it is exposed. Exposure time, temperature, and size of the area of exposure usually varies considerably in application, therefore, this table is given and accepted at the user's risk. Confirmation of the validity and suitability in specific cases should be obtained.

When considering XR-5 for specific applications, it is suggested that a sample be tested in actual service before specification. Where impractical, tests should be devised which simulate actual service conditions as closely as possible.

EXPOSURE	RATING	EXPOSURE	RATING
AFFF	A	JP-4 Jet Fuel	A
Acetic Acid (5%)	B	JP-5 Jet Fuel	A
Acetic Acid (50%)	C	JP-8 Jet Fuel	A
Ammonium Phosphate	T	Kerosene	A
Ammonium Sulfate	T	Magnesium Chloride	T
Antifreeze (ethylene glycol)	A	Magnesium Hydroxide	T
Animal Oil	A	Methanol	A
Aqua Regia	X	Methyl Alcohol	A
ASTM Fuel A (100% Iso-octane)	A	Methyl Ethyl Ketone	X
ASTM Oil #2 (Flash pt. 240°C)	A	Mineral Spirits	A
ASTM Oil #3	A	Naphtha	A
Benzene	X	Nitric Acid (5%)	B
Calcium Chloride Solutions	T	Nitric Acid (50%)	C
Calcium Hydroxide	T	Perchloroethylene	C
20% Chlorine Solution	A	Phenol	X
Clorox	A	Phenol Formaldehyde	B
Conc. Ammonium Hydroxide	A	Phosphoric Acid (50%)	A
Corn Oil	A	Phosphoric Acid (100%)	C
Crude Oil	A	Phthalate Plasticizer	C
Diesel Fuel	A	Potassium Chloride	T
Ethanol	A	Potassium Sulphate	T
Ethyl Acetate	C	Raw Linseed Oil	A
Ethyl Alcohol	A	SAE-30 Oil	A
Fertilizer Solution	A	Salt Water (25%)	B
#2 Fuel Oil	A	Sea Water	A
#6 Fuel Oil	A	Sodium Acetate Solutions	T
Furfural	X	Sodium Bisulfite Solution	T
Gasoline	B	Sodium Hydroxide (60%)	A
Glycerin	A	Sodium Phosphate	T
Hydraulic Fluid – Petroleum Based	A	Sulphuric Acid (50%)	A
Hydraulic Fluid – Phosphate		50% Tanic Acid	A
Ester Based	C	Toluene	C
Hydrocarbon Type II (40% Aromatic)	C	Transformer Oil	A
Hydrochloric Acid (50%)	A	Turpentine	A
Hydrofluoric Acid (5%)	A	Urea Formaldehyde	A
Hydrofluoric Acid 50%	A	UAN	A
Hydrofluosilicic Acid (30%)	A	Vegetable Oil	A
Isopropyl Alcohol	T	Water (200°F)	A
Ivory Soap	A	Xylene	X
Jet A	A	Zinc Chloride	T

Ratings are based on visual and physical examination of samples after removal from the test chemical after the samples of Black XR-5 were immersed for 28 days at room temperature. Results represent ability of material to retain its performance properties when in contact with the indicated chemical.

RATING KEY:

- A — Fluid has little or no effect
- B — Fluid has minor to moderate effect
- C — Fluid has severe effect
- T — No data-likely to be acceptable
- X — No data-not likely to be acceptable

PART B-2: COMPARATIVE CHEMICAL RESISTANCE

The table below lists a variety of chemicals and indicates the action of each material when in contact with Black XR-5, CPE, Hypalon, Urethane, and supported PVC. Membrane samples were totally immersed in each of the chemicals for a period of 28 days at room temperature. The rating system is indicated as:

A — Fluid has little or no effect at R.T.

B — Fluid has minor to moderate effect at R.T.

C — Fluid has severe effect at R.T.

Chemical	XR-5 [®]	Hypalon	Urethane	CPE	PVC
Kerosene	A	C	A	C	C
Diesel Fuel	A	C	A	C	C
Ohio Crude Oil	A	B	A	B	C
Hydraulic Fluid — Petroleum Based	A	C	A	B	C
Naptha	A	B	A	B	C
Conc. Ammonia Hydroxide	A	A	C	A	A
50% Acetic Acid	C	B	C	B	C
50% Phosphoric Acid	A	B	C	A	A
50% Hydrochloric Acid	A	A	C	A	A
50% Nitric Acid	C	B	C	A	C
50% Sulfuric Acid	A	C	C	C	A
60% Sodium Hydroxide	A	A	C	B	C
Methyl Alcohol	A	A	A	A	C
JP-4 Jet Fuel	A	B	A	B	C
Salt Water 180°F	A	B	B	B	C
Phthalate Plasticizers	B	C	A	C	C
SAE-30 Oil	A	A	A	A	C
Raw Linseed Oil	A	A	A	A	C

All technical information published in the brochure refers to the Black XR-5; other colors may not have the same chemical resistance as the black. If a color other than black is required, we suggest you check with Seaman Corporation as to the compatibility and resistance to that particular chemical environment.

The above ratings were arrived at by visual and physical examination of the membrane samples after their removal from the test chemical. When considering XR-5[®] for specific application, it is important to study the requirements such as permeability, service temperature, concentration, size to be contained, etc. Sample of XR-5[®] should be tested close to actual service conditions and also Seaman Corporation should be consulted.

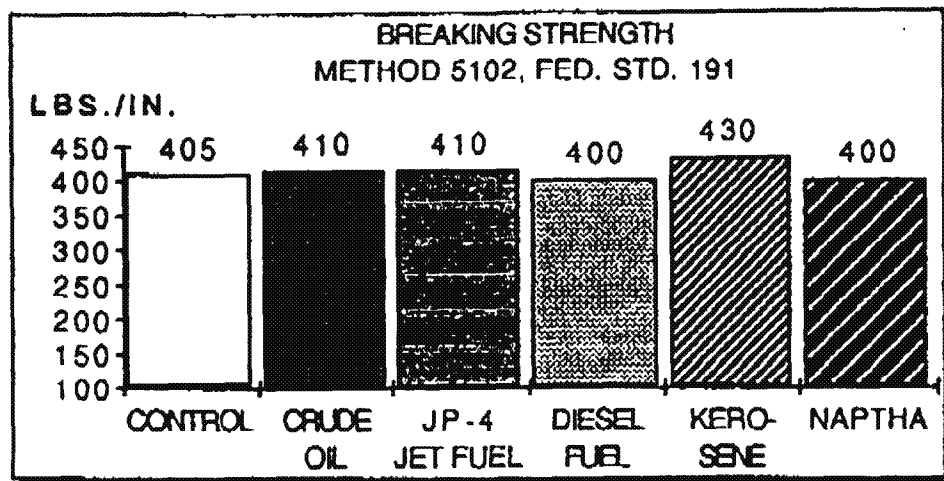
FUEL COMPATIBILITY — LONG TERM IMMERSION

TEST: Samples of 8130 XR[®] DC-7 Black were immersed in Diesel Fuel, JP-4 Jet Fuel, Crude Oil, Kerosene, and Naptha for 6½ years.

The samples were then taken out of the test chemicals, blotted and dried for 24 hours. The samples were observed for blistering, swelling, stiffening, cracking or delamination of the coating to the fiber.

RESULTS: It was found in all cases the 8130 XR-5[®], after immersion for six years, maintained the strength and there was no evidence of blistering, swelling, stiffening, cracking or delamination.

The strip tensile strength or breaking strength of the samples was measured after six years of immersion and the following are the results.

**LONG TERM SEAM ADHESION****11 YEARS IMMERSION****METHOD 5970 OF FEDERAL TEST METHOD STANDARD NO. 191****LBS./IN.**

Seam samples of 8130 XR-5[®] were dielectrically welded together and totally immersed in the liquids for 11 years. The samples were taken out, dried for 24 hours and visually observed for any signs of swelling, cracking, stiffening or degradation of the coating. The coating showed no appreciable degradation and no stiffening, swelling, cracking or peeling.

The adhesion, or resistance to separation of the coating from the base cloth, was then measured by Method 5970 of Federal Test Method Standard No. 191. Results show 8130 XR-5[®] has maintained the seam strength over the long period.

	Control	Crude Oil	JP-4 Jet Fuel	Diesel Fuel	Kerosene	Naptha
8130 XR-5 [®] DC-7 Black Lbs./In.	20+	18	33	25	40	33*

* The naptha sample was sticky.

IMMERSION: January, 1979 to March, 1990

We believe this information is the best currently available on the subject. It is offered as a possible helpful suggestion in experimentation you may care to undertake along these lines. It is subject to revision as additional knowledge and experience are gained. We make no guarantee of results and assume no obligation or liability whatsoever in connection with this information.

MPC

Containment Systems, Ltd.

4834 S. Oakley ○ Chicago, IL 60609

312/927-4120 ○ 800/621-0146

FAX#: 312/650-6028

IT IS ASSUMED THAT THE FOLLOWING WILL BE PROVIDED TO MPC

- A MOVABLE PLATFORM SIMILAR TO A WINDOW WASHER'S
- STUD WELDED ANCHORS FOR BATTENING 6" O/C
- LIGHTING
- CONCRETE SHOULD BE POURED AT TOWER BASE
- POWER 15KW 120/220V
- SAFE WORK ENVIRONMENT
- THE ABILITY TO USE HOT AIR AND HOT WEDGE WELDERS

BUDGETARY ONLY

a. LINE THE BARREL

PX \$230,000

PVI \$180,000.

b. LINE THE BOTTOM

PX \$80,000

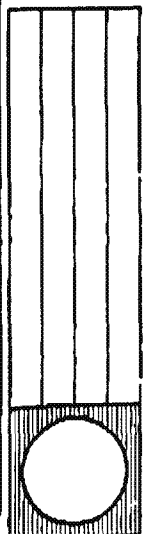
PVI \$65,000

- PRICE WITH FREIGHT ESTIMATE INCLUDED

© MPC containment systems, ltd.

MPC®

773/927-4120 800/621-0146 FAX: 773/650-6028 4834 S. Oakley, Chicago, IL 60609



PETRO GARD[®] X

PERFORMANCE SPECIFICATION

1.0 SCOPE

- 1.1 This specification establishes the requirement for a custom factory prefabricated flexible liner system utilizing the latest state-of-the-art concepts for secondary containment in accordance with the latest Federal and Local regulations.
- 1.2 The work shall include design, factory fabrication, field interface assembly, anchorage hardware, piping, prefabricated interface ports, test wells, and monitoring wells.
- 1.3 The materials of construction shall be compatible with the product to be stored in the primary containment vessel(s), and the material's product resistance to permeability shall conform to the criteria stated elsewhere in this specification.

2.0 APPLICABLE DOCUMENTS

- 2.1 Specification: Federal Standard 1912, Material Testing of protective coated industrial textiles.
- 2.2 Specification: A.S.T.M. Standard D751-89, method of testing coated fabrics.
- 2.3 Specification: MIL-T-4520, quality control inspection and testing for the fabrication of flexible membrane materials.
- 2.4 Specification: A.S.T.M. D-4437-84, determining the integrity of field seams used in joining flexible polymeric sheet geomembranes.
- 2.5 Specification: Buyers general specification and site drawings.

3.0 REQUIRED SUBMITTALS

- 3.1 The successful bidder shall provide material and joint test certification demonstrating that the material and fabrication joints shall comply with the physical and chemical resistance requirements of this specification.
- 3.2 The bid proposal shall include design drawings showing secondary containment interface details at all apertures and shall also include installation instructions.
- 3.3 The liner system shall be fabricated by MPC Containment Systems, Ltd., Chicago, IL.

4.0 WARRANTY

- 4.1 A minimum twenty year installation warranty covering material and workmanship is required.

5.0 ENVIRONMENTAL DESIGN REQUIREMENTS

- 5.1 The flexible secondary containment liner shall be capable of withstanding the following environmental installation conditions: 5.1.1 Ambient Temperature: 25 - 100 Degrees F.

6.0 MATERIALS AND WORKMANSHIP

- 6.1 Flexible Liner Material Description
 - 6.1.1 The flexible liner material shall consist of a high strength reinforcing fabric weighing approximately thirteen (13) ounces per square yard, coated with an overall protective urethane aromatic resistance polymer; total weight is approximately thirty-eight (38) ounces per square yard.
Color: Tan
 - 6.1.2 Coated Liner Material: The coating compound shall be selected to have characteristics suitable for high temperature thermal welding, shall be compounded to withstand the attack of high temperature, humidity and mildew, while at the same time, resisting the attack of the products to be stored in the primary containment vessel(s).
 - 6.1.3 Weight and Thickness: 38 ounces per square yard +/- 2 ounces; 40 mils. +/- 2 mils.
 - 6.1.4 Tensile Strength:
Grab lbs., A.S.T.M. D-751 1,100 lbs/1,100 lbs.
1" strip lbs., A.S.T.M. D-751 775 lbs/725 lbs.
 - 6.1.6 Hydrostatic Resistance: Fed. Std. 6512 800 psi
 - 6.1.8 Adhesion per one inch of width
A.S.T.M. D-751 (2" per minute) 20 lbs.
 - 6.1.7 Low Temperature: A.S.T.M. D-2136 - 60°
 - 6.1.8 Flexibility/Resistance to Cracking: PASS
Lab Procedure: Ten (10) pound weighted roller, sample size 2' x 12", fold 180 Degrees, pass roller ten times: PASS

- 6.1.9 Chemical Resistance: The liner material shall meet the following test criteria for automotive fuels:
Test Procedure: Permeability A.S.T.M. E-98
Procedure BW

Requirement:
.05 oz/Sq Ft/24 hrs.

- A.S.T.M. D471 Reference Fuel B
- 6.1.10 Bursting Strength:
A.S.T.M. D-751, Section 18.2 1750 lbs. minimum
- 6.1.11 Puncture Resistance:
A.S.T.M. D-751, Section 18.2
(Ball Tip) 1750 lbs. minimum
- 6.1.12 Stiffness: A.S.T.M. D-747 30,000 psi max. each direction
- 6.1.13 Minimum Abrasion Resistance
Taber Method 5306 H-22 Wheel 1000 gram load 10,000 cycles

7.0 LINER MATERIAL FABRICATION DETAILS

- 7.1 All panel joints shall be thermal automatic high pressure welded, utilizing a two inch lap-seal construction with a tolerance of +/- a quarter of an inch on the lap.
- 7.2 The coating formulation shall be suitable for thermal type fabrication and shall also be capable of conforming to the following test procedures without affecting the requirements of Section 6.0.
 - 7.2.1 Dead Load Criteria for Joints:
 - 7.2.1.1 Seams carry a minimum dead load of 50% of the minimum strip tensile without separation of the fabric in the warp direction when the temperature of the FML is 70 degrees F, when tested in accordance with MIL-T-32883E.
 - 7.2.1.2 Seams carry a minimum dead load of 25% of the strip tensile when the temperature of the FML is 180 degrees F, when tested in accordance with MIL-T-32883E.
 - 7.2.1.3 Seams shall carry a minimum seam shear strength of 95% of the minimum strip tensile strength of the fabric when tested in accordance with A.S.T.M. D-751, Section 50.

7.3 Patterning:

- 7.3.1 The flexible membrane liner shall be fabricated from full length modular panels with a maximum of one horizontal splice seam per panel. Splice seams shall be used only when required to utilize full roll size.
- 7.3.2 Panel joints shall be patterned as shown on the drawings.
- 7.3.3 Secondary joints and reinforcing areas shall be thermally welded. Stitching and cementing shall not be allowed for normal panel fabrication.
- 7.3.4 Aperture locations located in the liner shall be suitably reinforced as common practice by the factory fabricator. Aperture locations in general shall be produced from rigid bulkhead fittings and other mechanical compression members made from synthetic type materials which normally resist corrosion.

8.0 ANCHORAGE SYSTEM

- 8.1 The liner shall be provided with an anchorage system which shall include hardware as detailed in the manufacturer's installation drawings.

9.0 INSTALLATION

- 9.1 Installation of the factory manufactured liner system shall be performed by a factory approved and certified contractor.
- 9.2 A contractor who is not trained or certified may install the secondary containment liner system only under the direction of a factory authorized field technical assistance supervisor. Under this condition, the factory will provide a field report to the construction manager confirming that the liner was installed under his direction.
- 9.3 The manufacturer of the secondary containment system shall supply detailed installation drawings covering all components supplied.

10.0 TESTING OF THE SECONDARY CONTAINMENT LINER SYSTEM

- 10.1 The liner manufacturer shall provide written certification that the liner has been vacuum box tested at all panel thermal welded joint locations, and all panel materials have been visually inspected with defects noted and corrected prior to packaging. (Testing per A.S.T.M. D-4437 Mod. 1-2 PSI max.)
- 10.2 When a membrane liner is fabricated, seamed, sealed, modified or repaired in the field, the part so fabricated, seamed, sealed, modified or repaired shall be subjected to a performance test prescribed by the manufacturer.
CL19977-20895

PETRO GARD® X

CHEMICAL COMPATIBILITY CHART

The following fluids were tested and are considered compatible with PetroGard® X.

ASTM FUEL B	HYDRAULIC FLUID
ASTM FUEL C	JP-4
AVIATION GAS	JP-5
CRUDE OIL	KEROSENE
DIESEL FUEL	METHANOL
ETHANOL	MINERAL SPIRITS
FUEL OIL	MTBE
GASOLINE, LEADED	NAPHTHA
GASOLINE, PREMIUM UNLEADED	PETROLEUM HEAVY CAT CRACK
GASOLINE, REGULAR UNLEADED	PETROLEUM 95 OCTANE REFORMATE

The data shown is the result of the following laboratory tests and is intended to serve only as a guide:

Permeability	ASTM E-96
Solubility & Swell	ASTM D-543
Tensile & Elongation	ASTM D-751

Results were arrived at by visual and physical examination of the samples after immersion in the test fluid for 7 days at room temperature. Results represent the ability of the material to retain its performance properties. When considering PetroGard® X for a specific application, it is important to study other requirements such as permeability, service temperature, concentration, size to be contained, etc. MPC Containment Systems Ltd. Technical Department should be consulted for further recommendations. This table is presented and accepted at user's risk.

We believe that the above information is the best currently available on the subject. It is offered as a possible helpful suggestion in experimentation you may care to undertake along these lines. It is subject to revision as additional knowledge and experience are gained.

For more information call today.



4834 S. Oakley Ave.
Chicago, Illinois 60609
312 827-4120
(Outside IL) 800 621-0148
(Fax) 312 650-6028

CL10077-20486

PETRO GARD® VI

PERFORMANCE SPECIFICATION

1.0 SCOPE

- 1.1 This specification establishes the requirement for a custom factory prefabricated flexible liner system utilizing the latest state-of-the-art concepts for secondary containment in accordance with the latest Federal and Local regulations.
- 1.2 The work shall include design, factory fabrication, field interface assembly, anchorage hardware, piping, prefabricated interface ports, test wells, and monitoring wells.
- 1.3 The materials of construction shall be compatible with the product to be stored in the primary containment vessel(s), and the material's product resistance to permeability shall conform to the criteria stated elsewhere in this specification.

2.0 APPLICABLE DOCUMENTS

- 2.1 Specification: Federal Standard 1812, material testing of protective coated industrial textiles.
- 2.2 Specification: A.S.T.M. Standard D751, method of testing coated fabrics.
- 2.3 Specification: MIL-T-4520, quality control inspection and testing for the fabrication of flexible membrane materials.
- 2.4 Specification: A.S.T.M. D-751, determining the integrity of seams used in joining flexible polymeric sheet geomembranes.
- 2.5 Specification: ULC/ORD-C58.9-1993.

3.0 REQUIRED SUBMITTALS

- 3.1 The successful bidder shall provide material and joint test certification demonstrating that the material and fabrication joints shall comply with the physical and chemical resistance requirements of this specification.
- 3.2 The bid proposal shall include design drawings showing secondary containment interface details at all apertures and shall also include installation instructions.
- 3.3 The material shall be ULC approved.
- 3.4 The liner system shall be fabricated by MPC Containment Systems, Ltd., Chicago, IL.
- 3.5 The successful bidder shall provide and maintain third party pollution liability insurance coverage in the minimum amount of \$1 million.

4.0 WARRANTY

- 4.1 A minimum twenty year warranty covering material and workmanship is required.

5.0 ENVIRONMENTAL DESIGN REQUIREMENTS

- 5.1 The flexible secondary containment liner shall be capable of withstanding the following environmental installation conditions:
 - 5.1.1 Ambient Temperature: 25-100 Degrees F.

6.0 MATERIALS AND WORKMANSHIP

- 6.1 Flexible Liner Material Description
 - 6.1.1 The flexible liner material shall consist of a high strength reinforcing fabric weighing approximately seven and one half (7.5) ounces per square yard, coated with an overall protective multi-polymer, total weight is approximately thirty (30) ounces per square yard +/- 2 ounces. Color: Black front and back.
 - 6.1.2 Coated Liner Material: The coating compound shall be selected to have characteristics suitable for high temperature thermal-welding, shall be compounded to withstand the attack of high temperature, humidity and mildew, while at the same time, resisting the attack of the products to be stored in the primary containment vessel(s).
 - 6.1.3 Weight and Thickness: 30 ounces per square yard +/- 2 ounces; 30 mils. +/- 2 mils.
 - 6.1.4 Tensile Strength:

Grab lbs., A.S.T.M. D-751	650 lbs/650 lbs.
1" strip lbs., A.S.T.M. D-751	485 lbs/485 lbs.
 - 6.1.5 Hydrostatic Resistance: Fed. Std. 5512
 600 psi. |
 - 6.1.6 Adhesion per one inch of width:

A.S.T.M. D-751 (2" per minute)	15 lbs.
--------------------------------	---------

- 6.1.7 Low Temperature: A.S.T.M. D-2136
 -40° |
- 6.1.8 Flexibility/Resistance to Cracking: PASS

Lab Procedure: Ten (10) pound weighted roller, sample size 2" x 12", fold 180 Degrees, pass roller ten times: PASS
- 6.1.9 Chemical Resistance: The liner material shall meet the following test criteria for automotive fuels: Test Procedure: A.S.T.M. E-96 (Transmission of Material)

	Requirement:
A. Unleaded Gasoline	9.03 x 10 ⁻⁶ cm/sec
B. A.S.T.M. D471 Reference Fuel B	9.18 x 10 ⁻⁶ cm/sec
C. Methanol	3.38 x 10 ⁻⁶ cm/sec

*Per Koerner Method
- 6.1.10 Bursting Strength:

A.S.T.M. D-751, Section 18.2	950 lbs., minimum
------------------------------	-------------------
- 6.1.11 Puncture Resistance:

A.S.T.M. D-751, Section 18.2 (Ball Tip)	950 lbs. minimum
---	------------------
- 6.1.12 Stiffness: A.S.T.M. D-747
 30,000 psi max. each direction |
- 6.1.13 Coefficient of Thermal Expansion/Contraction

ASTM E-228	8 x 10 ⁻⁶ in/in %F. (max.)
------------	---------------------------------------
- 6.1.14 Weathering Resistance

Carbon-Arc	
Atlas Weather-o-meter	8,000 hrs. No Appreciable changes or stiffening or cracking of coating

7.0 LINER MATERIAL FABRICATION DETAILS

- 7.1 All panel joints shall be thermal automatic high pressure welded, utilizing a two inch lap-seal construction with a tolerance of +/- a quarter of an inch on the lap.
- 7.2 The coating formulation shall be suitable for thermal type fabrication and shall also be capable of conforming to the following test procedures without affecting the requirements of Section 6.0.
 - 7.2.1 Dead Load Criteria for Joints:
 - 7.2.1.1 Seams carry a minimum dead load of 50% of the minimum strip tensile without separation of the fabric in the warp direction when the temperature of the FML is 70 degrees F. when tested in accordance with MIL-T-52983E.
 - 7.2.1.2 Seams carry a minimum dead load of 25% of the strip tensile when the temperature of the FML is 160 degrees F. when tested in accordance with MIL-T-52983E.
 - 7.2.1.3 Seams shall carry a minimum seam shear strength of 95% of the minimum strip tensile strength of the fabric when tested in accordance with A.S.T.M. D-751, Section 50.

8.0 TESTING OF THE SECONDARY CONTAINMENT LINER SYSTEM

- 8.1 The liner manufacturer shall provide written certification that the liner has been vacuum box tested at all panel thermal welded joint locations, and all panel materials have been visually inspected with defects noted and corrected prior to packaging. (Testing per A.S.T.M. D-4437 Mod. 1-2 PSI max.)
- 8.2 When a membrane liner is fabricated, seamed, sealed, modified or repaired in the field, the part so fabricated, seamed, sealed, modified or repaired shall be subjected to a performance test prescribed by the manufacturer.

9.0 INSTALLATION

- 9.1 Installation of the factory manufactured liner system shall be performed by a factory approved and certified contractor.
- 9.2 A contractor who is not trained or certified may install the secondary containment liner system only under the direction of a factory authorized field technical assistance supervisor. Under this condition, the factory will provide a field report to the construction manager confirming that the liner was installed under his direction.
- 9.3 The manufacturer of the secondary containment system shall supply detailed installation drawings covering all components supplied.

PETRO GARD® VI

CHEMICAL COMPATIBILITY CHART

The following fluids were tested and are considered compatible with PetroGard® VI when used as a secondary containment dike liner with above ground storage tanks:

Antifreeze (ethylene glycol)	#6 Fuel Oil	Mineral Spirits
Animal Oil	Gasoline, leaded	MTBE
ASTM Fuel A	Gasoline, regular unleaded	Naptha
ASTM Fuel B	Gasoline, premium unleaded	Phosphoric Acid (50%)
ASTM Oil #2	Glycerin	Raw Linseed Oil
Aviation Gas	Hydraulic Fluid	SAE-30 Oil
20% Chlorine Solution	Hydrochloric Acid (50%)	Sea Water
Clorox	Hydrofluoric Acid (5%)	Sodium Hydroxide (60%)
Conc. Ammonium Hydroxide	Hydrofluoric Acid (50%)	Sulphuric Acid (50%)
Corn Oil	Hydrofluorosilicic Acid (30%)	50% Tanic Acid
Crude Oil	Ivory Soap	Transformer Oil
Diesel Fuel	JP-4 Jet Fuel	Turpentine
Ethanol	JP-5 Jet Fuel	Urea Formaldehyde
Ethyl Alcohol	JP-8 Jet Fuel	Vegetable Oil
Fertilizer Solution	Kerosene	Water (200°F).
#2 Fuel Oil	Methanol	

The data shown is the result of the following laboratory tests and is intended to serve only as a guide:

Permeability	ASTM E-96
Solubility & Swell	ASTM D-543
Tensile & Elongation	ASTM D-751

Results were arrived at by visual and physical examination of the samples after immersion in the test fluid for 7 days at room temperature. Results represent the ability of the material to retain its performance properties. When considering PetroGard® VI for a specific application, it is important to study other requirements such as permeability, service temperature, concentration, size to be contained, etc. MPC Containment Systems Ltd. Technical Department should be consulted for further recommendations. This table is presented and accepted at user's risk.

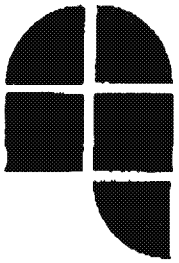
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For more information, call today.



4834 S. Oakley Ave.
Chicago, Illinois 60609
773 927-4120
(Outside IL) 800 621-0146
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CL10974-90686



**NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.**
21000 77th AVE. SOUTH
KENT, WA 98032
253-872-0244
FAX 253-872-0245

Friday, May 08, 1998

MATERIAL QUOTATION

Project: Red Hill Tank Farm - Tank #19

NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC. is providing a rough engineer's estimate to supply and install the following materials for the above referenced project based on limited information provided concerning site support, drawings, details, and conditions.

75,000 SF +/- XR-5 8130 Geomembrane Liner or 36 mil Coolguard HR
Stainless Steele Batten Attachment at top and bottom toe of tank wall
Pipe penetrations
Labor to install materials
Equipment to weld materials
Quality Control Testing

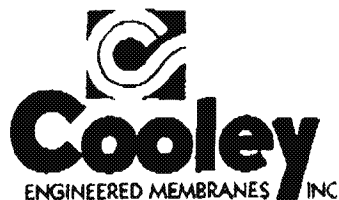
TOTAL: \$ 230,000.00

Contractor to provide:

Means to load material into tank
Means to move men from floor to top of tank for welding and batten installation
Air quality monitoring, fresh air fans, lighting
Supply 5 men for 6-7 days to aid in installation of wall sheets
Platform that can be reconfigured or moved in 2-3 hours to install batten and wall sheets
Power

Breakdown:

Liner Installation est. 20-30 days
XR-5 / Coolguard HR Materials (75,000 SF): \$ 60,000
For Urethane Liner add \$25,000.00
Batten Materials (2 ea. @ 315 LF) including installation of wall anchor bolts: \$ 15,000.00
Material Freight: \$ 4,000.00
Equipment, Labor, Misc., Travel, QA/QC, OH & Profit: \$ 150,000.00



Box 939, Pawtucket, R.I. 02862-0939 USA
 401-4490 • Fax 401/726-8731 • 800/444-4023

36 MIL COOLGUARD HR (Triopolymer Alloy/Elvaloy®) PHYSICAL PROPERTIES

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>VALUES</u>
Gauge, Nominal (Mils)	ASTM-D751	36 ± 10%
Plies Reinforcing	6.5 Ounce	1
Tongue Tear (LBS Min.)	ASTM-D751 Procedure B	135 x 135 lbs.
Trapezoid Tear (LBS Min.)	ASTM-D1117 Section 14	75 x 75 lbs.
Grab Tensile (LBS Min.)	ASTM-D751 Procedure A	500 x 450 lbs.
Strip Tensile (LBS Min.)	ASTM-D751 Procedure B	400 x 300 lbs.
Ply Adhesion (LBS/In. Min.)	ASTM-D751	10 lbs.
Hydrostatic Resistance (P.S.I. Min.)	ASTM-D751 Procedure A	600 psi
Puncture Resistance (1" Ball)	ASTM-D751	600 lbs.
Low Temperature (Deg. F)	ASTM-D2136	-30°F
Dimensional Stability (% Max)	ASTM-D1204 (1 Hr. @ 212°F)	2% Max.

ELVALOY IS A REGISTERED TRADEMARK OF E.I. DUPONT CO.

36CG395

KEY INC. LABORATORY IS A DEPARTMENT OF DEFENSE, DEFENSE SUPPLY AGENCY, QUALIFIED TESTING LABORATORY FOR CHEMICAL, PHYSICAL AND BIOLOGICAL TESTING QLL #5220
 DATA SHOWN ARE THE RESULT OF LABORATORY TESTS AND ARE INTENDED TO BE USED AS A GUIDE. NO PERFORMANCE, FITNESS, OR ANY OTHER WARRANTY IS INTENDED, EXPRESSED
 OR IMPLIED BY THIS DATA

ENTERPRISE

ENGINEERING, INC

101 MAIN ST. • P.O. BOX 550
YARMOUTH, MAINE 04096
TEL (207) 846-3000 FAX (207) 846-1115

MAY 08 1998 04:06PM

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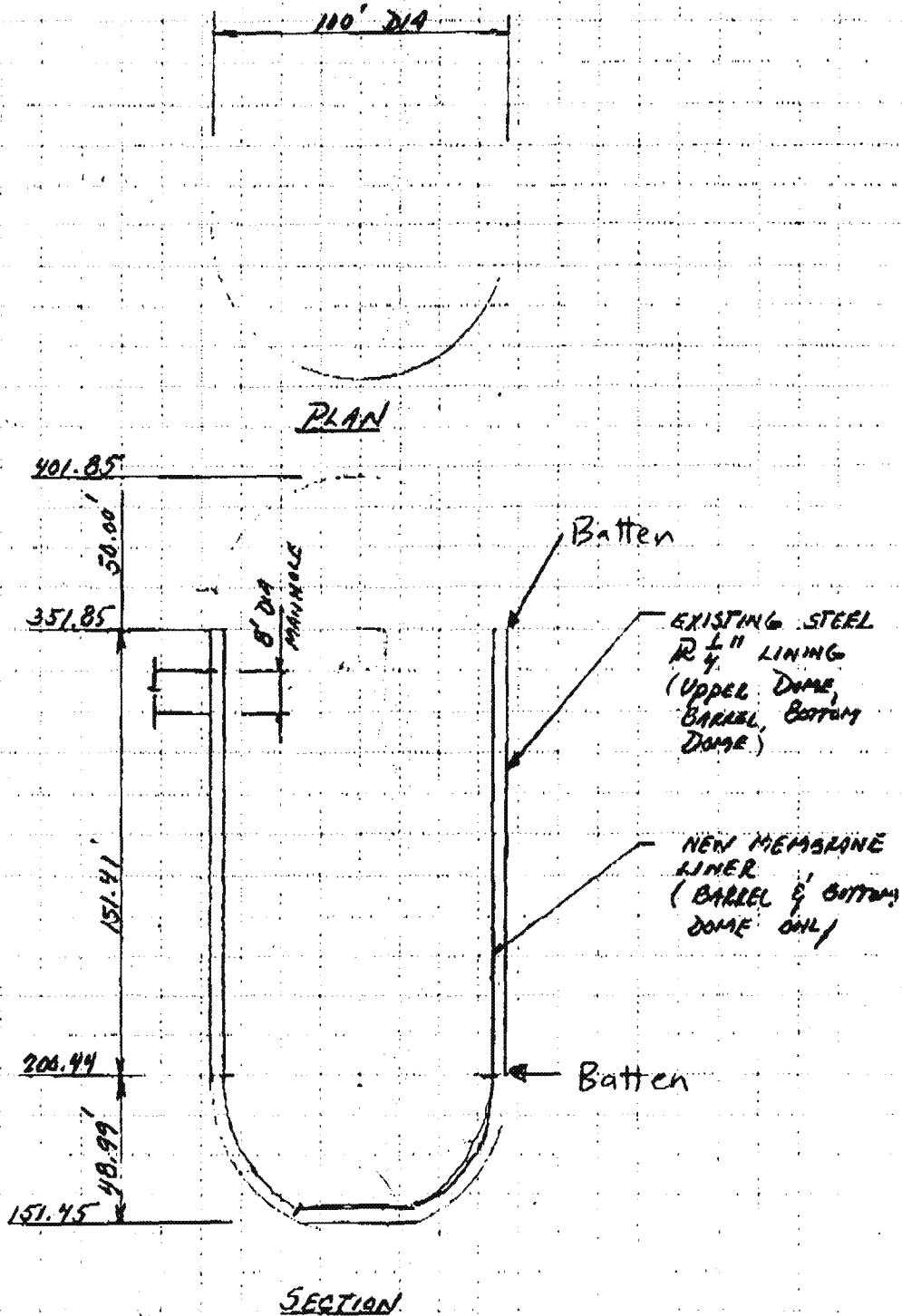
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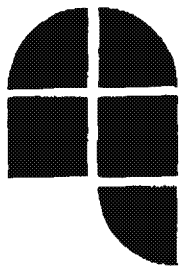
DATE 5/7/98

CHECKED BY _____

DATE _____

SCALE RED HILL TANK 19





NORTHWEST LININGS & GEOTEXTILE PRODUCTS, Inc.

21000 77th AVE. SOUTH
KENT, WA 98032
253-872-0244
FAX 253-872-0245

COOLGUARD-HR CHEMICAL RESISTANCE GUIDELINE

Cooley Engineered Membranes, Inc. offers a wide variety of geomembranes to fit your liner needs. Because each containment application is unique, this list is offered only as a guide in choosing the correct Cooley Geomembrane to fit your containment needs.

The following list of chemicals have been tested at ambient temperatures under static conditions. The effect of these chemicals on the geomembrane are subject to change based on variables such as, but not limited to; exposure to additional chemicals, temperature, dilution of the chemical, stronger concentrations, time of exposure, etc.

It is always recommended that you contact Cooley Engineered Membranes prior to choosing your geomembrane and/or that you test a sample of the geomembrane under actual or simulated jobsite conditions.

A	D	G
ACETIC ACID	DIESEL	GASOLINE
AMMONIUM CHLORIDE	DIMETHYLAMINE	GLYCERINE
AMMONIUM HYDROXIDE		
ANIMAL OIL	E	H
ASTM FUEL A	ETHANOL	HYDRAULIC FLUID
ASTM OIL #2	ETHYL ALCOHOL	HYDROCHLORIC ACID
ASTM OIL #3	ETHYLENE GLYCOL	HYDROGEN PEROXIDE
C	F	I
CALCIUM HYDROCHLORITE BLEACH	FORMALDEHYDE	ISOPROPYL ALCOHOL
CLOROX	FRESH WATER	
CORN OIL	#2 FUEL OIL	J
COTTONSEED OIL	#6 FUEL OIL	JP - 4 JET FUEL
CRUDE OIL		JP - 5 JET FUEL
		JP - 8 JET FUEL

K	N	T
KEROSENE	NITRIC ACID	TANIC ACID
	NAPHTHA	TRANSFORMER OIL
L		TURPENTINE
	P	
LINSEED OIL	PHOSPHORIC ACID	U
		UREA FORMALDEHYDE
M	S	UAN
MAGNESIUM HYDROXIDE	SALT WATER	
METHANOL	SOAP SOLUTIONS	V
METHYL ALCOHOL	SODIUM HYDROXIDE	VEGETABLE OIL
MINERAL SPIRITS	SODIUM HYPOCHLORITE	
	SOYBEAN OIL	W
	STEARIC ACID	WATER

The data shown are the result of laboratory test and are intended only as a guide. No performance warranty is intended or implied. Rating is determined by visual examination of coated fabric samples after contact with test fluid for 28 days at room temperature.

When considering COOLGUARD-III for a specific application, it is important to study other requirements such as permeability, service temperature, concentration, size to be contained, etc. A sample of COOLGUARD-III should be tested in actual service before specification. When impractical, tests should be devised which simulate actual service conditions as closely as possible. The Cooley/Engineered Membranes, Inc. Technical Department should be consulted for further recommendation. This table is presented at user's risk.



COATING INFORMATION

May 9, 1998

Enterprise Engineering, Inc.
c/o Thermal Engineering, Corp.
Fax: 808-846-6964
Fax: 808-924-6354 (Outrigger)

Attention: Steve DiGregorio

Subject: Budget for Red Hill Tank #19

RPI Ref.: EEI-RH19 / 050998mm

Dear Steve,

Robison-Prezioso, Inc. is pleased to submit a budget proposal for the removal of existing NRL lining and installation of a Morton FNEC 2515 lining system for steel. Per your fax we are providing a budget to reline the entire tank, upper dome-barrel-lower dome. Your fax refers to coating the domes and the barrel, but your item 7 of your fax, breakdown only lists the barrel and the lower dome. Our budget is broken down to do both domes, if only the lower dome is to be coated, certain fixed cost items that were spread over the 3 areas of activity, would have to be recalculated over 2 areas of activity (the barrel and lower dome).

The removal of existing NRL and surface prep, SSPC-SP10, would be considered the same work / labor activity.

<u>Item</u>	<u>Material Cost</u>	<u>Labor Cost</u>
Barrel		
Remove existing / SP10	\$ 92,000.00	\$113,000.00
FNEC coating	134,000.00	76,000.00
Lower Dome		
Remove existing / SP10	\$ 31,000.00	\$ 34,000.00
FNEC coating	46,000.00	22,000.00
Upper Dome		
Remove existing / SP10	\$ 31,000.00	\$ 42,000.00
FNEC coating	46,000.00	28,000.00

Enterprise
May 9, 1998
pg. 2

Material Sub-Total	\$ 380,000.00
Labor Sub-Total	<u>315,000.00</u>
Total	\$ 695,000.00

Please feel free to give me a call, if you have any questions concerning this budget.

Sincerely,



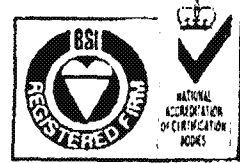
ROBISON-PREZIOSO, INC.
Mike McAndrew
10114 Shoemaker Ave
Santa Fe Springs, CA 90670
562-906-9002
562-906-9004 (F)

NDE INSPECTION QUOTES



Rohrback Cosasco Systems, Inc.
11841 East Smith Avenue
Santa Fe Springs, California 90670-6201
(562) 949-0123 FAX (562) 949-3065

a Corpro company



Certificate No. FM 10694
EN 29001 / ISO 9001 / BS 5750
Approved by BSI

FAX

To: Mr. Steve DiGregorio
Enterprise Engineering

Pages: 2 + Cover

From: Mike Kelly
Rohrback Cosasco Systems, Inc. (RCS)

cc: Inq. No. 3476

Subject: ***Ultrasonic Inspection of Below Grade Fuel Storage Tank***

Dear Mr. DiGregorio:

Thank you very much for allowing RCS to provide pricing for your cost estimate. Based on the information provided, we have prepared the following scope of work and pricing for inclusion in your report. Our pricing is based on certain assumptions which are included in our scope of work but we feel that we could accomplish the work in the time stated if the assumptions are met.

Scope of Work (10% Ultrasonic Sample of Tank)

RCS will dispatch a 2-man inspection crew with TMI-150 Ultrasonic Test System and personal safety gear for a sample inspection of approximately ten percent (10%) of one (1) underground fuel storage tank. RCS would scan 100% of six inch (6") wide strips, extending from the center of the bottom head, up the shell and concluding at the center of the top head. There will be a total of fifty-two of the six inch (6") wide strips, equally spaced, running from the bottom to the top of the storage tank. RCS will document the minimum and average remaining wall thickness measured in each three (3) foot by six inch (6") area of these strips. RCS will photograph any significant indications of corrosion (wall loss) discovered during the examination and produce a formal CAD report detailing the results of the examination. The estimated time for the completion of the examination is seven (7) working days.

Scope of Work (100% Ultrasonic Examination of Tank)

RCS will dispatch a 6-man inspection crew with TMI-150 Ultrasonic Test Systems and personal safety gear for a 100% inspection of one (1) underground fuel storage tank. RCS would scan 100% of both heads and the shell of the tank. RCS will document the minimum and average remaining wall thickness measured in each three (3) square area of the tank inner surface. RCS will photograph any significant indications of corrosion (wall loss) discovered during the examination and produce a formal CAD report detailing the results of the examination. The estimated time to complete the 100% examination is twenty (20) days.

General Assumptions

1. The RCS crew(s) will be supplied with adequate utilities, i.e., 120 VAC power, portable lighting to see the work and a 1/2", 5/8" or 3/4" standard tap water line in the immediate area of each working crew. RCS uses plain tap water as the "couplant" for ultrasonic readings.
2. RCS crews will have access to a man basket, scaffolding or other means of reaching the tank shell and all areas of each head. RCS has not included costs for the rental, installation or removal of this access.

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equipment.

3. The owner or operator of the tank will provide a safe entry permit. RCS has not include any costs for special breathing apparatus, hole watch personnel, special life lines, extraction equipment or other safety equipment and devices.
4. RCS expects to be able to begin the inspection work and complete our work without significant lost time due to sharing the man basket or other access equipment with other trades working in the tank concurrently.
5. RCS can reduce the number of days required for this work by adding additional crews and equipment to the job. RCS would be pleased to modify our pricing if additional personnel are required.
6. RCS pricing is for manual scanning of the tank and does not include any robotic equipment.

Pricing (10% Ultrasonic Sample of Tank)

Our total price for the ten percent (10%) sample inspection is \$19,750.00.

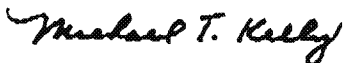
Pricing (100% Ultrasonic Examination of Tank)

Our total price for a one hundred percent (100%) examination of the tank is \$98,500.00.

If you need the costs broken down by heads and shells, it would be safe to assume a 33% split in each case. Although the shell contains more surface area it should go much quicker than working overhead or on the sloped bottom.

Once again, thank you very much for allowing RCS to quote. If you have any questions you can reach me at home this weekend at (213) 469-1522 or fax (213) 466-6266.

Very truly yours,



Michael T. Kelly, P.E.
RCS Field Services