COLLIN COUNTY, TEXAS

ADDENDUM No. Two (2) IFB NO. 12075-12

INVITATION FOR BIDS

FOR

REPLACEMENT OF FUEL TANK DISPENSERS AND
FUEL TANK MONITORING SYSTEMS

DATE: February 6, 2012

NOTICE TO ALL PROSPECTIVE BIDDERS:

YOU ARE HEREBY DIRECTED TO MAKE CHANGES TO THE INVITATION FOR BIDS IN ACCORDANCE WITH THE ATTACHED INFORMATION.

Delete: Bid End Date: February 9, 2012 at 2:00PM

Replace With: Bid End Date: February 16, 2012 at 2:00PM

Delete: 4.12.11.2 Gasboy Model 9853K (or Collin County approved equal)

Replace With: 4.12.11.2 Gasboy Above Ground Storage Tank Astra 9823K split remote pump with electronic register (or like equipment to replace existing Gasboy Astra 2623F/2622FV).

Add: Attachment B Service Center Waste Oil Tank Chart
Add: Attachment C Justice Center Diesel Tank Chart
Add: Attachment D 380/Courts Building Diesel Tank Chart
Add: Attachment E Service Center Diesel Tank Chart
Add: Attachment F Service Center Gas Tank Chart
Add: Attachment G Farmersville Diesel Tank Chart
Add: Attachment H Farmersville Gas Tank Chart
Add: Attachment I PermAlert ESP
Add: Attachment J Drawing for the PermAlert System

Add: 4.12.18.3: After completion of installations at all locations, vendor shall provide all required system testing , including Stage 2 Vapor Recovery, etc., to ensure installation meets all TCEQ requirements.

Clarifications:

GENERAL MEETING

Do you have tank charts? Yes. We will provide in addendum.

Where do the systems tie back? ATG systems shall have central controllers/monitors at the Service Center and at the Central Plant

CSLD? Dispensing 24 hours a day. Will require continuous statistical leak detection

Fax Modem- Needed? Add as an option? Ok

Dispensers- Tie into existing plumbing. Ok

Farmersville- is a dispenser needed or just a suction unit? Gasboy Above Ground Storage Tank Astra 9823K split remote pump with electronic register (or like equipment to replace existing Gasboy Astra 2623F/2622FV).

Do you monitor waste oil? Yes.

Would you entertain a wireless monitoring system? No.

Is new cabling required? What kind of cable is there now? CAT3 is in the ground now. We will install CAT 6

Monitoring system does not require CAT5-6 at the tanks, only a probe wire. Can we pull using the same conduit? We believe so since the CAT3 will be removed.

An internet connection is required at the PC only. Will we have access to the network? Yes, intranet only.

Can we have access to the internet for monitoring/troubleshooting? No, but a NetMeeting can be established for the contractor to work on the PC.

PUBLIC WORKS

What kind of dispenser is required? Single unit, twin dispenser with 20 gallon flow.

Is stage 2 testing required? Yes; add item 4.12.18.3: After completion of installations at all locations, vendor shall provide all required system testing , including Stage 2 Vapor Recovery, etc., to ensure installation meets all TCEQ requirements.

High hose retriever- can it be reused? Existing high hose retrievers may be used if they will be sufficient to keep hose (specified herein) off of ground. Otherwise, new hose retrievers must be installed.

Waste oil tank- should new wire be pulled if it doesn't meet spec (could void warranty) Use existing if it won't void warranty.

CENTRAL PLANT

Does the tank have a sump sensor? Yes

Can cables be spliced? No

Do you have specs on the current systems? Yes, will supply in addendum.

Can we do another walkthrough? At this time no other meeting is scheduled.

380 BUILDING

Does the tank have a sump sensor? Yes

FARMERSVILLE

Dispenser will not work as spec'd. Go back with like equipment (ASTRA 2623F and 2622FV Pedestal and Suction Pump). Gasboy Above Ground Storage Tank Astra 9823K split remote pump with electronic register (or like equipment to replace existing Gasboy Astra 2623F/2622FV).

Is the printer an option? Yes, the ATG system offered must MEET OR EXCEED the specs of the Veeder Root TLS-450

PLEASE NOTE ALL OTHER TERMS, CONDITIONS, SPECIFICATIONS DRAWINGS, ETC. REMAIN UNCHANGED.

SINCERELY,
FRANKLIN YBARBO
PURCHASING AGENT

Attachment 1 - B

SERV CENTER WASTE OIL

CONTAINMENT SOLUTIONS
A DENALI COMPANY

1,000 GALLON WASTE EVAC

Tank Capacity	**1,000 Gallons**
Tank Dimensions	**9'5" x 4'7" x 4'3"**
Primary Tank	**48 Inches**

INCHES	GALLONS	INCHES	GALLONS
1	21	25	521
2	42	26	542
3	63	27	563
4	83	28	583
5	104	29	604
6	125	30	625
7	146	31	646
8	167	32	667
9	188	33	688
10	208	34	708
11	229	35	729
12	250	36	750
13	271	37	771
14	292	38	792
15	313	39	813
16	333	40	833
17	354	41	854
18	375	42	875
19	396	43	896
20	417	44	917
21	438	45	938
22	458	46	958
23	479	47	979
24	500	48	1000

ATTACHMENT 2
INSTALLED 7-73

JUSTICE CENTER DIESEL

Model: DWT-2
20,000 Gallon Tanks (10 Ft. Diameter) (Actual Capacity 20,168gal)

Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons
1/8"	6	8 1/8"	559	16 1/8"	1540	24 1/8"	2796	32 1/8"	4250
1/4"	9	8 1/4"	572	16 1/4"	1558	24 1/4"	2817	32 1/4"	4274
3/8"	12	8 3/8"	584	16 3/8"	1576	24 3/8"	2839	32 3/8"	4299
1/2"	16	8 1/2"	597	16 1/2"	1594	24 1/2"	2860	32 1/2"	4323
5/8"	20	8 5/8"	610	16 5/8"	1612	24 5/8"	2882	32 5/8"	4347
3/4"	24	8 3/4"	623	16 3/4"	1630	24 3/4"	2903	32 3/4"	4371
7/8"	28	8 7/8"	636	16 7/8"	1648	24 7/8"	2925	32 7/8"	4395
1"	33	9"	650	17"	1666	25"	2947	33"	4419
1 1/8"	38	9 1/8"	663	17 1/8"	1684	25 1/8"	2968	33 1/8"	4443
1 1/4"	43	9 1/4"	676	17 1/4"	1702	25 1/4"	2990	33 1/4"	4468
1 3/8"	48	9 3/8"	690	17 3/8"	1721	25 3/8"	3012	33 3/8"	4492
1 1/2"	54	9 1/2"	703	17 1/2"	1739	25 1/2"	3034	33 1/2"	4516
1 5/8"	59	9 5/8"	717	17 5/8"	1758	25 5/8"	3055	33 5/8"	4541
1 3/4"	65	9 3/4"	731	17 3/4"	1776	25 3/4"	3077	33 3/4"	4565
1 7/8"	71	9 7/8"	745	17 7/8"	1795	25 7/8"	3099	33 7/8"	4590
2"	78	10"	759	18"	1813	26"	3121	34"	4614
2 1/8"	84	10 1/8"	773	18 1/8"	1832	26 1/8"	3143	34 1/8"	4638
2 1/4"	91	10 1/4"	787	18 1/4"	1851	26 1/4"	3165	34 1/4"	4663
2 3/8"	98	10 3/8"	801	18 3/8"	1870	26 3/8"	3188	34 3/8"	4688
2 1/2"	105	10 1/2"	816	18 1/2"	1889	26 1/2"	3210	34 1/2"	4712
2 5/8"	112	10 5/8"	830	18 5/8"	1907	26 5/8"	3232	34 5/8"	4737
2 3/4"	119	10 3/4"	844	18 3/4"	1926	26 3/4"	3254	34 3/4"	4761
2 7/8"	127	10 7/8"	859	18 7/8"	1946	26 7/8"	3277	34 7/8"	4786
3"	134	11"	874	19"	1966	27"	3299	35"	4811
3 1/8"	142	11 1/8"	888	19 1/8"	1984	27 1/8"	3321	35 1/8"	4836
3 1/4"	150	11 1/4"	903	19 1/4"	2003	27 1/4"	3344	35 1/4"	4860
3 3/8"	158	11 3/8"	918	19 3/8"	2022	27 3/8"	3366	35 3/8"	4885
3 1/2"	166	11 1/2"	933	19 1/2"	2042	27 1/2"	3389	35 1/2"	4910
3 5/8"	175	11 5/8"	948	19 5/8"	2061	27 5/8"	3411	35 5/8"	4935
3 3/4"	183	11 3/4"	963	19 3/4"	2081	27 3/4"	3434	35 3/4"	4960
3 7/8"	192	11 7/8"	978	19 7/8"	2100	27 7/8"	3457	35 7/8"	4985
4"	201	12"	994	20"	2120	28"	3479	36"	5010
4 1/8"	210	12 1/8"	1009	20 1/8"	2139	28 1/8"	3502	36 1/8"	5035
4 1/4"	219	12 1/4"	1025	20 1/4"	2159	28 1/4"	3525	36 1/4"	5060
4 3/8"	228	12 3/8"	1040	20 3/8"	2179	28 3/8"	3548	36 3/8"	5085
4 1/2"	237	12 1/2"	1056	20 1/2"	2199	28 1/2"	3571	36 1/2"	5110
4 5/8"	247	12 5/8"	1071	20 5/8"	2218	28 5/8"	3594	36 5/8"	5135
4 3/4"	256	12 3/4"	1087	20 3/4"	2238	28 3/4"	3616	36 3/4"	5160
4 7/8"	266	12 7/8"	1103	20 7/8"	2258	28 7/8"	3639	36 7/8"	5185
5"	276	13"	1119	21"	2278	29"	3662	37"	5210
5 1/8"	286	13 1/8"	1135	21 1/8"	2298	29 1/8"	3686	37 1/8"	5236
5 1/4"	296	13 1/4"	1151	21 1/4"	2319	29 1/4"	3709	37 1/4"	5261
5 3/8"	306	13 3/8"	1167	21 3/8"	2339	29 3/8"	3732	37 3/8"	5286
5 1/2"	317	13 1/2"	1183	21 1/2"	2359	29 1/2"	3755	37 1/2"	5311
5 5/8"	327	13 5/8"	1200	21 5/8"	2379	29 5/8"	3778	37 5/8"	5337
5 3/4"	338	13 3/4"	1216	21 3/4"	2400	29 3/4"	3801	37 3/4"	5362
5 7/8"	348	13 7/8"	1232	21 7/8"	2420	29 7/8"	3825	37 7/8"	5387
6"	359	14"	1249	22"	2441	30"	3848	38"	5413
6 1/8"	370	14 1/8"	1266	22 1/8"	2461	30 1/8"	3871	38 1/8"	5438
6 1/4"	381	14 1/4"	1282	22 1/4"	2482	30 1/4"	3895	38 1/4"	5464
6 3/8"	392	14 3/8"	1299	22 3/8"	2502	30 3/8"	3918	38 3/8"	5489
6 1/2"	403	14 1/2"	1316	22 1/2"	2523	30 1/2"	3942	38 1/2"	5515
6 5/8"	415	14 5/8"	1333	22 5/8"	2544	30 5/8"	3965	38 5/8"	5540
6 3/4"	426	14 3/4"	1349	22 3/4"	2564	30 3/4"	3989	38 3/4"	5566
6 7/8"	438	14 7/8"	1367	22 7/8"	2585	30 7/8"	4012	38 7/8"	5591
7"	449	15"	1384	23"	2606	31"	4036	39"	5617
7 1/8"	461	15 1/8"	1401	23 1/8"	2627	31 1/8"	4060	39 1/8"	5643
7 1/4"	473	15 1/4"	1418	23 1/4"	2648	31 1/4"	4084	39 1/4"	5668
7 3/8"	485	15 3/8"	1435	23 3/8"	2669	31 3/8"	4107	39 3/8"	5694
7 1/2"	497	15 1/2"	1453	23 1/2"	2690	31 1/2"	4131	39 1/2"	5720
7 5/8"	509	15 5/8"	1470	23 5/8"	2711	31 5/8"	4155	39 5/8"	5746
7 3/4"	521	15 3/4"	1487	23 3/4"	2732	31 3/4"	4179	39 3/4"	5771
7 7/8"	534	15 7/8"	1505	23 7/8"	2753	31 7/8"	4203	39 7/8"	5797
8"	546	16"	1523	24"	2775	32"	4227	40"	5823

Fiberglas® Tank for Fuel Storage

Calibration Chart*

How to properly gauge your tank:...

Underground storage tanks require periodic measurement to determine current inventory level. Using the proper methods when gauging your tank's contents will insure the most accurate reading and insure that you do not damage your tank. The following procedure should be followed whenever you use a gauge stick to determine the amount of product that is in your tank:

1. Use a wood dipstick with a rubber or nylon tip. Metallic dipsticks are not recommended. This will insure that frequent tank gaugings or an accidental dropping of the gauge stick into the tank will not damage the tank bottom.
2. Always gauge your tank at the fill port. A tank bottom protector plate has been installed under this pad to help protect the tank.
3. *Slowly lower you fill port until it tou Never free drop t can result in inac due to product s ping can also res damage and tan*
4. Remove your dip the product level gauge stick.

Water Paste De

To detect water in t water detection pa petroleum equipment distributors. However, some water detection paste cannot detect antifreeze mixtures. If antifreeze mixtures are used for the cavity monitoring fluid, the following product is capable of detecting water or antifreeze (brine or up to 50 percent glycol) solution in the tank water bottoms:

WATER FINDER
#7686-1870
DAYCO/NATIONAL
Dayton, OH
(513) 226-5879

Caution

Pressurized deliveries are not recommended. If the delivery vehicle uses pumps to fill the tank, install overfill shut-off equipment in the tank and truck to prevent the tank from being overfilled. **Overfilling the tank under pressure will damage the tank even if the tank vent is unrestricted.**

For Model DWT-2P double-wall tanks only, the annular space capacity for this tank is 1,360 gallons.

OWENS CORNING

Model: DWT-2 20,000 Gallon Tanks (10 Ft. Diameter)

(Actual Capacity 20,168 gal)

Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons
40⅛"	5849	48⅛"	7545	56⅛"	9297	64⅛"	11067	72⅛"	12816	80⅛"	14503	88⅛"	16088
40¼"	5875	48¼"	7572	56¼"	9325	64¼"	11095	72¼"	12842	80¼"	14529	88¼"	16112
40⅜"	5901	48⅜"	7599	56⅜"	9353	64⅜"	11122	72⅜"	12869	80⅜"	14554	88⅜"	16135
40½"	5926	48½"	7626	56½"	9380	64½"	11150	72½"	12896	80½"	14580	88½"	16159
40⅝"	5952	48⅝"	7653	56⅝"	9408	64⅝"	11178	72⅝"	12923	80⅝"	14606	88⅝"	16183
40¾"	5978	48¾"	7680	56¾"	9436	64¾"	11205	72¾"	12950	80¾"	14631	88¾"	16206
40⅞"	6004	48⅞"	7707	56⅞"	9463	64⅞"	11233	72⅞"	12977	80⅞"	14657	88⅞"	16230
41"	6030	49"	7735	57"	9491	65"	11260	73"	13004	81"	14682	89"	16253
41⅛"	6056	49⅛"	7762	57⅛"	9519	65⅛"	11288	73⅛"	13031	81⅛"	14708	89⅛"	16277
41¼"	6082	49¼"	7789	57¼"	9546	65¼"	11315	73¼"	13057	81¼"	14733	89¼"	16300
41⅜"	6108	49⅜"	7816	57⅜"	9574	65⅜"	11343	73⅜"	13084	81⅜"	14759	89⅜"	16323
41½"	6135	49½"	7843	57½"	9601	65½"	11370	73½"	13111	81½"	14784	89½"	16347
41⅝"	6161	49⅝"	7870	57⅝"	9629	65⅝"	11398	73⅝"	13138	81⅝"	14809	89⅝"	16370
41¾"	6187	49¾"	7898	57¾"	9657	65¾"	11425	73¾"	13165	81¾"	14835	89¾"	16393
41⅞"	6213	49⅞"	7925	57⅞"	9684	65⅞"	11453	73⅞"	13191	81⅞"	14860	89⅞"	16416
42"	6239	50"	7952	58"	9712	66"	11480	74"	13218	82"	14885	90"	16440
42⅛"	6265	50⅛"	7979	58⅛"	9740	66⅛"	11508	74⅛"	13245	82⅛"	14911	90⅛"	16463
42¼"	6292	50¼"	8007	58¼"	9767	66¼"	11535	74¼"	13271	82¼"	14936	90¼"	16486
42⅜"	6318	50⅜"	8034	58⅜"	9795	66⅜"	11563	74⅜"	13298	82⅜"	14961	90⅜"	16509
42½"	6344	50½"	8061	58½"	9823	66½"	11590	74½"	13325	82½"	14986	90½"	16533
42⅝"	6370	50⅝"	8088	58⅝"	9850	66⅝"	11618	74⅝"	13351	82⅝"	15011	90⅝"	16556
42¾"	6397	50¾"	8116	58¾"	9878	66¾"	11645	74¾"	13378	82¾"	15037	90¾"	16579
42⅞"	6423	50⅞"	8143	58⅞"	9906	66⅞"	11673	74⅞"	13405	82⅞"	15062	90⅞"	16601
43"	6449	51"	8170	59"	9934	67"	11700	75"	13431	83"	15087	91"	16624
43⅛"	6476	51⅛"	8198	59⅛"	9961	67⅛"	11727	75⅛"	13458	83⅛"	15112	91⅛"	16647
43¼"	6502	51¼"	8225	59¼"	9989	67¼"	11755	75¼"	13484	83¼"	15137	91¼"	16669
43⅜"	6528	51⅜"	8252	59⅜"	10017	67⅜"	11782	75⅜"	13511	83⅜"	15162	91⅜"	16692
43½"	6555	51½"	8280	59½"	10044	67½"	11810	75½"	13537	83½"	15187	91½"	16715
43⅝"	6581	51⅝"	8307	59⅝"	10072	67⅝"	11837	75⅝"	13564	83⅝"	15212	91⅝"	16737
43¾"	6608	51¾"	8334	59¾"	10100	67¾"	11864	75¾"	13590	83¾"	15237	91¾"	16760
43⅞"	6634	51⅞"	8362	59⅞"	10127	67⅞"	11892	75⅞"	13617	83⅞"	15261	91⅞"	16782
44"	6661	52"	8389	60"	10155	68"	11919	76"	13643	84"	15286	92"	16805
44⅛"	6687	52⅛"	8417	60⅛"	10183	68⅛"	11946	76⅛"	13669	84⅛"	15311	92⅛"	16828
44¼"	6714	52¼"	8444	60¼"	10210	68¼"	11974	76¼"	13696	84¼"	15336	92¼"	16850
44⅜"	6740	52⅜"	8471	60⅜"	10238	68⅜"	12001	76⅜"	13722	84⅜"	15361	92⅜"	16872
44½"	6767	52½"	8499	60½"	10266	68½"	12028	76½"	13749	84½"	15385	92½"	16895
44⅝"	6794	52⅝"	8526	60⅝"	10293	68⅝"	12056	76⅝"	13775	84⅝"	15410	92⅝"	16917
44¾"	6820	52¾"	8554	60¾"	10321	68¾"	12083	76¾"	13801	84¾"	15435	92¾"	16939
44⅞"	6847	52⅞"	8581	60⅞"	10349	68⅞"	12110	76⅞"	13827	84⅞"	15459	92⅞"	16962
45"	6873	53"	8609	61"	10376	69"	12138	77"	13854	85"	15484	93"	16984
45⅛"	6900	53⅛"	8636	61⅛"	10404	69⅛"	12165	77⅛"	13880	85⅛"	15508	93⅛"	17006
45¼"	6927	53¼"	8664	61¼"	10432	69¼"	12192	77¼"	13906	85¼"	15533	93¼"	17028
45⅜"	6953	53⅜"	8691	61⅜"	10459	69⅜"	12219	77⅜"	13932	85⅜"	15557	93⅜"	17050
45½"	6980	53½"	8719	61½"	10487	69½"	12247	77½"	13959	85½"	15582	93½"	17072
45⅝"	7007	53⅝"	8746	61⅝"	10515	69⅝"	12274	77⅝"	13985	85⅝"	15606	93⅝"	17094
45¾"	7034	53¾"	8774	61¾"	10542	69¾"	12301	77¾"	14011	85¾"	15631	93¾"	17116
45⅞"	7060	53⅞"	8801	61⅞"	10570	69⅞"	12328	77⅞"	14037	85⅞"	15655	93⅞"	17138
46"	7087	54"	8829	62"	10598	70"	12355	78"	14063	86"	15679	94"	17160
46⅛"	7114	54⅛"	8856	62⅛"	10625	70⅛"	12383	78⅛"	14089	86⅛"	15704	94⅛"	17181
46¼"	7141	54¼"	8884	62¼"	10653	70¼"	12410	78¼"	14115	86¼"	15728	94¼"	17203
46⅜"	7168	54⅜"	8911	62⅜"	10681	70⅜"	12437	78⅜"	14141	86⅜"	15752	94⅜"	17225
46½"	7195	54½"	8939	62½"	10708	70½"	12464	78½"	14167	86½"	15776	94½"	17247
46⅝"	7221	54⅝"	8966	62⅝"	10736	70⅝"	12491	78⅝"	14193	86⅝"	15801	94⅝"	17268
46¾"	7248	54¾"	8994	62¾"	10763	70¾"	12518	78¾"	14219	86¾"	15825	94¾"	17290
46⅞"	7275	54⅞"	9022	62⅞"	10791	70⅞"	12546	78⅞"	14245	86⅞"	15849	94⅞"	17311
47"	7302	55"	9049	63"	10819	71"	12572	79"	14271	87"	15873	95"	17333
47⅛"	7329	55⅛"	9077	63⅛"	10846	71⅛"	12599	79⅛"	14297	87⅛"	15897	95⅛"	17354
47¼"	7356	55¼"	9104	63¼"	10874	71¼"	12627	79¼"	14323	87¼"	15921	95¼"	17375
47⅜"	7383	55⅜"	9132	63⅜"	10902	71⅜"	12654	79⅜"	14349	87⅜"	15945	95⅜"	17397
47½"	7410	55½"	9159	63½"	10929	71½"	12681	79½"	14374	87½"	15969	95½"	17418
47⅝"	7437	55⅝"	9187	63⅝"	10957	71⅝"	12708	79⅝"	14400	87⅝"	15993	95⅝"	17439
47¾"	7464	55¾"	9215	63¾"	10984	71¾"	12735	79¾"	14426	87¾"	16017	95¾"	17460
47⅞"	7491	55⅞"	9242	63⅞"	11012	71⅞"	12762	79⅞"	14452	87⅞"	16040	95⅞"	17481
48"	7518	56"	9270	64"	11040	72"	12789	80"	14477	88"	16064	96"	17502

Model: DWT-2 20,000 Gallon Tanks (10 Ft. Diameter)

(Actual Capacity 20,168 gal)

Dipstick	Gallons	Dipstick	Gallons	Dipstick	Gallons
96⅛"	17524	104⅛"	18754	112⅛"	19699
96¼"	17545	104¼"	18771	112¼"	19710
96⅜"	17565	104⅜"	18788	112⅜"	19722
96½"	17586	104½"	18805	112½"	19734
96⅝"	17607	104⅝"	18822	112⅝"	19745
96¾"	17628	104¾"	18839	112¾"	19757
96⅞"	17649	104⅞"	18856	112⅞"	19768
97"	17669	105"	18873	113"	19779
97⅛"	17690	105⅛"	18889	113⅛"	19791
97¼"	17710	105¼"	18906	113¼"	19802
97⅜"	17731	105⅜"	18923	113⅜"	19812
97½"	17751	105½"	18939	113½"	19823
97⅝"	17772	105⅝"	18956	113⅝"	19834
97¾"	17792	105¾"	18972	113¾"	19844
97⅞"	17812	105⅞"	18988	113⅞"	19855
98"	17833	106"	19004	114"	19865
98⅛"	17853	106⅛"	19020	114⅛"	19875
98¼"	17873	106¼"	19037	114¼"	19886
98⅜"	17893	106⅜"	19053	114⅜"	19896
98½"	17913	106½"	19068	114½"	19905
98⅝"	17933	106⅝"	19084	114⅝"	19915
98¾"	17953	106¾"	19100	114¾"	19925
98⅞"	17973	106⅞"	19116	114⅞"	19934
99"	17993	107"	19131	115"	19943
99⅛"	18012	107⅛"	19147	115⅛"	19953
99¼"	18032	107¼"	19162	115¼"	19962
99⅜"	18052	107⅜"	19178	115⅜"	19971
99½"	18071	107½"	19193	115½"	19979
99⅝"	18091	107⅝"	19208	115⅝"	19988
99¾"	18110	107¾"	19223	115¾"	19997
99⅞"	18130	107⅞"	19238	115⅞"	20005
100"	18149	108"	19253	116"	20013
100⅛"	18168	108⅛"	19268	116⅛"	20021
100¼"	18188	108¼"	19283	116¼"	20029
100⅜"	18207	108⅜"	19298	116⅜"	20037
100½"	18226	108½"	19313	116½"	20045
100⅝"	18245	108⅝"	19327	116⅝"	20052
100¾"	18264	108¾"	19342	116¾"	20060
100⅞"	18283	108⅞"	19356	116⅞"	20067
101"	18302	109"	19370	117"	20074
101⅛"	18321	109⅛"	19384	117⅛"	20081
101¼"	18339	109¼"	19399	117¼"	20087
101⅜"	18358	109⅜"	19413	117⅜"	20094
101½"	18377	109½"	19427	117½"	20100
101⅝"	18395	109⅝"	19441	117⅝"	20106
101¾"	18414	109¾"	19454	117¾"	20112
101⅞"	18432	109⅞"	19468	117⅞"	20118
102"	18451	110"	19482	118"	20123
102⅛"	18469	110⅛"	19495	118⅛"	20129
102¼"	18487	110¼"	19509	118¼"	20134
102⅜"	18505	110⅜"	19522	118⅜"	20139
102½"	18524	110½"	19535	118½"	20143
102⅝"	18542	110⅝"	19548	118⅝"	20148
102¾"	18560	110¾"	19561	118¾"	20152
102⅞"	18578	110⅞"	19574	118⅞"	20156
103"	18596	111"	19587	119"	20159
103⅛"	18613	111⅛"	19600	119⅛"	20162
103¼"	18631	111¼"	19613	119¼"	20165
103⅜"	18649	111⅜"	19625	119⅜"	20168
103½"	18666	111½"	19638		
103⅝"	18684	111⅝"	19650		
103¾"	18701	111¾"	19662		
103⅞"	18719	111⅞"	19674		
104"	18736	112"	19687		

ATTACHMENT D

380/COURTS BLDG DIESEL

MODERN WELDING CO OF TEXAS

5000 GAL. CAP. TANK CHART 96X160 (817) 636-2215 (800) 565-2215

	1/8	1/4	3/8	1/2	5/8	3/4	7/8		0	1/8	1/4	3/8	1/2	5/8	3/4	7/8
	2	3	4	6	7	9	11	48		2523	2532	2540	2548	2557	2565	2573
13	15	17	19	21	23	25	28	49	2590	2598	2606	2615	2623	2631	2640	2648
30	33	35	38	41	44	47	49	50	2656	2665	2673	2681	2689	2698	2706	2714
52	56	59	62	65	68	71	75	51	2723	2731	2739	2748	2756	2764	2772	2781
78	82	85	89	92	96	100	103	52	2789	2797	2806	2814	2822	2830	2839	2847
07	111	115	119	122	126	130	135	53	2855	2863	2872	2880	2888	2896	2905	2913
39	143	147	151	155	160	164	168	54	2921	2929	2938	2946	2954	2962	2971	2979
73	177	181	186	190	195	200	204	55	2987	2995	3003	3012	3020	3028	3036	3044
09	213	218	223	228	232	237	242	56	3053	3061	3069	3077	3085	3093	3102	3110
47	252	257	262	267	272	277	282	57	3118	3126	3134	3142	3151	3159	3167	3175
87	292	298	303	308	313	319	324	58	3183	3191	3199	3207	3216	3224	3232	3240
29	335	340	345	351	356	362	367	59	3248	3256	3264	3272	3280	3288	3296	3304
73	378	384	389	395	401	406	412	60	3312	3320	3328	3336	3344	3352	3360	3368
18	424	429	435	441	447	453	459	61	3376	3384	3392	3400	3408	3416	3424	3432
64	470	476	482	488	494	500	506	62	3440	3448	3456	3464	3472	3480	3488	3496
12	519	525	531	537	543	549	555	63	3503	3511	3519	3527	3535	3551	3558	3566
62	568	574	580	587	593	599	606	64	3566	3574	3582	3590	3597	3605	3613	3621
12	619	625	631	638	644	651	657	65	3629	3636	3644	3652	3660	3667	3675	3683
64	670	677	683	690	697	703	710	66	3690	3698	3706	3713	3721	3729	3736	3744
16	723	730	737	743	750	757	763	67	3752	3759	3767	3774	3782	3790	3797	3805
70	777	784	791	797	804	811	818	68	3812	3820	3827	3835	3842	3850	3857	3865
	1/8	1/4	3/8	1/2	5/8	3/4	7/8			1/8	1/4	3/8	1/2	5/8	3/4	7/8
25	832	839	846	853	860	867	874	69	3872	3880	3887	3894	3902	3909	3917	3924
11	888	895	902	909	916	923	930	70	3931	3939	3946	3953	3961	3968	3975	3983
07	944	951	959	966	973	980	987	71	3990	3997	4004	4012	4019	4026	4033	4041
95	1002	1009	1016	1024	1031	1038	1045	72	4048	4055	4062	4069	4076	4083	4091	4098
53	1060	1067	1075	1082	1089	1097	1104	73	4105	4112	4119	4126	4133	4140	4147	4154
2	1119	1126	1134	1141	1149	1156	1164	74	4161	4168	4175	4182	4189	4195	4202	4209
1	1179	1186	1194	1201	1209	1216	1224	75	4216	4223	4230	4236	4243	4250	4257	4264
2	1239	1247	1254	1262	1270	1277	1285	76	4270	4277	4284	4290	4297	4304	4310	4317
2	1300	1308	1316	1323	1331	1339	1346	77	4324	4330	4337	4343	4350	4356	4363	4369
4	1362	1369	1377	1385	1393	1400	1408	78	4376	4382	4389	4395	4401	4408	4414	4420
6	1424	1432	1439	1447	1455	1463	1471	79	4427	4433	4439	4445	4452	4458	4464	4470
9	1486	1494	1502	1510	1518	1526	1534	80	4477	4483	4489	4495	4501	4507	4513	4519
2	1550	1557	1565	1573	1581	1589	1597	81	4525	4531	4537	4543	4549	4555	4561	4567
5	1613	1621	1629	1637	1645	1653	1661	82	4572	4578	4584	4590	4596	4601	4607	4613
9	1677	1685	1693	1701	1709	1717	1725	83	4618	4624	4630	4635	4641	4646	4652	4657
3	1741	1749	1758	1766	1774	1782	1790	84	4663	4668	4674	4679	4684	4690	4695	4700
8	1806	1814	1822	1830	1839	1847	1855	85	4705	4711	4716	4721	4726	4731	4736	4742
3	1871	1879	1887	1896	1904	1912	1920	86	4747	4752	4757	4761	4766	4771	4776	4781
3	1936	1945	1953	1961	1969	1977	1985	87	4786	4791	4796	4800	4805	4809	4814	4819
3	2002	2010	2018	2027	2035	2043	2051	88	4823	4828	4832	4836	4841	4845	4850	4854
	1/8	1/4	3/8	1/2	5/8	3/4	7/8			1/8	1/4	3/8	1/2	5/8	3/4	7/8
[illegible]	2068	2076	2084	2092	2101	2109	2117	89	4858	4862	4867	4871	4875	4879	4883	4887
[illegible]	2134	2142	2150	2159	2167	2175	2183	90	4891	4895	4899	4903	4906	4910	4914	4918
[illegible]	2200	2208	2216	2225	2233	2241	2249	91	4921	4925	4928	4932	4935	4939	4942	4946
[illegible]	2266	2274	2283	2291	2299	2307	2316	92	4949	4952	4955	4958	4961	4964	4967	4970
[illegible]	2332	2341	2349	2357	2365	2374	2382	93	4973	4975	4978	4981	4983	4986	4988	4990
[illegible]	2399	2407	2415	2424	2432	2440	2449	94	4993	4995	4997	4999	5001	5003	5004	5006
[illegible]	2465	2473	2482	2490	2498	2507	2515	95	5008	5009	5010	5011	5012	5013	5013	0
	/															
	1/8	1/4	3/8	1/2	5/8	3/4	7/8			1/8	1/4	3/8	1/2	5/8	3/4	7/8

TANK AT CAPACITY WHEN TANK IS 95 3/4" MAY VARY BY 5%

380

Old Hospital

ATTACHMENT E

SERVICE CENTER DIESEL

XERXES / CENTURY CAST ™

(holds 11681 actual)

Dipstick Calibration Chart for 12,000 Gallons Storage Tanks

DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons
0"	0	6 ½"	360	13"	993	19 ½"	1797	26"	2719	32 ½"	3725	39"	4784
⅛"	5	6 ⅝"	370	13 ⅛"	1007	19 ⅝"	1813	26 ⅛"	2738	32 ⅝"	3745	39 ⅛"	4804
¼"	7	6 ¾"	380	13 ¼"	1021	19 ¾"	1830	26 ¼"	2757	32 ¾"	3765	39 ¼"	4825
⅜"	10	6 ⅞"	391	13 ⅜"	1036	19 ⅞"	1847	26 ⅜"	2775	32 ⅞"	3785	39 ⅜"	4846
½"	13	7"	401	13 ½"	1050	20"	1864	26 ½"	2794	33"	3805	39 ½"	4866
⅝"	16	7 ⅛"	411	13 ⅝"	1064	20 ⅛"	1881	26 ⅝"	2813	33 ⅛"	3825	39 ⅝"	4887
¾"	20	7 ¼"	422	13 ¾"	1079	20 ¼"	1898	26 ¾"	2832	33 ¼"	3845	39 ¾"	4908
⅞"	24	7 ⅜"	433	13 ⅞"	1093	20 ⅜"	1915	26 ⅞"	2851	33 ⅜"	3865	39 ⅞"	4929
1"	28	7 ½"	443	14"	1107	20 ½"	1932	27"	2869	33 ½"	3885	40"	4949
1 ⅛"	32	7 ⅝"	454	14 ⅛"	1122	20 ⅝"	1949	27 ⅛"	2888	33 ⅝"	3905	40 ⅛"	4970
1 ¼"	37	7 ¾"	465	14 ¼"	1137	20 ¾"	1966	27 ¼"	2907	33 ¾"	3925	40 ¼"	4991
1 ⅜"	42	7 ⅞"	476	14 ⅜"	1151	20 ⅞"	1983	27 ⅜"	2926	33 ⅞"	3946	40 ⅜"	5012
1 ½"	47	8"	487	14 ½"	1166	21"	2000	27 ½"	2945	34"	3966	40 ½"	5033
1 ⅝"	52	8 ⅛"	498	14 ⅝"	1181	21 ⅛"	2018	27 ⅝"	2964	34 ⅛"	3986	40 ⅝"	5053
1 ¾"	57	8 ¼"	510	14 ¾"	1195	21 ¼"	2035	27 ¾"	2983	34 ¼"	4006	40 ¾"	5074
1 ⅞"	63	8 ⅜"	521	14 ⅞"	1210	21 ⅜"	2052	27 ⅞"	3002	34 ⅜"	4026	40 ⅞"	5095
2"	68	8 ½"	533	15"	1225	21 ½"	2070	28"	3021	34 ½"	4046	41"	5116
2 ⅛"	74	8 ⅝"	544	15 ⅛"	1240	21 ⅝"	2087	28 ⅛"	3041	34 ⅝"	4067	41 ⅛"	5137
2 ¼"	80	8 ¾"	556	15 ¼"	1255	21 ¾"	2105	28 ¼"	3060	34 ¾"	4087	41 ¼"	5157
2 ⅜"	86	8 ⅞"	567	15 ⅜"	1270	21 ⅞"	2122	28 ⅜"	3079	34 ⅞"	4107	41 ⅜"	5178
2 ½"	92	9"	579	15 ½"	1285	22"	2140	28 ½"	3098	35"	4127	41 ½"	5199
2 ⅝"	99	9 ⅛"	591	15 ⅝"	1301	22 ⅛"	2157	28 ⅝"	3117	35 ⅛"	4148	41 ⅝"	5220
2 ¾"	105	9 ¼"	603	15 ¾"	1316	22 ¼"	2175	28 ¾"	3137	35 ¼"	4168	41 ¾"	5241
2 ⅞"	112	9 ⅜"	615	15 ⅞"	1331	22 ⅜"	2192	28 ⅞"	3156	35 ⅜"	4188	41 ⅞"	5262
3 "	119	9 ½"	627	16"	1347	22 ½"	2210	29"	3175	35 ½"	4209	42"	5282
3 ⅛"	126	9 ⅝"	639	16 ⅛"	1362	22 ⅝"	2228	29 ⅛"	3194	35 ⅝"	4229	42 ⅛"	5303
3 ¼"	133	9 ¾"	651	16 ¼"	1377	22 ¾"	2245	29 ¼"	3214	35 ¾"	4249	42 ¼"	5324
3 ⅜"	140	9 ⅞"	663	16 ⅜"	1393	22 ⅞"	2263	29 ⅜"	3233	35 ⅞"	4270	42 ⅜"	5345
3 ½"	148	10"	676	16 ½"	1408	23"	2281	29 ½"	3253	36"	4290	42 ½"	5366
3 ⅝"	155	10 ⅛"	688	16 ⅝"	1424	23 ⅛"	2299	29 ⅝"	3272	36 ⅛"	4311	42 ⅝"	5387
3 ¾"	163	10 ¼"	701	16 ¾"	1440	23 ¼"	2317	29 ¾"	3291	36 ¼"	4331	42 ¾"	5408
3 ⅞"	171	10 ⅜"	713	16 ⅞"	1455	23 ⅜"	2335	29 ⅞"	3311	36 ⅜"	4352	42 ⅞"	5429
4"	179	10 ½"	726	17"	1471	23 ½"	2353	30"	3330	36 ½"	4372	43"	5449
4 ⅛"	187	10 ⅝"	739	17 ⅛"	1487	23 ⅝"	2371	30 ⅛"	3350	36 ⅝"	4392	43 ⅛"	5470
4 ¼"	195	10 ¾"	752	17 ¼"	1503	23 ¾"	2389	30 ¼"	3369	36 ¾"	4413	43 ¼"	5491
4 ⅜"	203	10 ⅞"	764	17 ⅜"	1519	23 ⅞"	2407	30 ⅜"	3389	36 ⅞"	4433	43 ⅜"	5512
4 ½"	211	11"	777	17 ½"	1535	24"	2425	30 ½"	3409	37"	4454	43 ½"	5533
4 ⅝"	220	11 ⅛"	790	17 ⅝"	1551	24 ⅛"	2443	30 ⅝"	3428	37 ⅛"	4474	43 ⅝"	5554
4 ¾"	229	11 ¼"	803	17 ¾"	1567	24 ¼"	2461	30 ¾"	3448	37 ¼"	4495	43 ¾"	5575
4 ⅞"	237	11 ⅜"	817	17 ⅞"	1583	24 ⅜"	2480	30 ⅞"	3468	37 ⅜"	4516	43 ⅞"	5596
5"	246	11 ½"	830	18"	1599	24 ½"	2498	31"	3487	37 ½"	4536	44"	5617
5 ⅛"	255	11 ⅝"	843	18 ⅛"	1615	24 ⅝"	2516	31 ⅛"	3507	37 ⅝"	4557	44 ⅛"	5638
5 ¼"	264	11 ¾"	856	18 ¼"	1632	24 ¾"	2534	31 ¼"	3527	37 ¾"	4577	44 ¼"	5658
5 ⅜"	273	11 ⅞"	870	18 ⅜"	1648	24 ⅞"	2553	31 ⅜"	3546	37 ⅞"	4598	44 ⅜"	5679
5 ½"	282	12"	883	18 ½"	1664	25"	2571	31 ½"	3566	38"	4618	44 ½"	5700
5 ⅝"	292	12 ⅛"	897	18 ⅝"	1681	25 ⅛"	2590	31 ⅝"	3586	38 ⅛"	4639	44 ⅝"	5721
5 ¾"	301	12 ¼"	910	18 ¾"	1697	25 ¼"	2608	31 ¾"	3606	38 ¼"	4660	44 ¾"	5742
5 ⅞"	311	12 ⅜"	924	18 ⅞"	1714	25 ⅜"	2626	31 ⅞"	3626	38 ⅜"	4680	44 ⅞"	5763
6"	320	12 ½"	938	19"	1730	25 ½"	2645	32"	3645	38 ½"	4701	45"	5784
6 ⅛"	330	12 ⅝"	952	19 ⅛"	1747	25 ⅝"	2663	32 ⅛"	3666	38 ⅝"	4722	45 ⅛"	5805
6 ¼"	340	12 ¾"	966	19 ¼"	1763	25 ¾"	2682	32 ¼"	3685	38 ¾"	4742	45 ¼"	5826
6 ⅜"	350	12 ⅞"	979	19 ⅜"	1780	25 ⅞"	2701	32 ⅜"	3705	38 ⅞"	4763	45 ⅜"	5855

XERXES / CENTURY CAST ™

Dipstick Calibration Chart for 12,000 Gallons Storage Tanks

DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons
45 ½"	5876	52"	6960	58 ½"	8016	65"	9018	71 ½"	9935	78"	10730	84 ½"	11351
45 ⅝"	5897	52 ⅛"	6980	58 ⅝"	8036	65 ⅛"	9036	71 ⅝"	9951	78 ⅛"	10743	84 ⅝"	11361
45 ¾"	5918	52 ¼"	7001	58 ¾"	8056	65 ¼"	9055	71 ¾"	9968	78 ¼"	10757	84 ¾"	11370
45 ⅞"	5939	52 ⅜"	7021	58 ⅞"	8075	65 ⅜"	9073	71 ⅞"	9984	78 ⅜"	10771	84 ⅞"	11380
46"	5960	52 ½"	7042	59"	8095	65 ½"	9092	72"	10001	78 ½"	10784	85"	11389
46 ⅛"	5981	52 ⅝"	7063	59 ⅛"	8115	65 ⅝"	9110	72 ⅛"	10017	78 ⅝"	10798	85 ⅛"	11399
46 ¼"	6002	52 ¾"	7083	59 ¼"	8135	65 ¾"	9128	72 ¼"	10033	78 ¾"	10811	85 ¼"	11408
46 ⅜"	6023	52 ⅞"	7104	59 ⅜"	8155	65 ⅞"	9147	72 ⅜"	10050	78 ⅞"	10825	85 ⅜"	11417
46 ½"	6044	53"	7125	59 ½"	8174	66"	9165	72 ½"	10066	79"	10838	85 ½"	11426
46 ⅝"	6065	53 ⅛"	7145	59 ⅝"	8194	66 ⅛"	9183	72 ⅝"	10082	79 ⅛"	10851	85 ⅝"	11435
46 ¾"	6085	53 ¼"	7166	59 ¾"	8214	66 ¼"	9202	72 ¾"	10098	79 ¼"	10865	85 ¾"	11444
46 ⅞"	6106	53 ⅜"	7186	59 ⅞"	8233	66 ⅜"	9220	72 ⅞"	10114	79 ⅜"	10878	86 ⅛"	11453
47"	6127	53 ½"	7207	60"	8253	66 ½"	9238	73"	10130	79 ½"	10891	86"	11461
47 ⅛"	6148	53 ⅝"	7227	60 ⅛"	8273	66 ⅝"	9256	73 ⅛"	10146	79 ⅝"	10904	86 ⅛"	11470
47 ¼"	6169	53 ¾"	7248	60 ¼"	8292	66 ¾"	9274	73 ¼"	10162	79 ¾"	10917	86 ¼"	11478
47 ⅜"	6190	53 ⅞"	7268	60 ⅜"	8312	66 ⅞"	9292	73 ⅜"	10178	79 ⅞"	10930	86 ⅜"	11486
47 ½"	6211	54"	7289	60 ½"	8331	67"	9310	73 ½"	10194	80"	10942	86 ½"	11494
47 ⅝"	6232	54 ⅛"	7309	60 ⅝"	8351	67 ⅛"	9328	73 ⅝"	10210	80 ⅛"	10955	86 ⅝"	11503
47 ¾"	6253	54 ¼"	7330	60 ¾"	8370	67 ¼"	9346	73 ¾"	10226	80 ¼"	10968	86 ¾"	11510
47 ⅞"	6274	54 ⅜"	7350	60 ⅞"	8390	67 ⅜"	9364	73 ⅞"	10241	80 ⅜"	10980	86 ⅞"	11518
48 "	6294	54 ½"	7370	61"	8409	67 ½"	9382	74"	10257	80 ½"	10993	87"	11526
48 ⅛"	6315	54 ⅝"	7391	61 ⅛"	8429	67 ⅝"	9400	74 ⅛"	10273	80 ⅝"	11005	87 ⅛"	11533
48 ¼"	6336	54 ¾"	7411	61 ¼"	8448	67 ¾"	9418	74 ¼"	10288	80 ¾"	11018	87 ¼"	11541
48 ⅜"	6357	54 ⅞"	7432	61 ⅜"	8467	67 ⅞"	9436	74 ⅜"	10304	80 ⅞"	11030	87 ⅜"	11548
48 ½"	6378	55"	7452	61 ½"	8487	68"	9453	74 ½"	10319	81"	11042	87 ½"	11555
48 ⅝"	6399	55 ⅛"	7472	61 ⅝"	8506	68 ⅛"	9471	74 ⅝"	10335	81 ⅛"	11054	87 ⅝"	11562
48 ¾"	6420	55 ¼"	7493	61 ¾"	8525	68 ¼"	9489	74 ¾"	10350	81 ¼"	11066	87 ¾"	11569
48 ⅞"	6440	55 ⅜"	7513	61 ⅞"	8545	68 ⅜"	9506	74 ⅞"	10365	81 ⅜"	11078	87 ⅞"	11576
49"	6461	55 ½"	7533	62"	8564	68 ½"	9524	75"	10381	81 ½"	11090	88"	11582
49 ⅛"	6482	55 ⅝"	7554	62 ⅛"	8583	68 ⅝"	9542	75 ⅛"	10396	81 ⅝"	11102	88 ⅛"	11589
49 ¼"	6503	55 ¾"	7574	62 ¼"	8602	68 ¾"	9559	75 ¼"	10411	81 ¾"	11114	88 ¼"	11595
49 ⅜"	6524	55 ⅞"	7594	62 ⅜"	8622	68 ⅞"	9577	75 ⅜"	10426	81 ⅞"	11126	88 ⅜"	11601
49 ½"	6545	56"	7614	62 ½"	8641	69"	9594	75 ½"	10441	82"	11137	88 ½"	11607
49 ⅝"	6565	56 ⅛"	7635	62 ⅝"	8660	69 ⅛"	9612	75 ⅝"	10456	82 ⅛"	11149	88 ⅝"	11613
49 ¾"	6586	56 ¼"	7655	62 ¾"	8679	69 ¼"	9629	75 ¾"	10471	82 ¼"	11160	88 ¾"	11619
49 ⅞"	6607	56 ⅜"	7675	62 ⅞"	8698	69 ⅜"	9646	75 ⅞"	10486	82 ⅜"	11171	88 ⅞"	11624
50"	6628	56 ½"	7695	63"	8717	69 ½"	9664	76"	10501	82 ½"	11183	89"	11629
50 ⅛"	6649	56 ⅝"	7716	63 ⅛"	8736	69 ⅝"	9681	76 ⅛"	10515	82 ⅝"	11194	89 ⅛"	11635
50 ¼"	6669	56 ¾"	7736	63 ¼"	8755	69 ¾"	9698	76 ¼"	10530	82 ¾"	11205	89 ¼"	11640
50 ⅜"	6690	56 ⅞"	7756	63 ⅜"	8774	69 ⅞"	9715	76 ⅜"	10545	82 ⅞"	11216	89 ⅜"	11644
50 ½"	6711	57"	7776	63 ½"	8793	70"	9732	76 ½"	10559	83"	11227	89 ½"	11649
50 ⅝"	6732	57 ⅛"	7796	63 ⅝"	8812	70 ⅛"	9749	76 ⅝"	10574	83 ⅛"	11238	89 ⅝"	11653
50 ¾"	6753	57 ¼"	7816	63 ¾"	8831	70 ¼"	9766	76 ¾"	10588	83 ¼"	11249	89 ¾"	11657
50 ⅞"	6773	57 ⅜"	7836	63 ⅞"	8849	70 ⅜"	9783	76 ⅞"	10603	83 ⅜"	11259	89 ⅞"	11661
51"	6794	57 ½"	7856	64"	8868	70 ½"	9800	77"	10617	83 ½"	11270	90"	11665
51 ⅛"	6815	57 ⅝"	7876	64 ⅛"	8887	70 ⅝"	9817	77 ⅛"	10631	83 ⅝"	11280	90 ⅛"	11668
51 ¼"	6835	57 ¾"	7896	64 ¼"	8906	70 ¾"	9834	77 ¼"	10646	83 ¾"	11291	90 ¼"	11671
51 ⅜"	6856	57 ⅞"	7916	64 ⅜"	8925	70 ⅞"	9851	77 ⅜"	10660	83 ⅞"	11301	90 ⅜"	11674
51 ½"	6877	58"	7936	64 ½"	8943	71"	9868	77 ½"	10674	84"	11311	90 ½"	11677
51 ⅝"	6898	58 ⅛"	7956	64 ⅝"	8962	71 ⅛"	9885	77 ⅝"	10688	84 ⅛"	11321	90 ⅝"	11679
51 ¾"	6918	58 ¼"	7976	64 ¾"	8981	71 ¼"	9901	77 ¾"	10702	84 ¼"	11331	90 ¾"	11680
51 ⅞"	6939	58 ⅜"	7996	64 ⅞"	8999	71 ⅜"	9918	77 ⅞"	10716	84 ⅜"	11341	90 ⅞"	11681
												91"	11681

ATTACHMENT F

SERVICE CENTER GAS

XERXES / CENTURY CAST™

Dipstick Calibration Chart for 6,000 Gallons Storage Tanks

DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons
0"	0	6 ½"	173	13"	491	19 ½"	904	26"	1386	32 ½"	1917	39"	2479
⅛"	2	6 ⅝"	178	13 ⅛"	498	19 ⅝"	912	26 ⅛"	1396	32 ⅝"	1927	39 ⅛"	2490
¼"	3	6 ¾"	183	13 ¼"	505	19 ¾"	921	26 ¼"	1405	32 ¾"	1938	39 ¼"	2501
⅜"	4	6 ⅞"	188	13 ⅜"	512	19 ⅞"	930	26 ⅜"	1415	32 ⅞"	1949	39 ⅜"	2512
½"	6	7"	193	13 ½"	519	20"	939	26 ½"	1425	33"	1959	39 ½"	2523
⅝"	7	7 ⅛"	198	13 ⅝"	527	20 ⅛"	947	26 ⅝"	1435	33 ⅛"	1970	39 ⅝"	2534
¾"	9	7 ¼"	203	13 ¾"	534	20 ¼"	956	26 ¾"	1445	33 ¼"	1980	39 ¾"	2545
⅞"	11	7 ⅜"	209	13 ⅞"	541	20 ⅜"	965	26 ⅞"	1455	33 ⅜"	1991	39 ⅞"	2556
1"	13	7 ½"	214	14"	549	20 ½"	974	27"	1465	33 ½"	2002	40"	2567
1 ⅛"	15	7 ⅝"	219	14 ⅛"	556	20 ⅝"	983	27 ⅛"	1475	33 ⅝"	2012	40 ⅛"	2579
1 ¼"	17	7 ¾"	225	14 ¼"	564	20 ¾"	992	27 ¼"	1485	33 ¾"	2023	40 ¼"	2590
1 ⅜"	19	7 ⅞"	230	14 ⅜"	571	20 ⅞"	1001	27 ⅜"	1495	33 ⅞"	2034	40 ⅜"	2601
1 ½"	21	8"	236	14 ½"	579	21"	1010	27 ½"	1505	34"	2044	40 ½"	2612
1 ⅝"	24	8 ⅛"	241	14 ⅝"	586	21 ⅛"	1019	27 ⅝"	1515	34 ⅛"	2055	40 ⅝"	2623
1 ¾"	26	8 ¼"	247	14 ¾"	594	21 ¼"	1028	27 ¾"	1525	34 ¼"	2066	40 ¾"	2634
1 ⅞"	29	8 ⅜"	253	14 ⅞"	601	21 ⅜"	1037	27 ⅞"	1535	34 ⅜"	2077	40 ⅞"	2645
2"	32	8 ½"	258	15"	609	21 ½"	1046	28"	1545	34 ½"	2087	41"	2656
2 ⅛"	34	8 ⅝"	264	15 ⅛"	617	21 ⅝"	1055	28 ⅛"	1555	34 ⅝"	2098	41 ⅛"	2667
2 ¼"	37	8 ¾"	270	15 ¼"	624	21 ¾"	1064	28 ¼"	1565	34 ¾"	2109	41 ¼"	2678
2 ⅜"	40	8 ⅞"	276	15 ⅜"	632	21 ⅞"	1073	28 ⅜"	1575	34 ⅞"	2119	41 ⅜"	2689
2 ½"	43	9"	282	15 ½"	640	22"	1082	28 ½"	1585	35"	2130	41 ½"	2700
2 ⅝"	46	9 ⅛"	288	15 ⅝"	648	22 ⅛"	1091	28 ⅝"	1595	35 ⅛"	2141	41 ⅝"	2712
2 ¾"	49	9 ¼"	283	15 ¾"	655	22 ¼"	1100	28 ¾"	1606	35 ¼"	2152	41 ¾"	2723
2 ⅞"	52	9 ⅜"	299	15 ⅞"	663	22 ⅜"	1110	28 ⅞"	1616	35 ⅜"	2163	41 ⅞"	2734
3 "	56	9 ½"	305	16"	671	22 ½"	1119	29"	1626	35 ½"	2173	42"	2745
3 ⅛"	59	9 ⅝"	312	16 ⅛"	679	22 ⅝"	1128	29 ⅛"	1636	35 ⅝"	2184	42 ⅛"	2756
3 ¼"	63	9 ¾"	318	16 ¼"	687	22 ¾"	1137	29 ¼"	1646	35 ¾"	2195	42 ¼"	2767
3 ⅜"	66	9 ⅞"	324	16 ⅜"	695	22 ⅞"	1147	29 ⅜"	1657	35 ⅞"	2206	42 ⅜"	2778
3 ½"	70	10"	330	16 ½"	703	23"	1156	29 ½"	1667	36"	2217	42 ½"	2789
3 ⅝"	73	10 ⅛"	336	16 ⅝"	711	23 ⅛"	1165	29 ⅝"	1677	36 ⅛"	2228	42 ⅝"	2800
3 ¾"	77	10 ¼"	343	16 ¾"	719	23 ¼"	1175	29 ¾"	1687	36 ¼"	2238	42 ¾"	2812
3 ⅞"	81	10 ⅜"	349	16 ⅞"	727	23 ⅜"	1184	29 ⅞"	1698	36 ⅜"	2249	42 ⅞"	2823
4"	84	10 ½"	355	17"	735	23 ½"	1194	30"	1708	36 ½"	2260	43"	2834
4 ⅛"	88	10 ⅝"	362	17 ⅛"	744	23 ⅝"	1203	30 ⅛"	1718	36 ⅝"	2271	43 ⅛"	2845
4 ¼"	92	10 ¾"	368	17 ¼"	752	23 ¾"	1212	30 ¼"	1729	36 ¾"	2282	43 ¼"	2856
4 ⅜"	96	10 ⅞"	375	17 ⅜"	760	23 ⅞"	1222	30 ⅜"	1739	36 ⅞"	2293	43 ⅜"	2867
4 ½"	100	11"	381	17 ½"	768	24"	1231	30 ½"	1749	37"	2304	43 ½"	2878
4 ⅝"	104	11 ⅛"	388	17 ⅝"	776	24 ⅛"	1241	30 ⅝"	1760	37 ⅛"	2315	43 ⅝"	2890
4 ¾"	109	11 ¼"	394	17 ¾"	785	24 ¼"	1250	30 ¾"	1770	37 ¼"	2326	43 ¾"	2901
4 ⅞"	113	11 ⅜"	401	17 ⅞"	793	24 ⅜"	1260	30 ⅞"	1780	37 ⅜"	2337	43 ⅞"	2912
5"	117	11 ½"	408	18"	801	24 ½"	1269	31"	1791	37 ½"	2347	44"	2923
5 ⅛"	121	11 ⅝"	414	18 ⅛"	810	24 ⅝"	1279	31 ⅛"	1801	37 ⅝"	2358	44 ⅛"	2934
5 ¼"	126	11 ¾"	421	18 ¼"	818	24 ¾"	1289	31 ¼"	1812	37 ¾"	2369	44 ¼"	2945
5 ⅜"	130	11 ⅞"	428	18 ⅜"	827	24 ⅞"	1298	31 ⅜"	1822	37 ⅞"	2380	44 ⅜"	2956
5 ½"	135	12"	435	18 ½"	835	25"	1308	31 ½"	1833	38"	2391	44 ½"	2968
5 ⅝"	139	12 ⅛"	442	18 ⅝"	844	25 ⅛"	1318	31 ⅝"	1843	38 ⅛"	2402	44 ⅝"	2979
5 ¾"	144	12 ¼"	448	18 ¾"	852	25 ¼"	1327	31 ¾"	1854	38 ¼"	2413	44 ¾"	2990
5 ⅞"	149	12 ⅜"	455	18 ⅞"	861	25 ⅜"	1337	31 ⅞"	1864	38 ⅜"	2424	44 ⅞"	3001
6"	153	12 ½"	462	19"	869	25 ½"	1347	32"	1875	38 ½"	2435	45"	3012
6 ⅛"	158	12 ⅝"	469	19 ⅛"	878	25 ⅝"	1356	32 ⅛"	1885	38 ⅝"	2446	45 ⅛"	3023
6 ¼"	163	12 ¾"	476	19 ¼"	886	25 ¾"	1366	32 ¼"	1896	38 ¾"	2457	45 ¼"	3035
6 ⅜"	168	12 ⅞"	483	19 ⅜"	895	25 ⅞"	1376	32 ⅜"	1906	38 ⅞"	2468	45 ⅜"	3050

Seamless Concrete Underground Tanks

XERXES / CENTURY CAST ™

Dipstick Calibration Chart for 6,000 Gallons Storage Tanks

DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons	DIPSTICK READINGS	Gallons
45 ½"	3061	52"	3639	58 ½"	4200	65"	4728	71 ½"	5207	78"	5615	84 ½"	5927
45 ⅝"	3073	52 ⅛"	3650	58 ⅝"	4210	65 ⅛"	4738	71 ⅝"	5216	78 ⅛"	5622	84 ⅝"	5931
45 ¾"	3084	52 ¼"	3661	58 ¾"	4221	65 ¼"	4748	71 ¾"	5224	78 ¼"	5629	84 ¾"	5936
45 ⅞"	3095	52 ⅜"	3672	58 ⅞"	4231	65 ⅜"	4758	71 ⅞"	5233	78 ⅜"	5636	84 ⅞"	5941
46"	3106	52 ½"	3683	59"	4242	65 ½"	4767	72"	5241	78 ½"	5643	85"	5945
46 ⅛"	3117	52 ⅝"	3694	59 ⅛"	4252	65 ⅝"	4777	72 ⅛"	5250	78 ⅝"	5650	85 ⅛"	5950
46 ¼"	3128	52 ¾"	3705	59 ¼"	4263	65 ¾"	4787	72 ¼"	5258	78 ¾"	5657	85 ¼"	5955
46 ⅜"	3140	52 ⅞"	3715	59 ⅜"	4273	65 ⅞"	4796	72 ⅜"	5267	78 ⅞"	5664	85 ⅜"	5959
46 ½"	3151	53"	3726	59 ½"	4284	66"	4806	72 ½"	5275	79"	5671	85 ½"	5963
46 ⅝"	3162	53 ⅛"	3737	59 ⅝"	4294	66 ⅛"	4815	72 ⅝"	5283	79 ⅛"	5677	85 ⅝"	5968
46 ¾"	3173	53 ¼"	3748	59 ¾"	4304	66 ¼"	4825	72 ¾"	5292	79 ¼"	5684	85 ¾"	5972
46 ⅞"	3184	53 ⅜"	3759	59 ⅞"	4315	66 ⅜"	4834	72 ⅞"	5300	79 ⅜"	5691	86 ⅞"	5976
47"	3195	53 ½"	3770	60"	4325	66 ½"	4844	73"	5308	79 ½"	5697	86"	5980
47 ⅛"	3206	53 ⅝"	3781	60 ⅛"	4336	66 ⅝"	4853	73 ⅛"	5317	79 ⅝"	5704	86 ⅛"	5985
47 ¼"	3218	53 ¾"	3792	60 ¼"	4346	66 ¾"	4863	73 ¼"	5325	79 ¾"	5710	86 ¼"	5989
47 ⅜"	3229	53 ⅞"	3803	60 ⅜"	4356	66 ⅞"	4872	73 ⅜"	5333	79 ⅞"	5717	86 ⅜"	5993
47 ½"	3240	54"	3814	60 ½"	4367	67"	4882	73 ½"	5341	80"	5723	86 ½"	5997
47 ⅝"	3251	54 ⅛"	3825	60 ⅝"	4377	67 ⅛"	4891	73 ⅝"	5349	80 ⅛"	5730	86 ⅝"	6000
47 ¾"	3262	54 ¼"	3836	60 ¾"	4387	67 ¼"	4901	73 ¾"	5358	80 ¼"	5736	86 ¾"	6004
47 ⅞"	3273	54 ⅜"	3846	60 ⅞"	4398	67 ⅜"	4910	73 ⅞"	5366	80 ⅜"	5742	86 ⅞"	6008
48 "	3284	54 ½"	3857	61"	4408	67 ½"	4919	74"	5374	80 ½"	5749	87"	6012
48 ⅛"	3295	54 ⅝"	3868	61 ⅛"	4418	67 ⅝"	4929	74 ⅛"	5382	80 ⅝"	5755	87 ⅛"	6015
48 ¼"	3307	54 ¾"	3879	61 ¼"	4428	67 ¾"	4938	74 ¼"	5390	80 ¾"	5761	87 ¼"	6019
48 ⅜"	3318	54 ⅞"	3890	61 ⅜"	4439	67 ⅞"	4947	74 ⅜"	5398	80 ⅞"	5767	87 ⅜"	6022
48 ½"	3329	55"	3901	61 ½"	4449	68"	4957	74 ½"	5406	81"	5773	87 ½"	6026
48 ⅝"	3340	55 ⅛"	3911	61 ⅝"	4459	68 ⅛"	4966	74 ⅝"	5414	81 ⅛"	5779	87 ⅝"	6029
48 ¾"	3351	55 ¼"	3922	61 ¾"	4469	68 ¼"	4975	74 ¾"	5422	81 ¼"	5785	87 ¾"	6032
48 ⅞"	3362	55 ⅜"	3933	61 ⅞"	4479	68 ⅜"	4984	74 ⅞"	5429	81 ⅜"	5791	87 ⅞"	6036
49"	3373	55 ½"	3944	62"	4490	68 ½"	4994	75"	5437	81 ½"	5797	88"	6039
49 ⅛"	3384	55 ⅝"	3955	62 ⅛"	4500	68 ⅝"	5003	75 ⅛"	5445	81 ⅝"	5803	88 ⅛"	6042
49 ¼"	3396	55 ¾"	3965	62 ¼"	4510	68 ¾"	5012	75 ¼"	5453	81 ¾"	5809	88 ¼"	6045
49 ⅜"	3407	55 ⅞"	3976	62 ⅜"	4520	68 ⅞"	5021	75 ⅜"	5461	81 ⅞"	5815	88 ⅜"	6048
49 ½"	3418	56"	3987	62 ½"	4530	69"	5030	75 ½"	5468	82"	5821	88 ½"	6050
49 ⅝"	3429	56 ⅛"	3998	62 ⅝"	4540	69 ⅛"	5039	75 ⅝"	5476	82 ⅛"	5826	88 ⅝"	6053
49 ¾"	3440	56 ¼"	4008	62 ¾"	4550	69 ¼"	5048	75 ¾"	5484	82 ¼"	5832	88 ¾"	6056
49 ⅞"	3451	56 ⅜"	4019	62 ⅞"	4560	69 ⅜"	5057	75 ⅞"	5491	82 ⅜"	5838	88 ⅞"	6058
50"	3462	56 ½"	4030	63"	4570	69 ½"	5066	76"	5499	82 ½"	5843	89"	6061
50 ⅛"	3473	56 ⅝"	4040	63 ⅛"	4580	69 ⅝"	5075	76 ⅛"	5506	82 ⅝"	5849	89 ⅛"	6063
50 ¼"	3484	56 ¾"	4051	63 ¼"	4590	69 ¾"	5084	76 ¼"	5514	82 ¾"	5855	89 ¼"	6066
50 ⅜"	3495	56 ⅞"	4062	63 ⅜"	4600	69 ⅞"	5093	76 ⅜"	5521	82 ⅞"	5860	89 ⅜"	6068
50 ½"	3506	57"	4073	63 ½"	4610	70"	5102	76 ½"	5529	83"	5865	89 ½"	6070
50 ⅝"	3517	57 ⅛"	4083	63 ⅝"	4620	70 ⅛"	5111	76 ⅝"	5536	83 ⅛"	5871	89 ⅝"	6072
50 ¾"	3528	57 ¼"	4094	63 ¾"	4630	70 ¼"	5120	76 ¾"	5544	83 ¼"	5876	89 ¾"	6074
50 ⅞"	3539	57 ⅜"	4104	63 ⅞"	4640	70 ⅜"	5129	76 ⅞"	5551	83 ⅜"	5881	89 ⅞"	6076
51"	3551	57 ½"	4115	64"	4650	70 ½"	5137	77"	5558	83 ½"	5887	90"	6077
51 ⅛"	3562	57 ⅝"	4126	64 ⅛"	4660	70 ⅝"	5146	77 ⅛"	5565	83 ⅝"	5892	90 ⅛"	6079
51 ¼"	3573	57 ¾"	4136	64 ¼"	4670	70 ¾"	5155	77 ¼"	5573	83 ¾"	5897	90 ¼"	6080
51 ⅜"	3584	57 ⅞"	4147	64 ⅜"	4679	70 ⅞"	5164	77 ⅜"	5580	83 ⅞"	5902	90 ⅜"	6082
51 ½"	3595	58"	4158	64 ½"	4689	71"	5172	77 ½"	5587	84"	5907	90 ½"	6083
51 ⅝"	3606	58 ⅛"	4168	64 ⅝"	4699	71 ⅛"	5181	77 ⅝"	5594	84 ⅛"	5912	90 ⅝"	6084
51 ¾"	3617	58 ¼"	4179	64 ¾"	4709	71 ¼"	5190	77 ¾"	5601	84 ¼"	5917	90 ¾"	6084
51 ⅞"	3628	58 ⅜"	4189	64 ⅞"	4719	71 ⅜"	5198	77 ⅞"	5608	84 ⅜"	5922	90 ⅞"	6085

ATTACHMENT 3

FARMERSVILLE

HOOVER
Containment Systems Inc.
A SUBSIDIARY OF HOOVER GROUP, INC.
P.O. BOX 396
SEVERNA PARK, MARYLAND 21146
410-987-3800 800-777-2823 FAX 410-987-3890

MEMBER PEI

0.125 = 1/8
.250 = 1/4
.375 = 3/8
.500 = 1/2
.625 = 5/8
.750 = 3/4
.875 = 7/8

5,000 GALLON TANK **FARMERSVILLE DIESEL**

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
0.125	8	5.375	336	10.625	664
0.250	16	5.500	344	10.750	672
0.375	23	5.625	352	10.875	680
0.500	31	5.750	359	11.000	688
0.625	39	5.875	367	11.125	695
0.750	47	6.000	375	11.250	703
0.875	55	6.125	383	11.375	711
1.000	63	6.250	391	11.500	719
1.125	70	6.375	398	11.625	727
1.250	78	6.500	406	11.750	734
1.375	86	6.625	414	11.875	742
1.500	94	6.750	422	12.000	750
1.625	102	6.875	430	12.125	758
1.750	109	7.000	438	12.250	766
1.875	117	7.125	445	12.375	773
2.000	125	7.250	453	12.500	781
2.125	133	7.375	461	12.625	789
2.250	141	7.500	469	12.750	797
2.375	148	7.625	477	12.875	805
2.500	156	7.750	484	13.000	813
2.625	164	7.875	492	13.125	820
2.750	172	8.000	500	13.250	828
2.875	180	8.125	508	13.375	836
3.000	188	8.250	516	13.500	844
3.125	195	8.375	523	13.625	852
3.250	203	8.500	531	13.750	859
3.375	211	8.625	539	13.875	867
3.500	219	8.750	547	14.000	875
3.625	227	8.875	555	14.125	883
3.750	234	9.000	563	14.250	891
3.875	242	9.125	570	14.375	898
4.000	250	9.250	578	14.500	906
4.125	258	9.375	586	14.625	914
4.250	266	9.500	594	14.750	922
4.375	273	9.625	602	14.875	930
4.500	281	9.750	609	15.000	938
4.625	289	9.875	617	15.125	945
4.750	297	10.000	625	15.250	953
4.875	305	10.125	633	15.375	961
5.000	313	10.250	641	15.500	969
5.125	320	10.375	648	15.625	977
5.250	328	10.500	656	15.750	984

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410-987-3800 800-777-2823 FAX 410-987-3890

PEI

5,000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
15.875	992	21.125	1320	26.375	1648
16.000	1000	21.250	1328	26.500	1656
16.125	1008	21.375	1336	26.625	1664
16.250	1016	21.500	1344	26.750	1672
16.375	1023	21.625	1352	26.875	1680
16.500	1031	21.750	1359	27.000	1688
16.625	1039	21.875	1367	27.125	1695
16.750	1047	22.000	1375	27.250	1703
16.875	1055	22.125	1383	27.375	1711
17.000	1063	22.250	1391	27.500	1719
17.125	1070	22.375	1398	27.625	1727
17.250	1078	22.500	1406	27.750	1734
17.375	1086	22.625	1414	27.875	1742
17.500	1094	22.750	1422	28.000	1750
17.625	1102	22.875	1430	28.125	1758
17.750	1109	23.000	1438	28.250	1766
17.875	1117	23.125	1445	28.375	1773
18.000	1125	23.250	1453	28.500	1781
18.125	1133	23.375	1461	28.625	1789
18.250	1141	23.500	1469	28.750	1797
18.375	1148	23.625	1477	28.875	1805
18.500	1156	23.750	1484	29.000	1813
18.625	1164	23.875	1492	29.125	1820
18.750	1172	24.000	1500	29.250	1828
18.875	1180	24.125	1508	29.375	1836
19.000	1188	24.250	1516	29.500	1844
19.125	1195	24.375	1523	29.625	1852
19.250	1203	24.500	1531	29.750	1859
19.375	1211	24.625	1539	29.875	1867
19.500	1219	24.750	1547	30.000	1875
19.625	1227	24.875	1555	30.125	1883
19.750	1234	25.000	1563	30.250	1891
19.875	1242	25.125	1570	30.375	1898
20.000	1250	25.250	1578	30.500	1906
20.125	1258	25.375	1586	30.625	1914
20.250	1266	25.500	1594	30.750	1922
20.375	1273	25.625	1602	30.875	1930
20.500	1281	25.750	1609	31.000	1938
20.625	1289	25.875	1617	31.125	1945
20.750	1297	26.000	1625	31.250	1953
20.875	1305	26.125	1633	31.375	1961
21.000	1313	26.250	1641	31.500	1969

FV DIESEL

HOOVER
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410-987-3800 800-777-2823 FAX 410-987-3890

PEI

5,000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
31.625	1977	36.875	2305	42.125	2633
31.750	1984	37.000	2313	42.250	2641
31.875	1992	37.125	2320	42.375	2648
32.000	2000	37.250	2328	42.500	2656
32.125	2008	37.375	2336	42.625	2664
32.250	2016	37.500	2344	42.750	2672
32.375	2023	37.625	2352	42.875	2680
32.500	2031	37.750	2359	43.000	2688
32.625	2039	37.875	2367	43.125	2695
32.750	2047	38.000	2375	43.250	2703
32.875	2055	38.125	2383	43.375	2711
33.000	2063	38.250	2391	43.500	2719
33.125	2070	38.375	2398	43.625	2727
33.250	2078	38.500	2406	43.750	2734
33.375	2086	38.625	2414	43.875	2742
33.500	2094	38.750	2422	44.000	2750
33.625	2102	38.875	2430	44.125	2758
33.750	2109	39.000	2438	44.250	2766
33.875	2117	39.125	2445	44.375	2773
34.000	2125	39.250	2453	44.500	2781
34.125	2133	39.375	2461	44.625	2789
34.250	2141	39.500	2469	44.750	2797
34.375	2148	39.625	2477	44.875	2805
34.500	2156	39.750	2484	45.000	2813
34.625	2164	39.875	2492	45.125	2820
34.750	2172	40.000	2500	45.250	2828
34.875	2180	40.125	2508	45.375	2836
35.000	2188	40.250	2516	45.500	2844
35.125	2195	40.375	2523	45.625	2852
35.250	2203	40.500	2531	45.750	2859
35.375	2211	40.625	2539	45.875	2867
35.500	2219	40.750	2547	46.000	2875
35.625	2227	40.875	2555	46.125	2883
35.750	2234	41.000	2563	46.250	2891
35.875	2242	41.125	2570	46.375	2898
36.000	2250	41.250	2578	46.500	2906
36.125	2258	41.375	2586	46.625	2914
36.250	2266	41.500	2594	46.750	2922
36.375	2273	41.625	2602	46.875	2930
36.500	2281	41.750	2609	47.000	2938
36.625	2289	41.875	2617	47.125	2945
36.750	2297	42.000	2625	47.250	2953

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MEMBER PEI

5,000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
47.375	2961	52.625	3289	57.875	3617
47.500	2969	52.750	3297	58.000	3625
47.625	2977	52.875	3305	58.125	3633
47.750	2984	53.000	3313	58.250	3641
47.875	2992	53.125	3320	58.375	3648
48.000	3000	53.250	3328	58.500	3656
48.125	3008	53.375	3336	58.625	3664
48.250	3016	53.500	3344	58.750	3672
48.375	3023	53.625	3352	58.875	3680
48.500	3031	53.750	3359	59.000	3688
48.625	3039	53.875	3367	59.125	3695
48.750	3047	54.000	3375	59.250	3703
48.875	3055	54.125	3383	59.375	3711
49.000	3063	54.250	3391	59.500	3719
49.125	3070	54.375	3398	59.625	3727
49.250	3078	54.500	3406	59.750	3734
49.375	3086	54.625	3414	59.875	3742
49.500	3094	54.750	3422	60.000	3750
49.625	3102	54.875	3430	60.125	3758
49.750	3109	55.000	3438	60.250	3766
49.875	3117	55.125	3445	60.375	3773
50.000	3125	55.250	3453	60.500	3781
50.125	3133	55.375	3461	60.625	3789
50.250	3141	55.500	3469	60.750	3797
50.375	3148	55.625	3477	60.875	3805
50.500	3156	55.750	3484	61.000	3813
50.625	3164	55.875	3492	61.125	3820
50.750	3172	56.000	3500	61.250	3828
50.875	3180	56.125	3508	61.375	3836
51.000	3188	56.250	3516	61.500	3844
51.125	3195	56.375	3523	61.625	3852
51.250	3203	56.500	3531	61.750	3859
51.375	3211	56.625	3539	61.875	3867
51.500	3219	56.750	3547	62.000	3875
51.625	3227	56.875	3555	62.125	3883
51.750	3234	57.000	3563	62.250	3891
51.875	3242	57.125	3570	62.375	3898
52.000	3250	57.250	3578	62.500	3906
52.125	3258	57.375	3586	62.625	3914
52.250	3266	57.500	3594	62.750	3922
52.375	3273	57.625	3602	62.875	3930
52.500	3281	57.750	3609	63.000	3938

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FV DIESEL

MEMBER PEI

5,000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
63.125	3945	68.375	4273	73.625	4602
63.250	3953	68.500	4281	73.750	4609
63.375	3961	68.625	4289	73.875	4617
63.500	3969	68.750	4297	74.000	4625
63.625	3977	68.875	4305	74.125	4633
63.750	3984	69.000	4313	74.250	4641
63.875	3992	69.125	4320	74.375	4648
64.000	4000	69.250	4328	74.500	4656
64.125	4008	69.375	4336	74.625	4664
64.250	4016	69.500	4344	74.750	4672
64.375	4023	69.625	4352	74.875	4680
64.500	4031	69.750	4359	75.000	4688
64.625	4039	69.875	4367	75.125	4695
64.750	4047	70.000	4375	75.250	4703
64.875	4055	70.125	4383	75.375	4711
65.000	4063	70.250	4391	75.500	4719
65.125	4070	70.375	4398	75.625	4727
65.250	4078	70.500	4406	75.750	4734
65.375	4086	70.625	4414	75.875	4742
65.500	4094	70.750	4422	76.000	4750
65.625	4102	70.875	4430	76.125	4758
65.750	4109	71.000	4438	76.250	4766
65.875	4117	71.125	4445	76.375	4773
66.000	4125	71.250	4453	76.500	4781
66.125	4133	71.375	4461	76.625	4789
66.250	4141	71.500	4469	76.750	4797
66.375	4148	71.625	4477	76.875	4805
66.500	4156	71.750	4484	77.000	4813
66.625	4164	71.875	4492	77.125	4820
66.750	4172	72.000	4500	77.250	4828
66.875	4180	72.125	4508	77.375	4836
67.000	4188	72.250	4516	77.500	4844
67.125	4195	72.375	4523	77.625	4852
67.250	4203	72.500	4531	77.750	4859
67.375	4211	72.625	4539	77.875	4867
67.500	4219	72.750	4547	78.000	4875
67.625	4227	72.875	4555	78.125	4883
67.750	4234	73.000	4563	78.250	4891
67.875	4242	73.125	4570	78.375	4898
68.000	4250	73.250	4578	78.500	4906
68.125	4258	73.375	4586	78.625	4914
68.250	4266	73.500	4594	78.750	4922

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MEMBER PEI

5,000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS
78.875	4930
79.000	4938
79.125	4945
79.250	4953
79.375	4961
79.500	4969
79.625	4977
79.750	4984
79.875	4992
80.000	5000

ATTACHMENT A

Collin County, Farmersville, Tx.

HOOVER
Containment Inc.
P.O. Box 396
SEVERNA PARK, MARYLAND 21146

1/8 = 0.125
1/4 = 0.250
3/8 = 0.375
1/2 = 0.500
5/8 = 0.625
3/4 = 0.750
7/8 = 0.875

GAS

PEI
410-987-380
800-777-282
FAX 410-987-389

1000 GALLON TANK

FARMERSVILLE GAS

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
0.125	2	5.375	67	10.625	133
0.250	3	5.500	69	10.750	134
0.375	5	5.625	70	10.875	136
0.500	6	5.750	72	11.000	138
0.625	8	5.875	73	11.125	139
0.750	9	6.000	75	11.250	141
0.875	11	6.125	77	11.375	142
1.000	13	6.250	78	11.500	144
1.125	14	6.375	80	11.625	145
1.250	16	6.500	81	11.750	147
1.375	17	6.625	83	11.875	148
1.500	19	6.750	84	12.000	150
1.625	20	6.875	86	12.125	152
1.750	22	7.000	88	12.250	153
1.875	23	7.125	89	12.375	155
2.000	25	7.250	91	12.500	156
2.125	27	7.375	92	12.625	158
2.250	28	7.500	94	12.750	159
2.375	30	7.625	95	12.875	161
2.500	31	7.750	97	13.000	163
2.625	33	7.875	98	13.125	164
2.750	34	8.000	100	13.250	166
2.875	36	8.125	102	13.375	167
3.000	38	8.250	103	13.500	169
3.125	39	8.375	105	13.625	170
3.250	41	8.500	106	13.750	172
3.375	42	8.625	108	13.875	173
3.500	44	8.750	109	14.000	175
3.625	45	8.875	111	14.125	177
3.750	47	9.000	113	14.250	178
3.875	48	9.125	114	14.375	180
4.000	50	9.250	116	14.500	181
4.125	52	9.375	117	14.625	183
4.250	53	9.500	119	14.750	184
4.375	55	9.625	120	14.875	186
4.500	56	9.750	122	15.000	188
4.625	58	9.875	123	15.125	189
4.750	59	10.000	125	15.250	191
4.875	61	10.125	127	15.375	192
5.000	63	10.250	128	15.500	194
5.125	64	10.375	130	15.625	195
5.250	66	10.500	131	15.750	197

1000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
15.875	198	21.125	264	26.375	330
16.000	200	21.250	266	26.500	331
16.125	202	21.375	267	26.625	333
16.250	203	21.500	269	26.750	334
16.375	205	21.625	270	26.875	336
16.500	206	21.750	272	27.000	338
16.625	208	21.875	273	27.125	339
16.750	209	22.000	275	27.250	341
16.875	211	22.125	277	27.375	342
17.000	213	22.250	278	27.500	344
17.125	214	22.375	280	27.625	345
17.250	216	22.500	281	27.750	347
17.375	217	22.625	283	27.875	348
17.500	219	22.750	284	28.000	350
17.625	220	22.875	286	28.125	352
17.750	222	23.000	288	28.250	353
17.875	223	23.125	289	28.375	355
18.000	225	23.250	291	28.500	356
18.125	227	23.375	292	28.625	358
18.250	228	23.500	294	28.750	359
18.375	230	23.625	295	28.875	361
18.500	231	23.750	297	29.000	363
18.625	233	23.875	298	29.125	364
18.750	234	24.000	300	29.250	366
18.875	236	24.125	302	29.375	367
19.000	238	24.250	303	29.500	369
19.125	239	24.375	305	29.625	370
19.250	241	24.500	306	29.750	372
19.375	242	24.625	308	29.875	373
19.500	244	24.750	309	30.000	375
19.625	245	24.875	311	30.125	377
19.750	247	25.000	313	30.250	378
19.875	248	25.125	314	30.375	380
20.000	250	25.250	316	30.500	381
20.125	252	25.375	317	30.625	383
20.250	253	25.500	319	30.750	384
20.375	255	25.625	320	30.875	386
20.500	256	25.750	322	31.000	388
20.625	258	25.875	323	31.125	389
20.750	259	26.000	325	31.250	391
20.875	261	26.125	327	31.375	392
21.000	263	26.250	328	31.500	394

F V GAS

1000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
31.625	395	36.875	461	42.125	527
31.750	397	37.000	463	42.250	528
31.875	398	37.125	464	42.375	530
32.000	400	37.250	466	42.500	531
32.125	402	37.375	467	42.625	533
32.250	403	37.500	469	42.750	534
32.375	405	37.625	470	42.875	536
32.500	406	37.750	472	43.000	538
32.625	408	37.875	473	43.125	539
32.750	409	38.000	475	43.250	541
32.875	411	38.125	477	43.375	542
33.000	413	38.250	478	43.500	544
33.125	414	38.375	480	43.625	545
33.250	416	38.500	481	43.750	547
33.375	417	38.625	483	43.875	548
33.500	419	38.750	484	44.000	550
33.625	420	38.875	486	44.125	552
33.750	422	39.000	488	44.250	553
33.875	423	39.125	489	44.375	555
34.000	425	39.250	491	44.500	556
34.125	427	39.375	492	44.625	558
34.250	428	39.500	494	44.750	559
34.375	430	39.625	495	44.875	561
34.500	431	39.750	497	45.000	563
34.625	433	39.875	498	45.125	564
34.750	434	40.000	500	45.250	566
34.875	436	40.125	502	45.375	567
35.000	438	40.250	503	45.500	569
35.125	439	40.375	505	45.625	570
35.250	441	40.500	506	45.750	572
35.375	442	40.625	508	45.875	573
35.500	444	40.750	509	46.000	575
35.625	445	40.875	511	46.125	577
35.750	447	41.000	513	46.250	578
35.875	448	41.125	514	46.375	580
36.000	450	41.250	516	46.500	581
36.125	452	41.375	517	46.625	583
36.250	453	41.500	519	46.750	584
36.375	455	41.625	520	46.875	586
36.500	456	41.750	522	47.000	588
36.625	458	41.875	523	47.125	589
36.750	459	42.000	525	47.250	591

1000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
47.375	592	52.625	658	57.875	723
47.500	594	52.750	659	58.000	725
47.625	595	52.875	661	58.125	727
47.750	597	53.000	663	58.250	728
47.875	598	53.125	664	58.375	730
48.000	600	53.250	666	58.500	731
48.125	602	53.375	667	58.625	733
48.250	603	53.500	669	58.750	734
48.375	605	53.625	670	58.875	736
48.500	606	53.750	672	59.000	738
48.625	608	53.875	673	59.125	739
48.750	609	54.000	675	59.250	741
48.875	611	54.125	677	59.375	742
49.000	613	54.250	678	59.500	744
49.125	614	54.375	680	59.625	745
49.250	616	54.500	681	59.750	747
49.375	617	54.625	683	59.875	748
49.500	619	54.750	684	60.000	750
49.625	620	54.875	686	60.125	752
49.750	622	55.000	688	60.250	753
49.875	623	55.125	689	60.375	755
50.000	625	55.250	691	60.500	756
50.125	627	55.375	692	60.625	758
50.250	628	55.500	694	60.750	759
50.375	630	55.625	695	60.875	761
50.500	631	55.750	697	61.000	763
50.625	633	55.875	698	61.125	764
50.750	634	56.000	700	61.250	766
50.875	636	56.125	702	61.375	767
51.000	638	56.250	703	61.500	769
51.125	639	56.375	705	61.625	770
51.250	641	56.500	706	61.750	772
51.375	642	56.625	708	61.875	773
51.500	644	56.750	709	62.000	775
51.625	645	56.875	711	62.125	777
51.750	647	57.000	713	62.250	778
51.875	648	57.125	714	62.375	780
52.000	650	57.250	716	62.500	781
52.125	652	57.375	717	62.625	783
52.250	653	57.500	719	62.750	784
52.375	655	57.625	720	62.875	786
52.500	656	57.750	722	63.000	788

FUGAS

1000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS
63.125	789
63.250	791
63.375	792
63.500	794
63.625	795
63.750	797
63.875	798
64.000	800
64.125	802
64.250	803
64.375	805
64.500	806
64.625	808
64.750	809
64.875	811
65.000	813
65.125	814
65.250	816
65.375	817
65.500	819
65.625	820
65.750	822
65.875	823
66.000	825
66.125	827
66.250	828
66.375	830
66.500	831
66.625	833
66.750	834
66.875	836
67.000	838
67.125	839
67.250	841
67.375	842
67.500	844
67.625	845
67.750	847
67.875	848
68.000	850
68.125	852
68.250	853
68.375	855
68.500	856
68.625	858
68.750	859
68.875	861
69.000	863
69.125	864
69.250	866
69.375	867
69.500	869
69.625	870
69.750	872
69.875	873
70.000	875
70.125	877
70.250	878
70.375	880
70.500	881
70.625	883
70.750	884
70.875	886
71.000	888
71.125	889
71.250	891
71.375	892
71.500	894
71.625	895
71.750	897
71.875	898
72.000	900
72.125	902
72.250	903
72.375	905
72.500	906
72.625	908
72.750	909
72.875	911
73.000	913
73.125	914
73.250	916
73.375	917
73.500	919
73.625	920
73.750	922
73.875	923
74.000	925
74.125	927
74.250	928
74.375	930
74.500	931
74.625	933
74.750	934
74.875	936
75.000	938
75.125	939
75.250	941
75.375	942
75.500	944
75.625	945
75.750	947
75.875	948
76.000	950
76.125	952
76.250	963
76.375	955
76.500	956
76.625	958
76.750	959
76.875	961
77.000	963
77.125	964
77.250	966
77.375	967
77.500	969
77.625	970
77.750	972
77.875	973
78.000	975
78.125	977
78.250	978
78.375	980
78.500	981
78.625	983
78.750	984

1000 GALLON TANK

PRIMARY TANK 80 " HIGH

INCHES	GALLONS
78.875	986
79.000	988
79.125	989
79.250	991
79.375	992
79.500	994
79.625	995
79.750	997
79.875	998
80.000	1000

Attachment I

PermAlert™ ESP
A SUBSIDIARY OF MIDWESCO, INC.

7720 N. Lehigh Ave.
Niles, IL 60714-3491
Phone (708) 966-2190
Fax (708) 470-1204

December 15, 1992

VIA: UPS Next Day Air
(214) 741-9410

Mr. John Hines
Trinity Contractors, Inc.
2425 S. Dillard Street
Grand Prairie, TX 75051

RE: Colin County Justice Center
PermAlert ESP's Job No. PAE5005

Dear Sir:

Enclosed is PermAlert ESP's design package for the "Double Contained Piping System" for the referenced project. This package includes the following:

Item	No. of Copies	Description
A	12	Design layout drawing no. 92-306-D, sheets 1 and 2 of 2
B	12	Pipe Product Data Sheets for: • SCH 40 A53B ERW and A106B SMLS steel product pipe • FRP containment pipe as manufactured by Fowlco
C	12	Leak detection product data sheets for: • Multichannel TankWatch unit • PHL hydrocarbon probe • PWS water probe • PFS float switch probe
D	12	Intallation instructions for: • TankWatch monitoring unit • Probes

One (1) complete copy of this submittal package, with field verified dimensions shown on one of the enclosed layout drawings marked "Approved and Released for Fabrication", must be returned to PermAlert ESP in order for this project to be entered into our production schedule.

If I can be of further assistance, please do not hesitate to call.

Sincerely,

Dmitry Silversteyn
Project Engineer
Extension 2837

DS/nj - Enclosures

cc: Tierra Environmental, Inc.
R. Maffei
K. Gryzik
Job File/PAE5005

PermAlert ESP

PHL

Liquid Hydrocarbon Probe

Product Data

PHL The **PHL** probe can easily be connected into a PAL-AT* cable "sensor string" providing increased utilization of the PAL-AT capabilities. Each probe assembly includes a probe integrator with 60 feet of jumper cable to connect to the sensing string, and 20 feet of lead cable to attach the probe to the integrator.

The unique design of the PAL-AT probe integrator eliminates the need for additional power at the probe.

Its patented solid-state construction allows the **PHL** probe to respond to most liquid hydrocarbons but ignore vapors, thus virtually eliminating false alarms due to vapors. **PHL** is responsive to a broad range of fuels and solvents. The probe resets quickly after removal from exposure to most volatile hydrocarbons (see Table 1).

Note:

A "-S" probe must be connected in the first 2,500 feet of sensor string.

A "-L" probe must be connected to more than 2,500 feet from the PAL-AT panel.

DESCRIPTION:

- Probe Operating Temperature: 0ºF to 100ºF
- Probe Length: 1.25"
- Probe Diameter: .625"
- Probe Lead Length (max): 20'
- Activation Level (min): .25"
- Junction Box: NEMA 4X 8" x 6" x 4"

APPLICATION

- DOUBLE WALL TANKS • SEALED TRENCHES

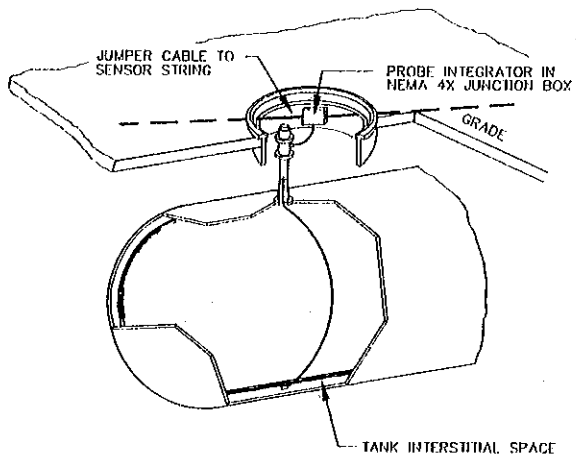
U.S. Patent 4,855,706

Typical PHL Probe Resetability Table

Liquid	Reset
1, 1, 1, Trichlorethane	YES
Acetone	YES
Methyl Ethyl Ketone	YES
Xylene (mixed)	YES
Naphtha	YES
Gasoline	YES
Ethyl Acetate	YES
Isopropanol	NO
Kerosene	NO
Diesel Fuel	NO
Jet Fuel• A, JP4, JP5	NO
Crude Oil• Lt., Med., Hvy.	NO
New 10W-30 Motor Oil	NO

The PHL probe resonds to all the liquids listed in less than one (1) minute. The number of times a sensor will reset is dependent on hydrocarbon purity and exposure time. Due to the variable conditions which may be encountered in each installation, this data is only provided as a guide. Actual performance may differ from the test values.

TABLE 1



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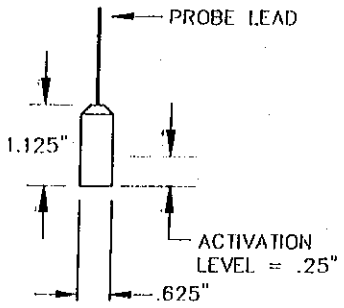
(708) 966 - 2190 Fax (708) 470 - 1204

PermAlert ESP

PWS
Water Based Liquid Probe
Product Data



PROBE ASSEMBLY DETAIL

DESCRIPTION:

- Probe Operating Temperature: 0ºF to 180ºF
- Probe Length: 1.25"
- Probe Diameter: .625"
- Probe Lead Length (max): 20'
- Activation Level (min): .25"
- Junction Box: NEMA 4X 8" x 6" x 4"
- Material:
  - 304 Stainless Steel

APPLICATION

- SUMPS • MANHOLES • DOUBLE WALL TANKS
- SEALED TRENCHES • INDOOR WATER DETECTION
- DRIP PANELS

PWS The **PWS** probe can easily be connected into a PAL-AT" cable "sensor string" providing increased utilization of the PAL-AT capabilities. Each probe assembly includes a probe integrator with 60 feet of jumper cable to connect to the sensing string, and 20 feet of lead cable to attach the probe to the probe integrator.

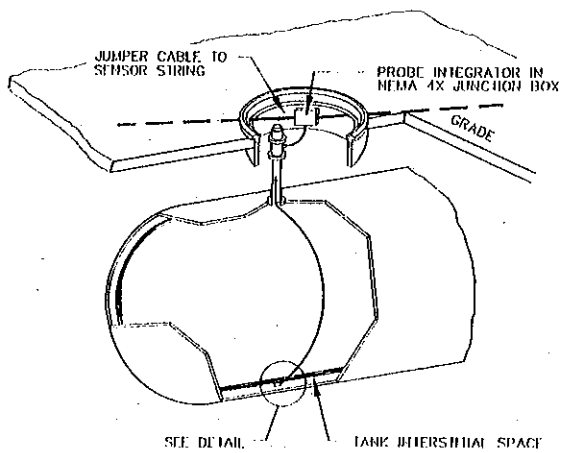
The unique design of the PAL-AT probe integrator eliminates the need for additional power at the probe.

Its solid-state stainless-steel construction allows the **PWS** probe to respond to all conductive liquids - water, acids, bases, chemicals, etc. The probe resets quickly after removal from the liquid.

NOTE:

A "-S" probe must be connected in the first 2,500 feet of sensor string.

A "-L" probe must be connected more than 2,500 feet from the PAL-AT panel.



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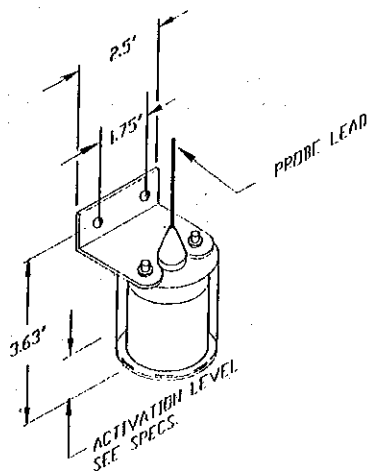
PermAlert ESP



DESCRIPTION:

- Probe Operating Temperature: 0°F to 140°F
- Probe Diameter (max): 2.60"
- Probe Lead Length (max): 20'
- Activation Level: Water: (S.G.=1.0) 1.38"
  Oil: (S.G.=.75) 1.83"
- Materials:
  - Stem: 316 Stainless Steel
  - Float: Buna-N
  - Junction Box: Nema 4X 8" x 6" x 4"

APPLICATION

- Sumps
- Manholes

PFS

The **PFS** float switch can easily be connected into a PAL-AT® cable "sensor string" providing increased utillization of the PAL-AT capabilities. Each assembly includes a probe integrator with 60 feet of jumper cable to connect to the sensing string, and 20 feet of lead cable to attach the float switch to the probe integrator.

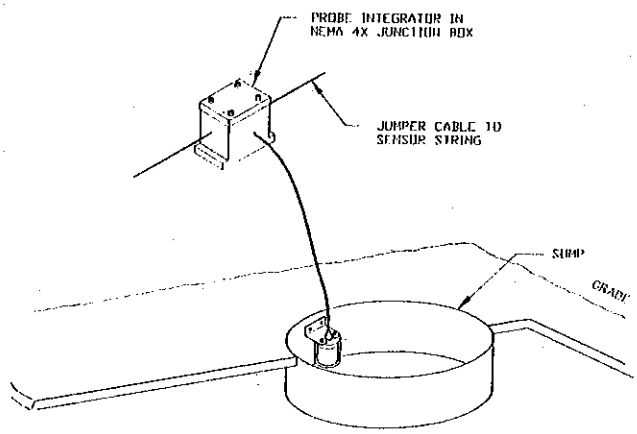
The unique design of the PAL-AT probe integrator eliminates the need for additional power at the probe.

The **PFS** is a hermetically sealed reed float switch which signals the presence of liquids. The probe resets immediately after the liquid drops below the activation level.

NOTE:

A "-S" probe must be connected in the first 2,500 feet of sensor string.

A "-L" probe must be connected more than 2,500 feet from the PAL-AT panel.



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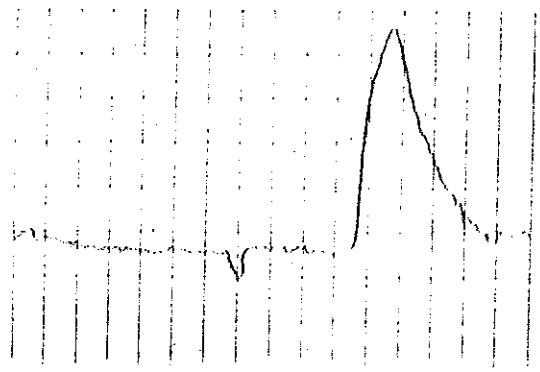
PAL-AT™

LEAK DETECTION/LOCATION



PermAlert
Environmental Specialty Products, Inc.

PROBE INSTALLATION GUIDE

PermAlert ESP
7720 Lehigh Ave
Niles, IL 60648-3401
708/966-2400

Manual No. PA101.2

PROBE INSTALLATION GUIDE
FOR INTERFACE WITH
PAL-AT™
LEAK DETECTION AND LOCATION SYSTEM

This manual is intended for use as an installation guide for the integration of probes with the PAL-AT Leak Detection/ Location System . Also refer to "Installation Instructions for Alarm/Locator Units and Cable Connectors."

Introduction

The PAL-AT System consists of a solid state electronic alarm/locator panel connected in series by jumper cable to probes and liquid sensing cables. The PAL-AT's family of probes does not require electrical power at the monitoring point. Connected into the "sensor string" by coaxial jumper cable, PAL-AT probes provide monitoring as long as the PAL-AT unit is operating.

The following general precautions should be observed:

1. Read this manual carefully before beginning any work. Do not use substitute materials or short-cut recommended procedures. Understanding and following this guide is essential to avoid installation problems.

2. Collect the needed quantities of all materials well in advance of scheduled work.

3. Check packing list quantities against received items. Report immediately any shortages or damaged materials to the delivering carrier of PermAlert ESP shipments.

4. All probes must be tested immediately upon receipt following the probe test procedures contained in this manual. Report immediately to PermAlert ESP any probes that fail this quality control test. Failure to report within ten (10) work days of receipt of goods shall waive the purchaser's right to file a warranty claim.

5. Care must be taken to store all PAL-AT components in a dry and protected area at all times. Electronic alarm units, sensing cable and probes should be wrapped and sealed with plastic.

6. System drawings, provided by the designer, should indicate the extent, general location, and arrangement of leak detection/location equipment, cables and probes. The installer must become familiar with all details of the installation before proceeding.

7. Electrical work should be performed by a qualified electrician.

Materials and Equipment Normally Supplied by PermAlert ESP for Probes

1. Leak detection/location alarm unit
2. Jumper cable
3. Cable connector assemblies
4. Probe assembly with 20 feet of twin lead cable.
5. A PT10 Probe Integrator installed in a NEMA 6 junction box, consisting of 10 feet of jumper cable attached to the input and 50 feet attached to the output of the probe integrator and one cable connector assembly.

Optional Materials Purchased From PermAlert ESP Upon Request

Part No.	Description
8057950	1/2" Cord Grip for Twin Lead Cable
8057955	1/2" Cord Grip for JMP Jumper Cable
8047665	6 x 6 x 4 NEMA 6 Junction Box
8047680	8 x 6 x 4 NEMA 6 Junction Box
8047695	10 x 8 x 4 NEMA 6 Junction Box

Materials and Equipment Normally Supplied by Installing Contractor

1. Silicone caulk or RTV sealant

2. PVC electrical tape

3. Miscellaneous pipe nipples, unions and fittings, as required to provide watertight jumper cable connections to probe cables.

4. Watertight junction boxes conforming to NEMA 6 or 6P.

No. of Cable Junctions in Enclosure	Recommended Minimum Inside Dimensions
1	6"x6"x4"
2	8"x6"x4"
3	10"x8"x4"

5. 1" inch rigid electrical conduit or IMC and watertight junction boxes, as required, for installation of jumper cable within manholes, pits and buildings. Use 1" conduit hubs, OZ Gedney CH-100.

6. Ohmmeter for testing.

UL Requirements

The PAL-AT is UL listed and provides intrinsically safe output circuits for use in Class 1, Division 1, Group C & D hazardous locations when used with probes listed below and installed in accordance with the instructions in this manual.

The probe configurations are:

1. PHL Solid State Hydrocarbon Sensor for Liquids, with PT10 Probe Integrator.

2. All PermAlert supplied probes and float switches, with PT10 Probe Integrator, which operate as a simple dry contact switch closure.

3. A PermAlert PT10 Probe Integrator connected to a customer supplied switch, if the switch operates as a simple dry contact closure with no external power supplied to the switch. The switch may operate as normally open or normally closed.

Probe Integrator Selection

All probe integrators have a red or blue band(s) of shrink tubing on the 6" length of probe twin lead cable. A probe integrator with a red band(s) is used with a PHL, PSTV, PFS, PHFW, and PTHL probe or a normally closed switch. A probe integrator with a blue band(s) is used with the PWS probe or a normally open switch.

The number of bands on the probe integrator indicates where it can be used in the sensing string. One (1) band means the probe integrator can be connected to the system in the first 2500 feet of sensing string from the PAL-AT panel. Two (2) bands indicates that the probe integrator can be connected to the sensing string over 2500 feet from the PAL-AT panel. Two (2) band probe integrators cannot be used in the first 2500 feet of sensing string.

Probe Installation

1. All PAL-AT probes are furnished with a probe integrator and sixty (60) feet of type JMP jumper cable in a NEMA 6 junction box. The probe integrator allows the attachment of probes to the PAL-AT monitoring system.

2. Mount the probe integrator junction box at a location close to the point being monitored. Probes are supplied by PermAlert ESP with 20 feet of twin lead cable. Do not splice on additional wire to lengthen the leads. If the probe integrator is located in a manhole or pit, which may collect and hold water, mount the junction box as high as possible.

3. Figure 1 and 2 show the recommended installation procedures. Figures 3 thru 7 show typical probe installations. Install the probe and use electrical conduit and/or watertight cord grips, as necessary, to prevent water entry where the probe twin lead penetrates the monitored area. The cord grips (part no. 8057950) with the oval opening in the bushing are used with the twin lead cable. The cord grips (part no. 8057955) with the round hole are for the jumper cable.

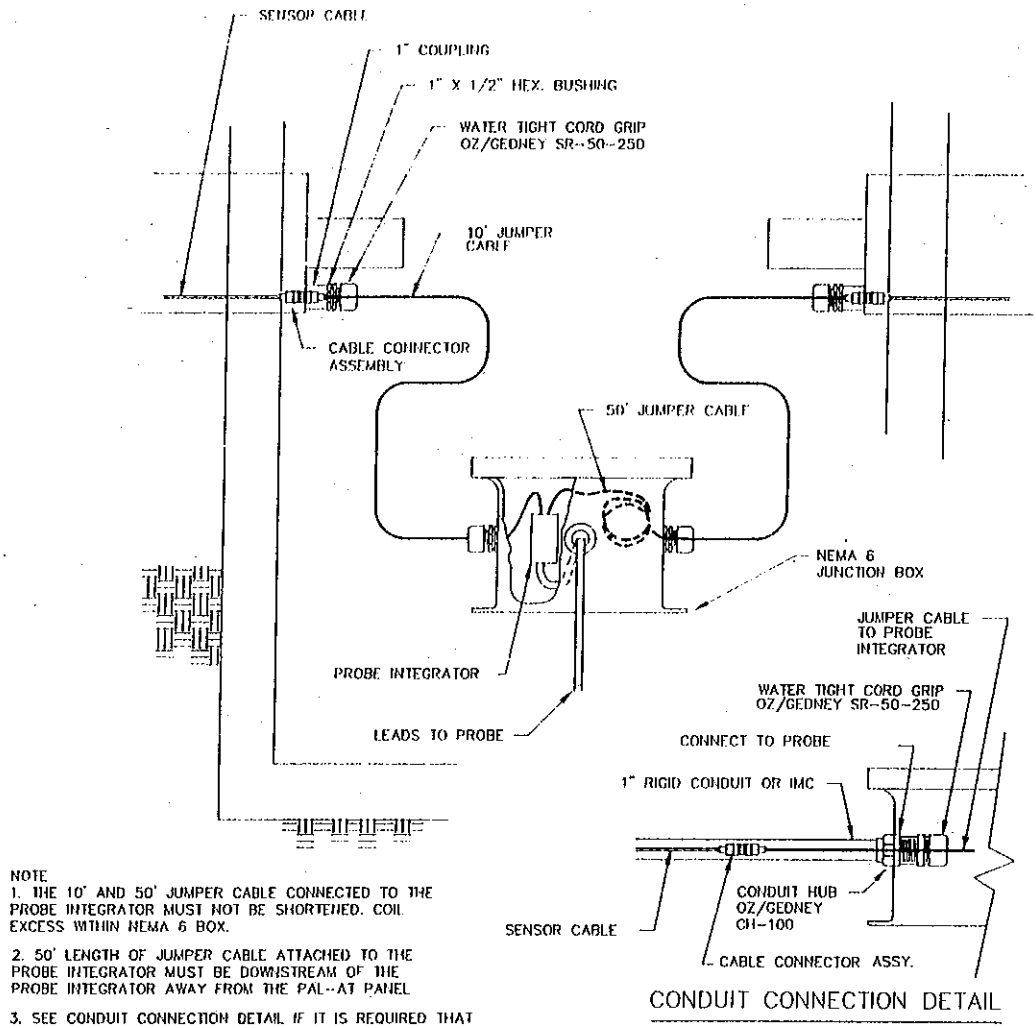
4. Once a probe is installed, the twin lead should be routed to the junction box containing the probe integrator. **Trim the excess length of the probe twin lead before splicing it to the probe integrator.** Splice the leads by using the crimp connectors supplied with the probe.

5. Use all sixty (60) feet of jumper cable furnished with the probe integrator. **If the jumper cable leads are too long, do not shorten,** merely loosen the watertight cord grips and coil the excess jumper cable within the probe junction box. One (1) jumper cable length will be shorter than the other. Connect the shorter end (10') to the cable segment closest to the Alarm/Locator Unit. The longer length of jumper cable (50') can be routed to the connection point for the continuation of the sensing string. If the probe location is at the end of the sensing string, terminate the longer length of jumper cable with a cable connector and store it within the junction box.

   Additional jumper cable may be connected on either side of the probe integrator to facilitate connection of remote sensing string components.

6. Refer to the "Installation Instructions for Alarm/Locator Units and Cable Connectors" manual and install a connector on each length of jumper cable. Test all connectors using the cable testing procedures in the manual.

7. Cable connections to jumper cable from the probe integrators will become calibration points, and must be accessible during system start up. Refer to "Installation Instructions for Alarm/Locator Units and Cable Connectors" for additional calibration information.

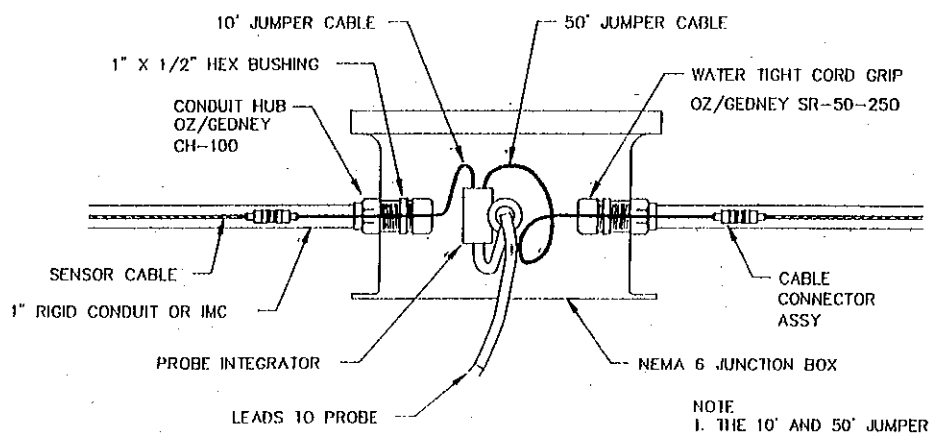


NOTE
1. THE 10' AND 50' JUMPER CABLE CONNECTED TO THE PROBE INTEGRATOR MUST NOT BE SHORTENED. COIL EXCESS WITHIN NEMA 6 BOX.

2. 50' LENGTH OF JUMPER CABLE ATTACHED TO THE PROBE INTEGRATOR MUST BE DOWNSTREAM OF THE PROBE INTEGRATOR AWAY FROM THE PAL-AT PANEL

3. SEE CONDUIT CONNECTION DETAIL IF IT IS REQUIRED THAT ALL JUMPER CABLE BE ENCLOSED IN CONDUIT. WATER TIGHT CORD GRIPS, CONDUIT HUBS AND CONDUIT MUST BE USED.

Figure 1
Typical Probe Connection In Monitored Areas



NOTE
1. THE 10' AND 50' JUMPER CABLE CONNECTED TO THE PROBE INTEGRATOR MUST NOT BE SHORTENED. COIL EXCESS WITHIN NEMA 6 BOX.

2. 50' LENGTH OF JUMPER CABLE ATTACHED TO THE PROBE INTEGRATOR MUST BE DOWNSTREAM OF THE PROBE INTEGRATOR AWAY FROM THE PAL-AT PANEL

Figure 2
Typical Conduit Connection Detail

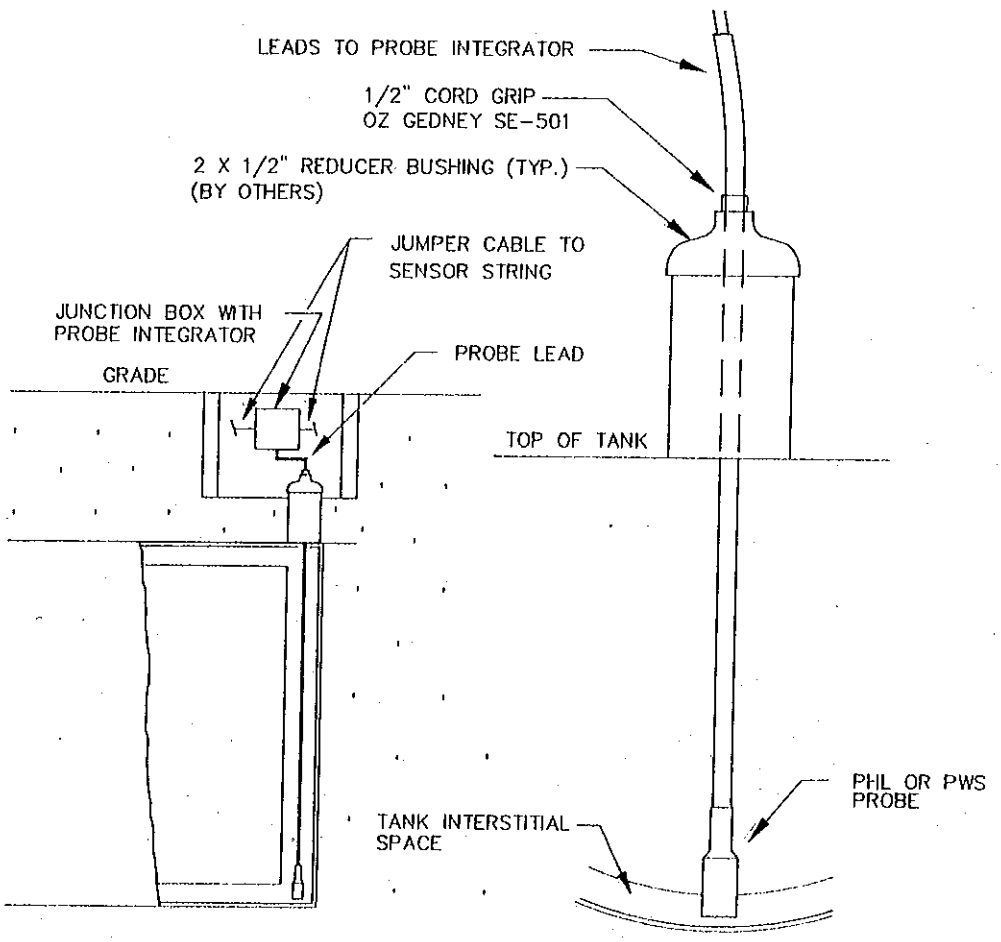
Connecting Probes Into the Sensing String

1. Jumper cable (type JMP, JPL or JPP) is used to connect sensing cable segments and probes in series to form the sensing circuit (string). Jumper cable is not affected by occasional contact with water and can be strung in buildings and vaults. In underground locations and areas where damage may occur to the jumper cable electrical conduit should be used to provide protection. In wet environments or areas subject to flooding, cable connectors on jumper cable should be located in watertight electrical junction boxes (NEMA 6 or 6P).

2. Jumper cable can be pulled using conventional methods. The pulling force for jumper cable should never exceed forty (40) pounds. Generally, pull points can be located at 400 to 500 foot intervals with no more than three changes in direction. Fewer changes in direction will allow longer pull point spacing intervals.

Typical Installations

Figures 3 thru 7 show typical probe installations.



NOTE:

1. LENGTH OF PROBE LEAD IS 20 FEET MAX.

Figure 3
Typical PHL or PWS Probe Installation

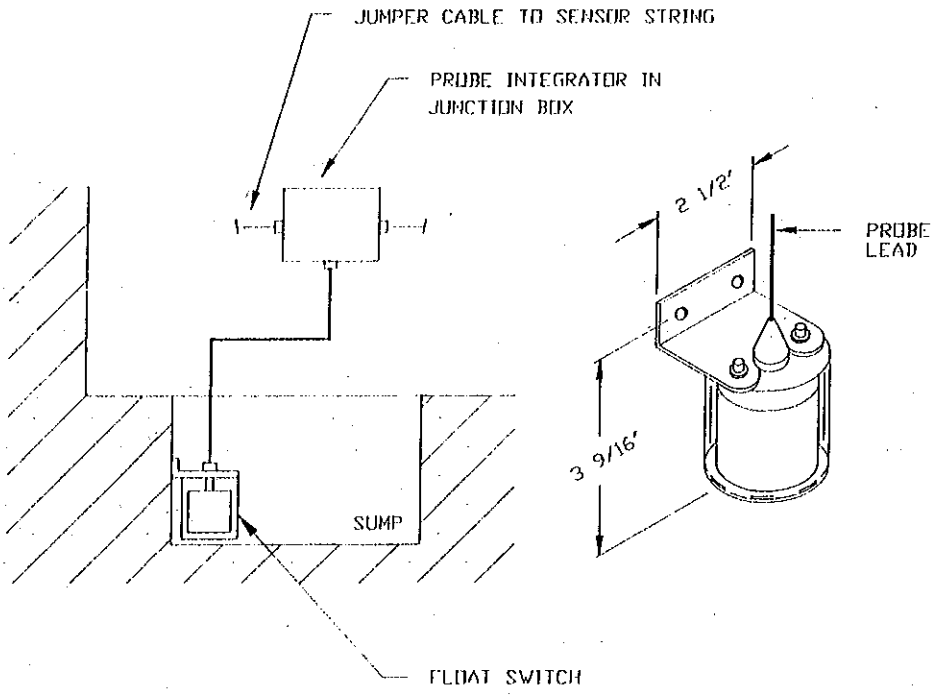


Figure 6
Typical PFS Installation

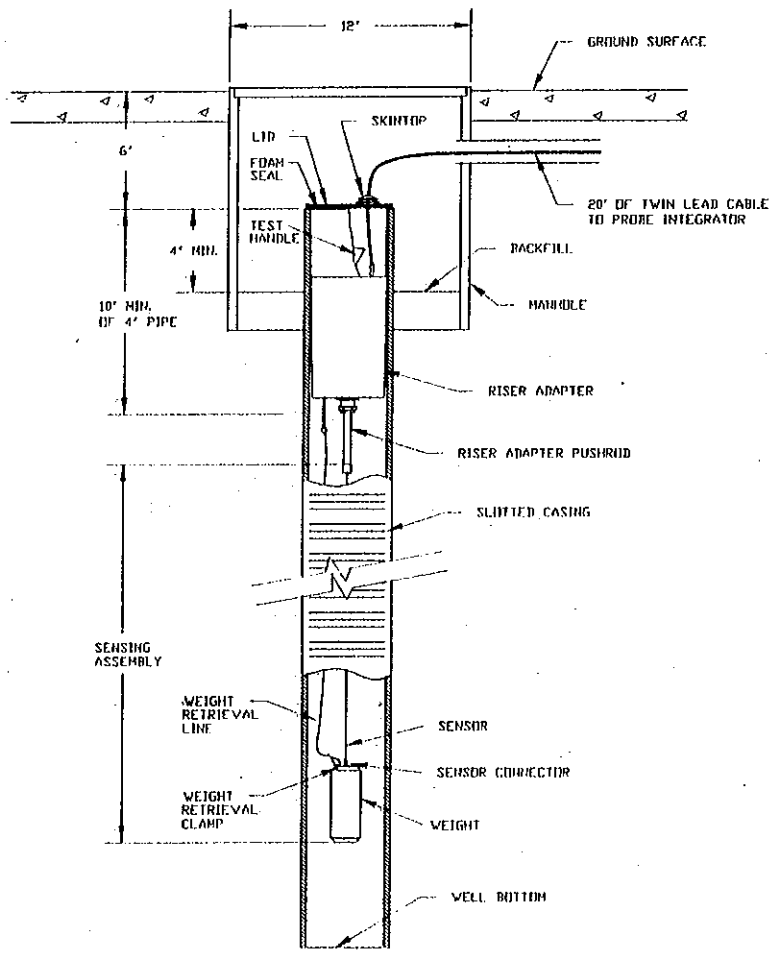
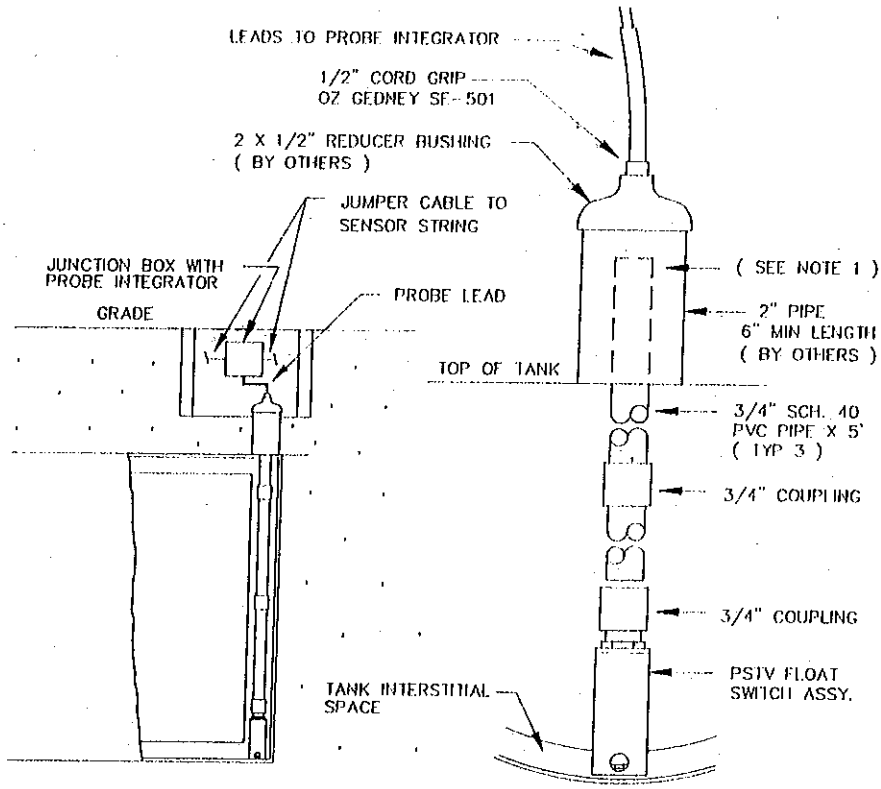


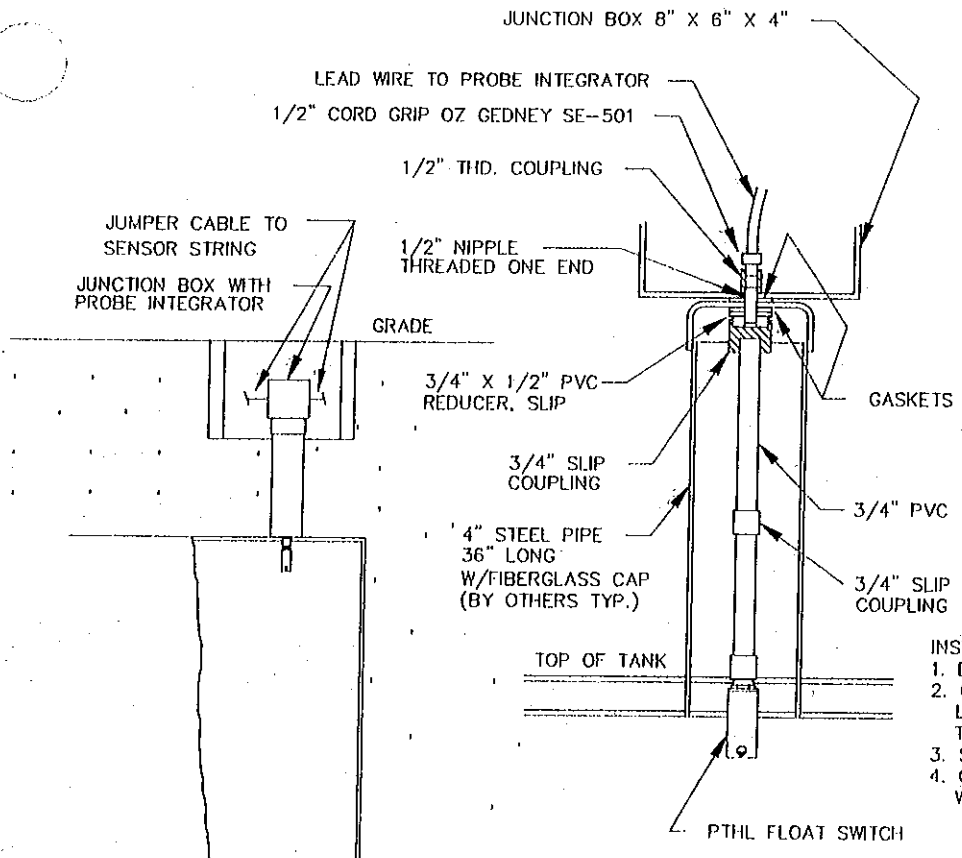
Figure 7
Typical PHFW Monitoring Well Hydrocarbon Probe Installation



NOTE:

1. CUT LENGTH OF 3/4" PIPE TO CLEAR 2" REDUCER BUSHING
2. ROUTE LEADS TO PROBE INTEGRATOR THRU 3/4" PVC PIPE TO TOP OF TANK
3. LENGTH OF PROBE LEAD IS A MAXIMUM OF 20 FEET

Figure 4
Typical PSTV Tank Float Switch Installation



INSTALLATION NOTES:

1. DRILL 7/8" HOLE IN JUNCTION BOX AND PIPE CAP
2. CUT UNTHREADED END OF 1/2" NIPPLE TO CORRECT LENGTH. TO CLAMP THE JUNCTION BOX AND GASKETS TO THE PIPE CAP.
3. SOLVENT WELD NIPPLE TO REDUCER.
4. CUT 3/4" PIPE TO LENGTH AS REQUIRED AND SOLVENT WELD ALL SLIP JOINTS.

Figure 5
Typical PTHL Float Switch Installation

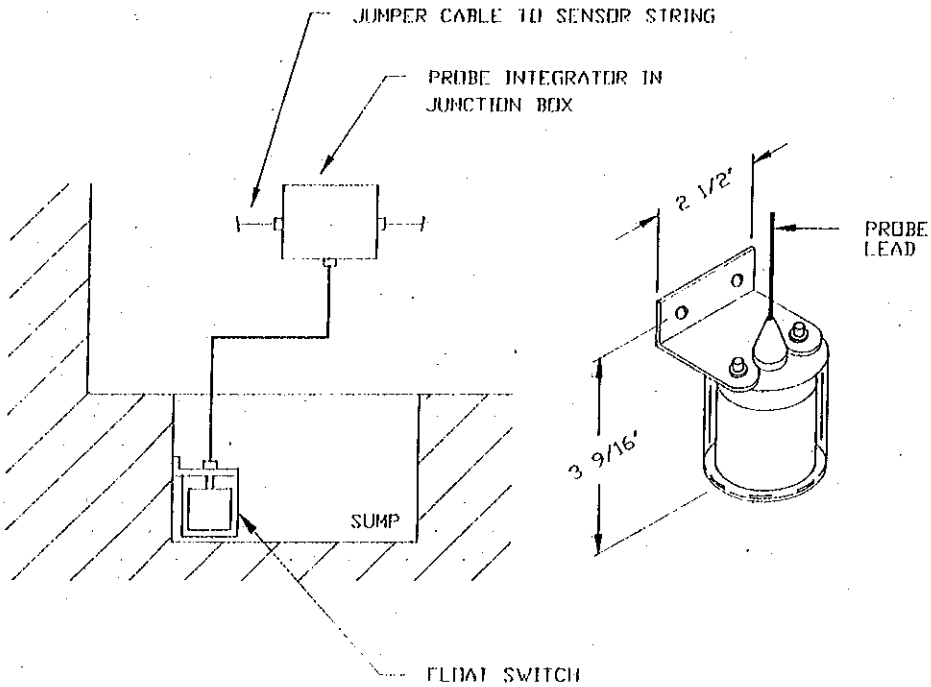


Figure 6
Typical PFS Installation

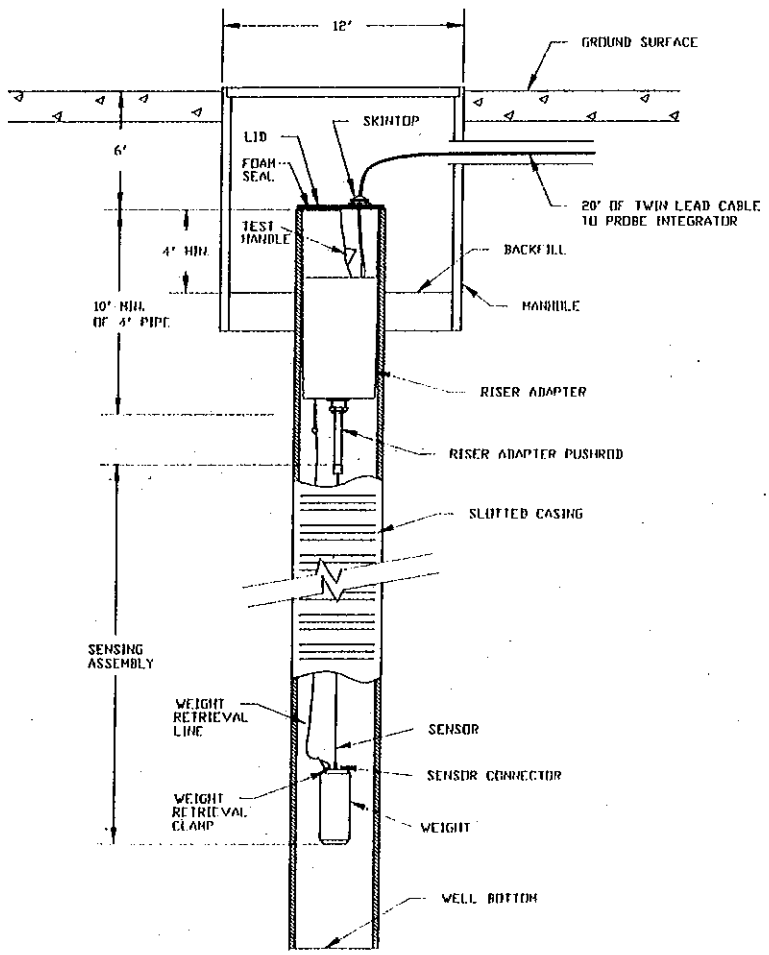


Figure 7
Typical PHFW Monitoring Well Hydrocarbon Probe Installation

PHFW Probe Installation

The PHFW probe is designed for use in 4" monitoring wells, or other locations where the sensor can hang vertically, extending to the bottom of the well or cavity (see figure 7). A weight attached to the sensor keeps it taut. The sensor responds to contact with selected petroleum fuels and chemicals by breaking, which causes the probe integrator to trigger an alarm.

The Type 2 sensor normally supplied with a PHFW probe must be installed according to the following procedure.

PHFW Sensor Termination

To size and terminate the Type 2 sensor follow steps 1 thru 10 below (refer to figure 8).

1. Stretch the tip of the sensor so that it is thin enough to pass through the sensor connector tube.

2. Pass the shrink tube and one Type 2 sensor connector (threaded end up) onto the sensor.

3. Insert the sensor into the unflared end of the sensor connector tube, and draw it forcibly through the tube until an unstretched portion of sensor fills the tube.

   Cut the sensor even with the flared end of the tube.

4. Pass the connector and shrink tubing onto the sensor connector tube.

5. Heat and shrink the shrink tubing around the sensor connector tube and sensor. Do not shrink the end of the shrink tubing that meets the sensor. The sensor will temporarily soften. Be careful not to overheat, stretch, or damage the sensor while it is soft. Lay the sensor on a flat surface until it cools.

6. Measure the distance from the bottom of the well to the top of the well casing (and extension). Subtract 17 inches.

7. Measure and mark the length calculated in step 6, and cut the sensor 6 inches longer than this length.

8. For the opposite end of the sensor, repeat steps 1 and 2.

9. Insert the sensor into the unflared end of the sensor connector tube, and draw it frocibly through the tube until the mark of step 7 is even with the flared end of the sensor connector tube.

10. Cut the sensor even with the flared end of the tube.

11. Repeat steps 4 and 5 for the lower end of the sensor.

Installing the Weight Retrieval Line

1. Cut the weight retrieval line about a foot longer than the sensor.

2. Pass the weight retrieval clamp onto the stud of the weight.

Installing the Weight Retrieval Line (continued)

3. Screw the connector at one end of the sensor onto the weight stud, securing the clamp.

4. Screw the other sensor connector onto the riser adapter pushrod.

5. Tie one end of the weight retrieval line to the clamp on the weight; tie the other end to the eye at the end of the bead chain on the riser adapter. The final length of the weight retrieval line should be about three inches longer than the sensor.

Installing the PHFW Probe in the Well

1. Gently adjust the foam seal on the riser adapter until the upper edge of the foam seal is approximately 3/4" below the upper lip of the riser adapter.

2. Carefully feed the sensing assembly into the casing. Two people may be needed for this step.

Caution

Be sure the sensor filament does not kink or bend sharply as it passes over the edge of the casing. Avoid tangling the sensor and the weight retrieval line.

3. As the riser adapter pases into the top of the casing, make sure that the lower part of the foam seal enters smoothly and the upper 1/8" of the foam seal jams between the casing rim and the riser adapter lip. The upper edge of foam seal should not slip below the casing rim.

4. Connect the probe twin lead cable to the probe integrator.

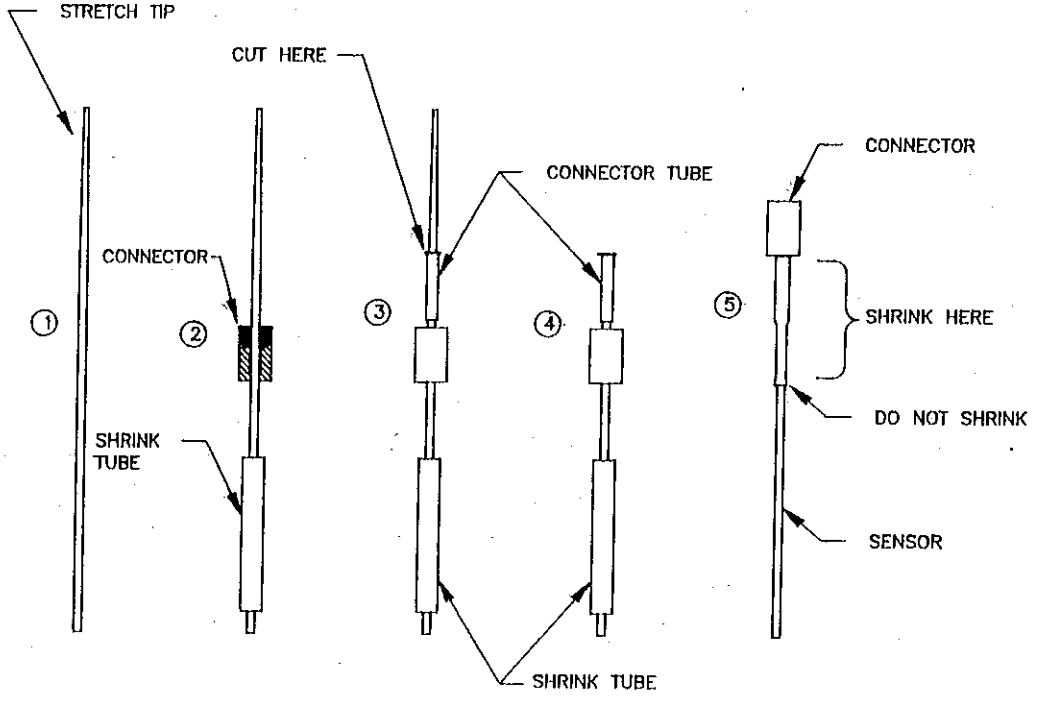


Figure 8
Type 2 Sensor Termination

Probe Tests

Figure 9 shows a typical probe integrator test setup. There are four (4) test procedures based on the type of integrator used. The red lead of an ohmmeter should be connected to the center pin of either of the connectors (point A). The black lead should be connected to the connector housing (point B). The ohmmeter should be set to resistance. Follow the test procedure in figure 10 to test the probe integrator and probes.

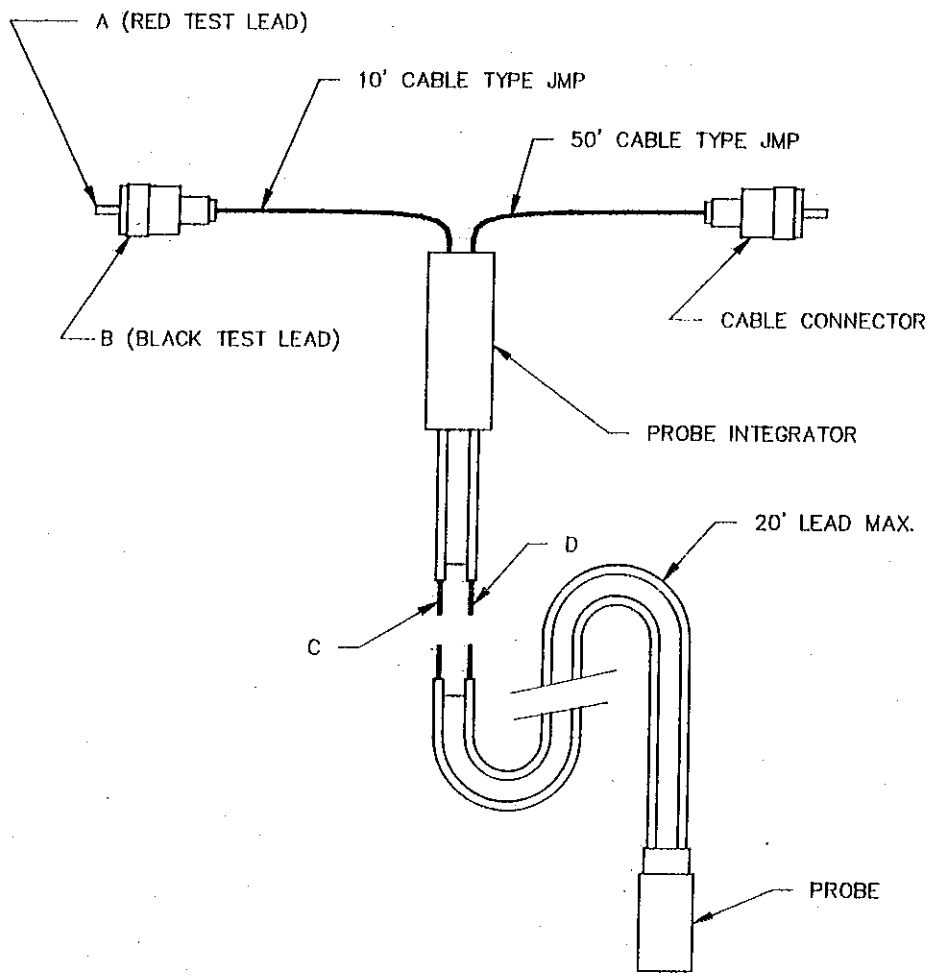


Figure 9
Probe Integrator Test Setup

PROBE INTEGRATOR TESTS

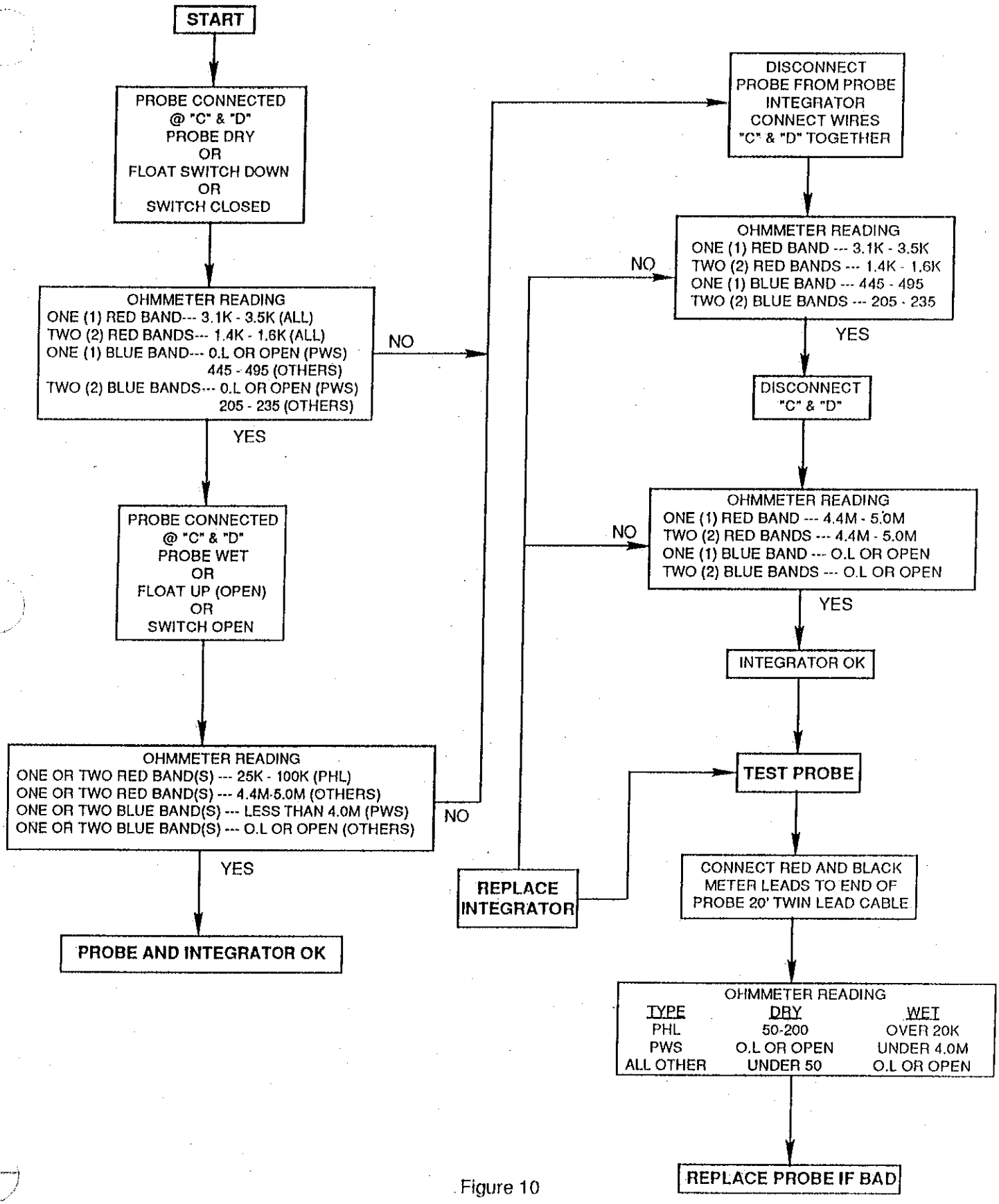


Figure 10
Probe Integrator Tests

WARRANTY

Seller warrants that the PAL-AT™ Leak Detection System (the "System") will be free from defects in materials and workmanship for a period of one year from the date of shipment by Seller to Purchaser. Seller is not responsible for damage to the System occurring in transit or arising from the installation, alteration or repair of the System by persons other than Seller's employees, or from any abnormal or improper use of, negligence with respect to or accident affecting the System. Expendable service parts, such as probes, are not warranted by Seller. Seller's sole obligation and liability, and Purchaser's sole remedy, under this warranty shall be the repair or replacement, at Seller's election, by Seller of any defective materials or workmanship covered by this warranty, without charge to Purchaser. Repaired or replacement materials shall be delivered to Purchaser F.O.B. Seller's plant or F.O.B. such other location as Seller shall designate. Seller shall not be responsible for any product returned to Seller without Sellers's prior express consent. THE FOREGOING WARRANTY SHALL BE SELLER'S SOLE AND EXCLUSIVE WARRANTY WITH REGARD TO THE SYSTEM AND EACH COMPONENT THERE OF, INCLUDING THE SALE, MANUFACTURE, DESIGN, DISTRIBUTION AND USE OF THE SYSTEM, AND IS IN LIEU OF ALL OTHER WARRANTIES AND REPRESENTATIONS OF EVERY KIND, WRITTEN AND ORAL, EXPRESS AND IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH OTHER WARRANTIES HEREBY ARE UNCONDITIONALLY AND IRREVOCABLY DISCLAIMED. In no event, whether because of a breach of warranty or representation or any other cause, whether based upon contract, tort, warranty, strict liability or otherwise, or arising out of the performance or nonconformance by Seller of its obligations hereunder, with regard to the System or to Purchaser, shall Seller be liable to Purchaser for indirect, incidental or consequential damages. If any damages are awarded against Seller pertaining to the System, such damage in no event shall exceed the original purchase price of the System.

No claim shall be permitted under this warranty unless Purchaser notifies Seller in writing within ten (10) days after Purchaser first learns of facts giving rise to any such claim and unless notice is given within the one year term of this warranty. In order to be valid, any notice sent to Seller in connection with and claim under this warranty must reasonably specify the defect which is the subject of such claim. Purchaser shall be responsible for testing and inspecting the System promptly after receipt and thereafter at such intervals as are reasonably prudent so as to inform Purchaser of any defects which exist in the System. Notwithstanding the filing of a claim hereunder, this warranty will expire after one year from the original date of shipment of the System with respect to materials and workmanship which are not then the subject of a proper claim.

The information contained in this document is subject to change without notice. PermAlert ESP, Inc. believes the information contained herein to be reliable, but makes no representations as to its accuracy or completeness.

TankWatch

LEAK DETECTION

Owner's Manual
and
Installation Guide
For
Models PHM10 & PHMS

PermAlert ESP
7720 N. Lehigh Avenue
Niles, IL 60648
(708) 966-2190

The following instructions describe the installation and operation procedures for TankWatch® Model PHM10 Multi-channel Monitoring Unit and Model PHMS Single Channel Monitoring Unit.

Introduction

The TankWatch System consists of a solid state electronic monitoring unit connected by lead-in cable to probes.

The following general precautions should be observed:

1. Read this manual carefully before beginning installation. Do not use substitute materials or short cut recommended procedures. Understanding and following these instructions is essential to avoid installation problems.

2. Collect the needed quantities of all materials well in advance of scheduled work.

3. Check packing list quantities against received items. The shipping box contains the TankWatch monitoring unit with channel expansion card(s) installed and as many probes as were ordered. Report immediately any shortages or damaged materials to the delivering carrier.

4. Care must be taken to store all TankWatch components in a dry and protected area at all times. Electronic monitoring units should be wrapped and sealed with plastic.

5. Electrical work should be performed by a qualified electrician.

MONITORING UNIT INSTALLATION

Mount the monitoring unit indoors where it will not be exposed to vibration, shock, high temperatures, or humidity. **DO NOT CONNECT POWER TO THE MONITORING UNIT YET.**

PROBE INSTALLATION

TankWatch can monitor several types of probes supplied by PermAlert: (1) combination hydrocarbon/water probes, (2) hydrocarbon probes, (3) water probes, and (4) switches such as float switches when connected to a contact adapter.

A contact adapter must be used to connect TankWatch to switches. A contact adapter can be connected to one (1) normally-open switch, one (1) normally-closed switch, or two (2) switches if one is normally-open and the other is normally-closed.

NOTE: All probes have four (4) conductors. Combination probes have four (4) active conductors - black, white, red, and green. Hydrocarbon probes and normally-closed switches have two (2) active conductors - black and white. Water probes and normally-open switches have two (2) active conductors - red and green.

Install the probe to allow easy access for inspection or replacement. The probe is supplied with enough cable (25') to reach the bottom of a typical 10,000 gallon tank. Additional lead-in cable may be spliced to the cable up to a maximum of 5,000. Additional lead-in must be protected from induced currents, lightning and weather, etc.

If the probe is being mounted in the air space of a double-wall tank then:

Run the probe cable through a cord grip and connect it to the lead-in cable, MATCHING COLOR FOR COLOR. Do this now to avoid losing the probe into the tank air space later on.

Drop the probe into the air space using a monitoring port on the "low" side of the tank, making sure to place the probe at the bottom of the space.

If the probe(s) is being installed in an application not requir ing a cord grip as in an open environment such as a berm, piping trench or sub-floor then:

> Connect the conductors of the probe cable to the lead-in cable, MATCHING COLOR FOR COLOR. The connections should be made in a suitable junction box or enclosure to protect them from the environment.
>
> Mount the probe at the point to be monitored and keep it safe from foot traffic, fork lifts, etc. Mount it securely at a low point.

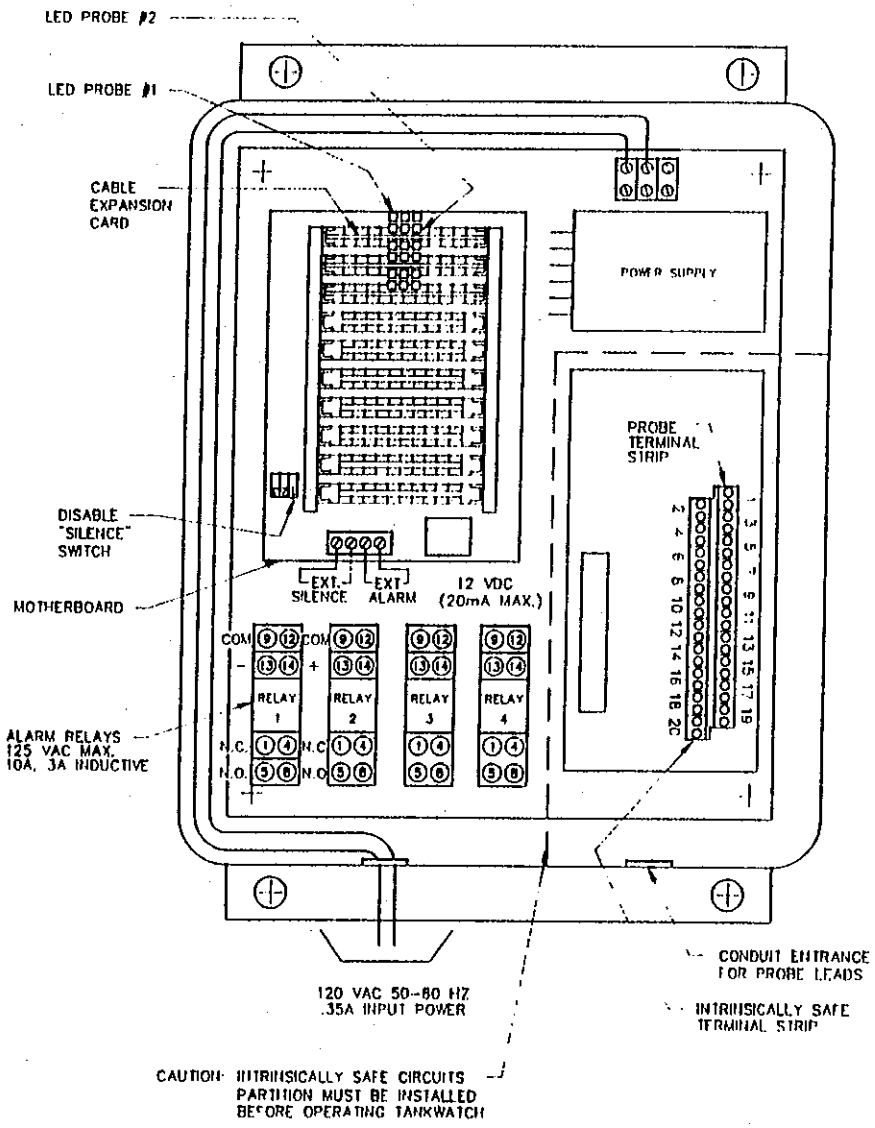
Measure the resistance(s) of the active conductors of the probe(s), using a multimeter:

> BLACK to WHITE resistance should be between 50 and 5,000 ohms. RED to GREEN resistance should be approximately 33,000 (33K) ohms. If the readings are not within the specified values, recheck the connections and correct any errors.

CHANNEL EXPANSION CARD(S) SETUP

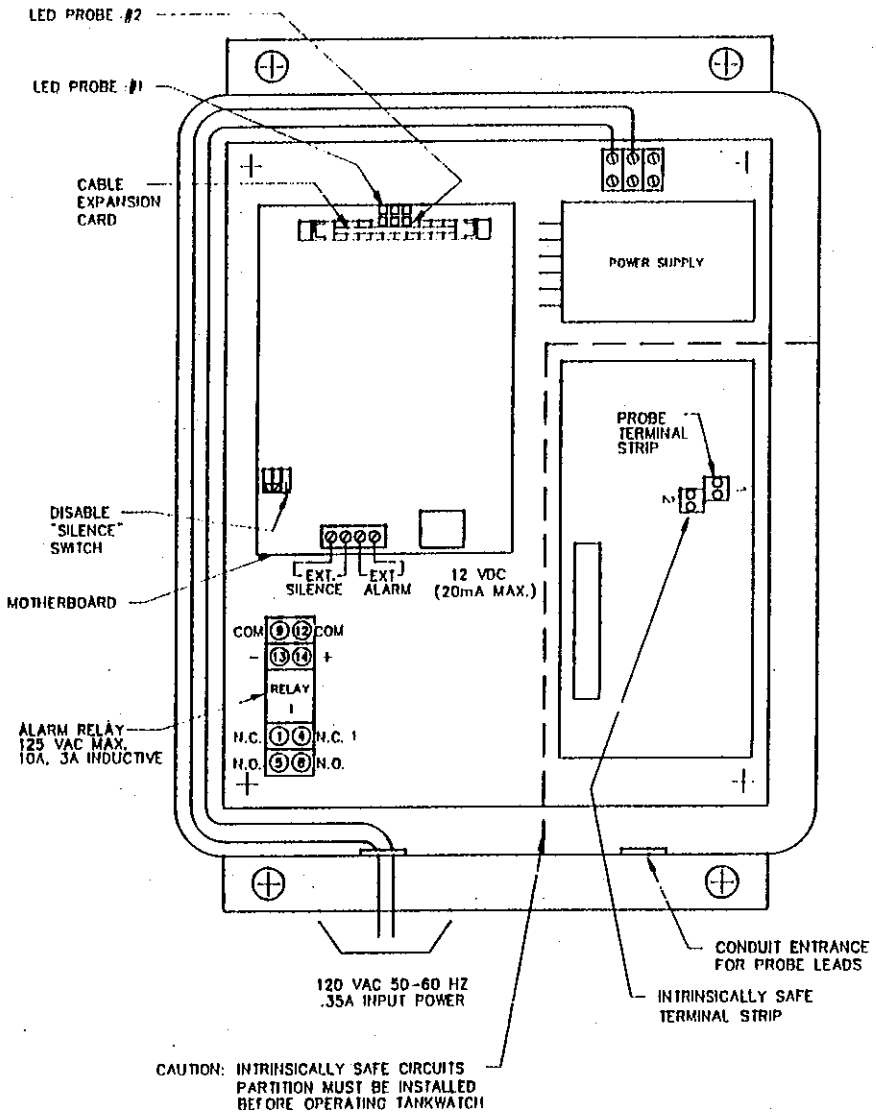
Each multi-channel monitoring unit (PHM10) consists of a "mother" board, a number of "daughter" cards (channel expansion cards), and four (4) 10 amp DPDT relays (See Figure 1). The mother board has ten (10) slots for channel expansion cards. The single channel monitoring unit (PHMS) has only one channel expansion card (See Figure 2). The channel expansion cards slide into the slots with the electronic components facing toward the top of the panel. If the card is installed upside down, it will not work but will not be damaged.

Each channel expansion card is configured at the factory for combination probes with the hydrocarbon section of the probe connected to the ODD numbered probes and the water section connected to the EVEN numbered probes.



Multi-Channel TankWatch

Figure 1

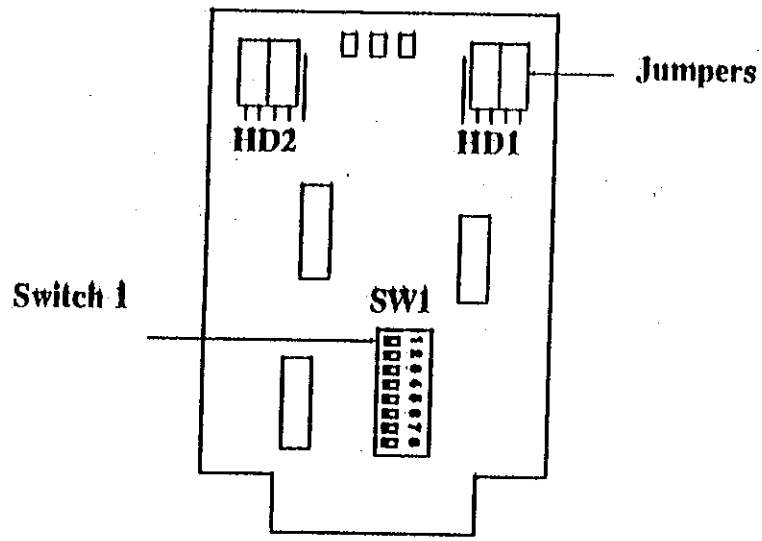


Single Channel TankWatch

Figure 2

CARD CONFIGURATION

If the system has only combination probes, skip this section and go directly to the RELAYS section.



Channel Expansion Card

Figure 3

Remove the upper-most channel expansion card by pulling out firmly (they "snap" in and out). Each card monitors one (1) combination probe or two (2) water probes, hydrocarbon probes, or switches. The card has 2 LED "traffic light" displays, an ODD and an EVEN display. ODD and EVEN refers to the probe number on the label on the cover of TankWatch and the terminal strip to connect the probe lead-in cables (See Figures 1 and 2). The ODD display is the upper one on the card and it ends up appearing on the window as probe 1,3,5 etc. (the top display for the single channel unit). The EVEN display is the lower one against the circuit board and it ends up as 2,4,6 etc. (the bottom display for the single channel unit). JUMPERS are rectangular plugs which connect two (2) of the five (5) pins at HD1 or HD2 (See Figure 3). Jumpers are easily positioned to set EACH display to correspond with the probe and liquid selected.

Position the card on a clean flat surface, as shown in Figure 3. The ODD numbered probe is controlled by the jumpers and pins labeled HD1; the EVEN by the jumpers and pins labeled HD2. Place the two (2) jumpers on the right four (4) pins (leaving the far left pin exposed), to set the display to monitor a hydrocarbon probe, a normally-closed switch, or the hydrocarbon part of a combination probe. Place the two (2) jumpers on the left four (4) pins (leaving the far right pin exposed) to set the display to monitor a water probe, a normally-open switch, or the water part of a combination probe. In Figure 3, HD1 is set for a hydrocarbon probe and HD2 is set for a water probe. Set both the ODD and EVEN jumpers to monitor the selected probes.

RELAYS

Next, set the card to activate the relay(s) when a "LEAK" (red light) is detected. The multi-channel system has four (4) - DPDT relays rated for 240VAC, 10A and the single channel system has one (1) - DPDT relay. They are NORMALLY ENERGIZED and de-energize

RELAY	ODD PROBE	EVEN PROBE
1	SWITCH 1	SWITCH 5
2	SWITCH 2	SWITCH 6
3	SWITCH 3	SWITCH 6
4	SWITCH 4	SWITCH 8

Relay Settings

Figure 4

during an alarm. Any leak (red light) alarm on any probe can activate any relay or combination of relays. To select the relay(s) activated by an alarm on a specific probe, refer to SW1 in Figure 3 and select the switch(es) required from the chart on Figure 4. Turn them on with a paper clip or small screwdriver by moving the appropriate switch to the right. Remember any relay can be switched by any probe on any card. More than one probe can switch the same relay and more than one relay can be switched by one probe. This feature allows shut

down of a tank system that has an alarm while allowing another system to continue to operate. Once the card has been set up, insert it back into the slot in the mother board and program any remaining cards.

SILENCE FEATURE

The only other setup remaining is to decide whether to disable the "Silence" button. To allow silencing of the alarm, do nothing. To disable it, simply push down the blank side of "rocker" 1 of switch "SW1" on the mother board (see Figures 1 and 2) so that the numeral "1" is up and the blank side of the rocker switch is down. (Rockers 2 and 3 are not used.)

INTRINSICALLY SAFE - UL LISTED

TankWatch is listed by Underwriter's Laboratories, Inc. and provides intrinsically safe output circuits for use in Class 1 Groups C & D hazardous locations when used with TankWatch probes or contact adapters and installed in accordance with the instructions in this manual. Refer to Figure 5, TankWatch Control Drawing.

- **The maximum operating voltage allowed in the TankWatch panel is 240 vac. In addition, the voltage on any wires to the control relays must be limited to 240 vac.**

- **The partition (cage) must be installed over the probe terminal strip before operating the system. Refer to Figures 1 and 2.**

- **Power and probe cables must be in separate conduit.**

ELECTRICAL HOOKUP

This step must be performed by properly qualified personnel. Refer to Figures 1 and 2.

First hook up the probe cables to the terminal strip. The ODD probes are connected via the top row of connectors on the probe terminal strip.

TankWatch Control Drawing

Figure 5

The EVEN probes use the bottom row. There is no polarity to observe. The hydrocarbon element or a normally-closed switch is always BLACK and WHITE, the water element or a normally-open switch is always RED and GREEN. Confirm the resistance values of the pair before hook up.

The relays are numbered left to right; 1 is on the left and 4 is on the right. The contacts are illustrated on the relay top. THESE RELAYS ARE NORMALLY ENERGIZED.

Connect the line power to the monitoring unit. The 120 volt terminal is located at the top of the back panel. It is recommended to use a dedicated circuit breaker.

TESTING

Turn on the power to the monitoring unit. The displays should be GREEN. If any display is YELLOW, then there is an open circuit to that probe. If only one probe is connected to a channel expansion card, the unused display will show a yellow light. If any display is RED, the corresponding liquid is in contact with that probe. Check the probe to verify liquid contact. **Never attempt to disassemble the probe. The sensors will be damaged.**

When all of the GREEN lights are showing, push the "Test" button. As long as the button is depressed, four things will be happening:

(1) The RED light will be on for all fuel probes.
(2) The YELLOW light will be on for all water probes.
(3) The audible alarm will be on.
(4) The relays selected on the fuel probes will switch (de-energize). This will affect auxilary equipment, if it is connected.

The only exception to the above is, if a probe has recently been wet, so be sure the probe(s) are fully dry before pushing the test button.

When the button is released, all the displays will return to green and the relay will reswitch (energize). The audible alarm will continue to sound. Press the silence button unless it is disabled; in which case you must temporarily reset switch "1" on the motherboard, push the silence button and then set switch "1". (See section "Silence Feature")

When the system performs as described by this section, the installation is complete. If the required results are not met, recheck the connections and resistance values and correct any error(s).

PROBES

The probes used in the system contain sophisticated sensor elements and are designed to tolerate the conditions found in monitoring. Because the probes are quite sensitive they must not be subjected to mechanical shock, especially when they are wet. **Never expose a probe to mechanical shock or shake it dry. Never stir a probe in a liquid.**

Hydrocarbon probes may be tested with gas or other highly volatile liquid. However, the liquid must fully evaporate or the element will not reset. In the event that the hydrocarbon liquid to be monitored will not evaporate, the probe may be tested using 1,1,1 trichloroethane. (TCA-sold as energine cleaning fluid). Test a probe for water-based liquid detection using water. **Always observe proper safety precautions when using flammable, toxic, or corrosive chemicals during testing.**

To test a probe, immerse it in the appropriate liquid without stirring or swirling. In order to dry a probe allow the probe to air dry or blow on it using cool air from a hair dryer on low. Do not use hot or pressurized air to dry a probe.

Two (2) probe location decals are included with the monitoring unit. The location of each probe should be recorded as well as whether the probe is monitoring a water-based or hydrocarbon-base fluid by marking the appropriate letter. Be sure to write an emergency phone number in the space provided at the top of the label.

OPERATING

Both water and fuel displays should all be GREEN when the system is running and no leaks are present. If any display is YELLOW, there is a wire break in the probe cable and it requires maintenance or a channel section does not have a probe connected to it.

- **If any display is red, a liquid is in contact with the sensor. Take action to verify this and notify responsible personnel.**
- **It is very important to plan what actions will be taken in the event of a leak.**
- **List persons responsible and their phone number.**
- **Never disconnect the power from the unit to ignore an alarm.**

Once the liquid has been cleaned up, the sensor will dry out if it was exposed to most volatile liquids. The display will typically reset to GREEN. If the liquid does not evaporate or has attacked the probe, it should be replaced.

Push the test button at prudent intervals to verify that the system is operating properly.

WARRANTY

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The PermAlert Environmental Specialty Products, Inc., subsidiary of Midwesco, Inc. reserves the right, in its discretion, at any time and from time to time, to make changes to any specification, data or information in this manual.

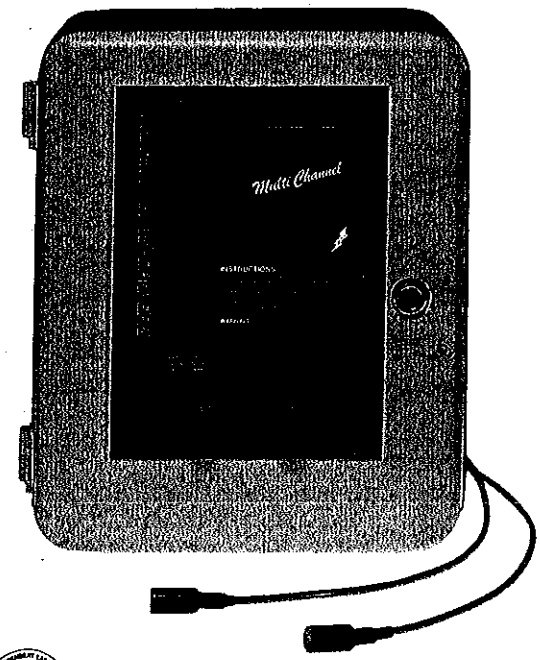
PermAlert ESP, INC.

Environmental Speciality Products

Product Data Sheet

TankWatch™

Multi-Channel Leak Detection Monitoring Unit



Model # PHM10 Part # 8068250
Patent # 4855706

Product Features.....

- *Solid state probe sensor technology*
- *Sensing of organic liquids and water within seconds of contact*
- *Vapor and gases are ignored*
- *Remote monitoring capabilities*
- *Broad detectable range of organic liquids*
- *Monitors optional switches*
- *UL listed for intrinsically safe output circuits for Class 1, Division 1, Groups C & D hazardous locations*

The **TankWatch™** PHM10 Multi-Channel monitoring unit has been engineered to meet a broad range of customers needs. The multi-channel sytem can be configured from one to ten channels with each channel capable of monitoring one dual probe or two single hydrocarbon or water probes. Tank Watch's modular design permits future expansion to ten channels by simply plugging in channel expansion cards and connecting probes. This modular construction permits plug-in pull-out service ease.

TankWatch employs an understandable **"traffic light"** display to keep you informed about the system's status:

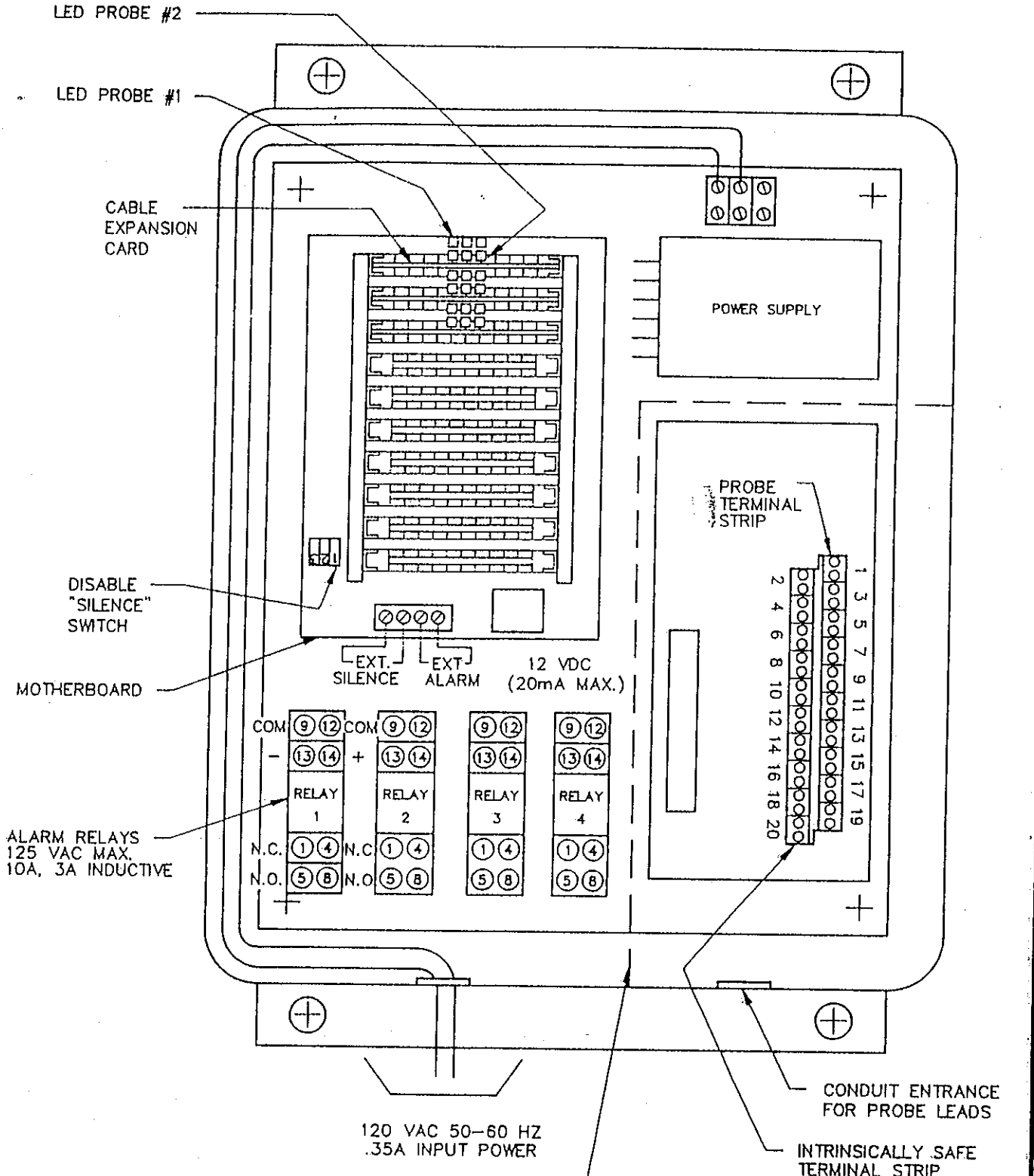
Green *means the system is monitoring* ; **Yellow *indicates a wire break*, and Red *a leak*.** The unit will enter into the alarm mode on any red or yellow condition, activating an audible alarm. A leak will activate the system relay for external alarm or control functions. There are only two operator buttons. One button is used periodically to test the system, and the other to silence the alarm. This silence button can be disabled via an internal switch to prevent unauthorized alarm silencing.

The**TankWatch** monitoring unit is equipped with four (4) independent, normally energized, 10 amp DPDT relays. Any or all relays can be field set to respond to both fuel and water leaks, or only one type, either fuel or water. The alarm console can be located up to 5,000 feet away from the probe. The system relays can activate an optional remote alarm or an auto-dialer. The remote can be located up to 1,000 feet from the console and can silence the console alarm as well as its own internal alarm.

The patented compact probes for Tank Watch are solid state design, and respond in seconds after contact with organic liquids or water. Hydrocarbon fumes or vapor have no effect, thereby virtually eliminating false alarms.

The **TankWatch** monitoring unit can also monitor any switch; ie: float switches, thermostats, high level switches, etc.; which is connected to the optional contact adapter.

Probe Model	*Part Number*	*Description*
PHDP	8068235	Dual Probe for Hydrocarbon & Water Liquids
PHHL	8068295	Hydrocarbon Probe
PHWL	8068296	Water Probe
PHCA	[illegible]	Contact Adapter



PermAlert

ENVIRONMENTAL SPECIALTY PRODUCTS INC.
A SUBSIDIARY OF MIDWESCO INC.
7720 LEHIGH AVE. NILES ILLINOIS 708/966-2190

MULTICHANNEL TANKWATCH

DATE	BY	DWG. NO
2/21/90	M.H.D.	LD-179

SECTION 9

REPAIRS

For damaged pipe and for leaking joints, Smith Fiberglass Products recommends only the repair methods listed below. **DO NOT** attempt to repair damaged fittings. Always pressure test repair work before putting the line back into service to assure the soundness of the repaired section. Contact your local Smith Fiberglass Products representative for further information.

You can use a conventional repair clamp for a temporary repair. However, on buried lines, you should make a permanent repair before covering the line.

During repair, the pipeline cannot be under pressure, and the area to be repaired must be clean and dry throughout the procedure.

A. Repairing Weather Damage

When machined surfaces of pipe or fittings are exposed to direct sunlight prior to installation, the result is a loss of joint bonding strength. Therefore, if protective coverings have been removed and ultraviolet exposure was greater than one day, the following steps must be taken:

1. For exposed spigot ends, cut 1/2" or 1" off the end and retaper. This will remove the weathered layer and give a fresh surface for bonding. For fittings with spigot ends, it is sometimes possible to lightly sand the spigot using the same procedure as for bell ends.
2. For exposed bell ends (pipe or fittings), sand thoroughly until the entire surface appears fresh. Hand sanding with 40 grit sandpaper is recommended. A flapper sander of about 40 grit mounted on an electric hand drill also works well; however, use a light sanding operation to prevent changing the taper angle.

NOTE: COUPLINGS OR INTEGRAL BELLS WITH T.A.B. THREADS THAT HAVE BEEN OVEREXPOSED MUST BE **REPLACED**.

B. Pipe Patching

Follow these instructions to repair pipe wall damage where the damaged area is 2" or less in diameter.

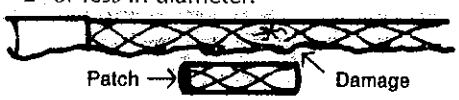


FIGURE 9.0

1. Cut a length of good pipe long enough to adequately cover the damaged area and extend at least 3" (and preferably 4") to either side of damaged area.

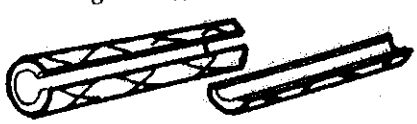


FIGURE 9.1

2. Slit this "patch" lengthwise twice and remove a section so that about 3/4 of the circumference remains for 1"-4" pipe, and 1/2 of the circumference for 6" and larger pipe.

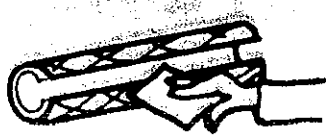


FIGURE 9.2

3. Thoroughly sand the inner surface of the patch and sand a corresponding area on the pipe around the damaged section. Use coarse sandpaper, a file, or a disc sander to remove all gloss from the surfaces to be bonded.

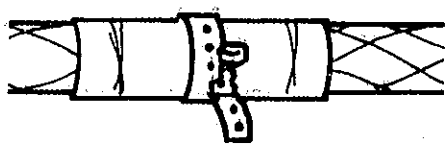


FIGURE 9.3

4. Clean all bonding surfaces with joint cleaner from an adhesive kit. Allow the cleaner to evaporate, then apply a thick coating of adhesive to both surfaces, snap the patch in place, and apply pressure with hose clamps or banding material until the adhesive hardens. The clamps may be left on or removed after curing, depending on their salvage value.

C. Repairing Extensive Damage

When the damaged area in the pipe wall is larger than 2" in diameter or for repair of pipe in severe chemical service that requires a lined product such as GREEN THREAD or POLY THREAD pipe, follow these instructions:

1. When damage is local (less than 2" long, but more than 2" around the circumference of the pipe), check to see if there is enough slack in the pipe to cut out the damaged section, retaper the cut ends, and bond a sleeve coupling between the tapered ends. When there is enough slack, follow the close tolerance plumbing procedure to make sure that the joints are locked up, i.e. follow the dry fit vs. wet fit procedure shown to determine the insertion length into the coupling. (See Section 10.) If the pipe is buried, excavate a working area large enough to allow for tapering tool rotation. Taper the cut ends of the pipeline and install the sleeve coupling using the procedure shown in paragraph C.2.

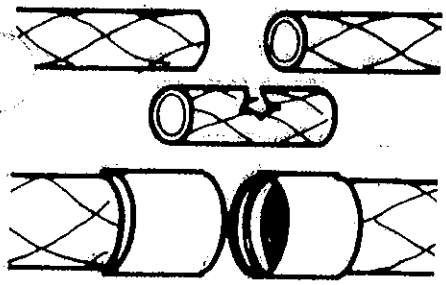


FIGURE 9.4

2. When damage is extensive (too large for replacement by a sleeve coupling), cut out the damaged section, taper the cut ends, and install two sleeve couplings and a pipe nipple. This procedure requires sufficient slack in the line to make the final joint by lifting the pipe (or moving the pipe to one side) to engage the bell and spigot joint. Therefore, it may be necessary to remove additional backfill from a buried line to allow for pipeline movement of several feet. (Note: In some buried pipelines, tapering pipe in the ditch is difficult. In these instances, see paragraph 4.)

   a. Cut out the damaged section of pipe.

   b. Taper one end of a piece of pipe at least as long as the damaged section above. When tapering, carefully observe the position of the nipple on the tapering tool. This taper will be used as a gauge. See Section 10.B. Cut this nipple to the proper length in the following steps.

   c. When pipe is buried, excavate a working area large enough to allow for tapering tool rotation. Taper the cut ends of the pipeline and install the two sleeve couplings. Cure these joints and then measure the gap between the sleeve couplings. At this point, determine the proper length of the pipe nipple. This length is the sum of the distance between the two sleeve couplings, the insertion length of the tapered ends, and an additional length to assure joint lock up. To determine the insertion length of the tapered ends, move one of the couplings to the side and use the end of the repair nipple made in the previous step to determine the dry fit into each bell. (Note: The dry fit must be very tight, i.e. use a 2 x 4 to drive the joint together tightly enough that it is difficult to separate.) The total length of the repair nipple is determined by adding the two make-up dimensions from the close tolerance plumbing section of this manual, Section 10. (Example for 6" pipe = 2 x .25 = .5"). This added length is needed due to additional insertion which occurs because the adhesive acts as a lubricant. (Caution: This additional insertion will be greater if you do not achieve a tight, dry fit when measuring. It will also be different for each size of pipe.)

      After you determine the final nipple length, cut the other end of the nipple and taper it, making sure that the nipple is on the tapering tool in exactly the same position as the first taper (which was used to measure the insertion length).

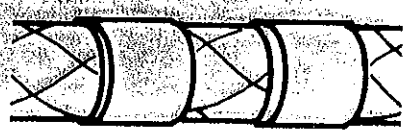


FIGURE 9.5

   d. Clean all bonding surfaces using the joint cleaner provided in your adhesive kits. Allow the cleaner to evaporate, apply adhesive to all bonding surfaces, and insert the nipple into the line by lifting the line or moving it to one side. Pushing the pipe back into line will push the nipples into the bell. Make certain that all tapers are tightly locked.

3. If the line cannot be moved sufficiently to install a sleeve coupling or a sleeve coupling spool piece, taper both ends of the pipe and install flanges. If the pipe is buried, you must excavate a working area large enough to allow for tapering tool rotation. A flanged spool can now be assembled and bolted in place. Follow the close tolerance plumbing procedure (as described in Section 10) to assure that the proper flange spool length is made, i.e. follow the dry fit vs. wet fit procedure to determine the insertion length into each flange.

4. If it is impossible to taper the pipe in the ditch, you can install a new section of pipe by overwrapping the plain cut ends. (Note: This repair method is suitable for most chemical service, but it is not suitable for permanent repair of some extremely corrosive services handled by GREEN THREAD or POLY THREAD pipe. Some such services could attack the overwrap materials. Contact your Smith Fiberglass Products representative if in doubt about the use of this repair method.

   a. Clear an area large enough for installers to work on both sides and under the pipe. Cut out the damaged section of pipe and measure the gap. Cut a section of good pipe that is not more than 1/2" shorter than the length to be replaced (1/4" maximum gap on each end).

   b. Sand the ends of the pipe to remove all resin gloss. Align the replacement pipe section with the pipeline and block up all sections to maintain alignment. All sections must be rigid so they will not move during the overwrapping procedure. In some cases, it may be necessary to make tack welds by using 1" x 2" patches of glass cloth and adhesive (4 patches spaced at 90° around pipe are sufficient). Heating the pipe surface where the tack weld is to be applied produces a hot patch which will cure rapidly. Use a small propane torch or a hot air blower to apply heat. These tack welds are used only to hold the pipe stationary while the structural overwrap is being made — they will not seal the joint. Therefore, it is essential that the tack welds not exceed 1/2" on either side of the pipe gap.

The remaining procedures for this method are the same as the overwrap procedures for a leaking joint, as follows.

D. Repairing Leaking Joints

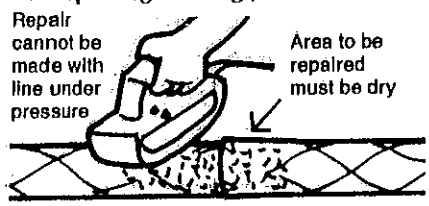


FIGURE 9.6

Overwrapping - If a joint leaks because of improper installation, you can repair it by overwrapping with glass cloth and resin. In cool weather, the work area may have to be covered and heated to ensure a good overwrap (plastic around a wooden framework and space heaters have been used successfully). The temperature in the work area should be 75-90°F with uniform heating. Hot and/or cold sections of overwrap can overheat and/or sag. The overwrap must also be protected from the sun which will produce a temperature differential from the top side to the bottom side.

1. Use 7-10 oz. glass cloth, 6"-8" wide with a finish compatible with the resin system used. NOTE! Volan A finish is compatible with both **epoxy and polyester.** For 1" through 3" diameter pipe, use four layers of glass cloth; for 4" through 16" diameter pipe, use one layer of glass cloth for each inch of diameter. Use the same adhesive as was used to join the pipe. Components for the epoxy overwrap are available in DS-8088 adhesive kits.
2. Use a grinder or sander with coarse sandpaper (40 grit or less) to remove gloss 5" on both sides of the joint.
3. Bevel the shoulder of the bell with the grinder to blend it in with the pipe wall, i.e. there must be a smooth slope from the raised coupling, pipe bell end or fitting to the pipe wall. In cases where it is impractical to do this much grinding, you can make a smooth transition between the two diameters by using a grout compound or putty made by mixing an inert filler such as fine, dry sand or grinding dust from the glass removal operation into the adhesive. This putty can be applied at the edge of the bell to form a slope which removes the step between the coupling, pipe bell end or fitting and the pipe. The length (distance along the axis) of this putty should be held to a minimum, because the putty has

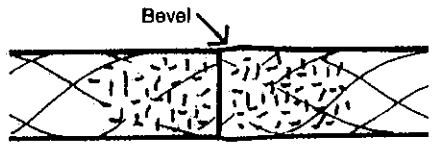


FIGURE 9.7

limited pressure capabilities and is used only to ensure that the glass cloth is not laid over a sharp break in contour (usually 1/2" of tapered putty slope is sufficient).

CAUTION: There must not be any pressure on the line or any fluid leaking from the joint when performing this procedure.

4. Clean the sanded surfaces with joint cleaner and allow the cleaner to evaporate.
5. Thoroughly mix the adhesive and hardener with the stir stick until there is a uniform color and a consistent flow off the stir stick.

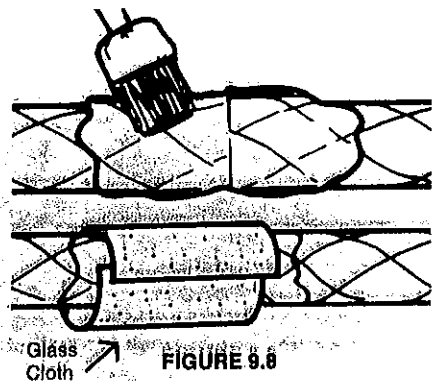


FIGURE 9.8

6. Using a paint brush, apply the mixed adhesive to all sanded areas.
7. Each piece of glass cloth must be slightly longer than the previous piece, because the O.D. of the pipe becomes larger as you add glass cloth. We suggest that you cut the first piece to allow for 2" of overlap. Then, when this length is no longer sufficient to overlap at least 1/2" on the ends, determine a new length with 2" of overlap.
8. Center a piece of glass cloth over the joint. Pull on the cloth while positioning it, and wet it out by painting with adhesive. Brush to remove any trapped air bubbles in the wrap. Start at one end of the cloth and work around the circumference, wetting the cloth with resin. Work the cloth away from the starting end and from the center of the cloth to the sides. The cloth

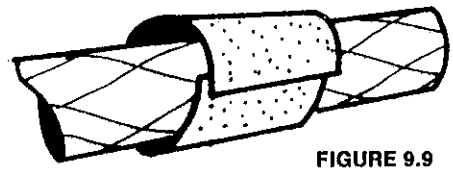


FIGURE 9.9

must be thoroughly wetted with adhesive, but do not spend a lot of time in one area, as the cloth will wet out (lose its shiny, white appearance) with time. By the time the cloth has been worked down smoothly with no air beneath it, most of it will be wetted out. In areas that remain unwetted, brush the area in smooth strokes in the same direction the cloth was laid (work out any wrinkles in the same manner).

9. Center the next piece of glass cloth on the joint starting from a new point on the circumference. Stagger the overlap of the ends to prevent thick sections or humps in the overwrap. Apply some tension to the glass cloth while positioning it in order to work the adhesive through the cloth. Smooth the glass around the circumference before adding more adhesive. Use only enough adhesive to wet out the cloth. Excess adhesive will run to the bottom of the wrap and may cause the entire wrap to sag (in which case the wrap must be restarted).
10. Should the overwrap start to give off heat, discontinue wrapping and let the joint cure and cool. Sand the cured layers to remove the gloss before restarting the overwrap procedure.

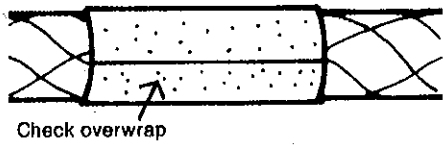
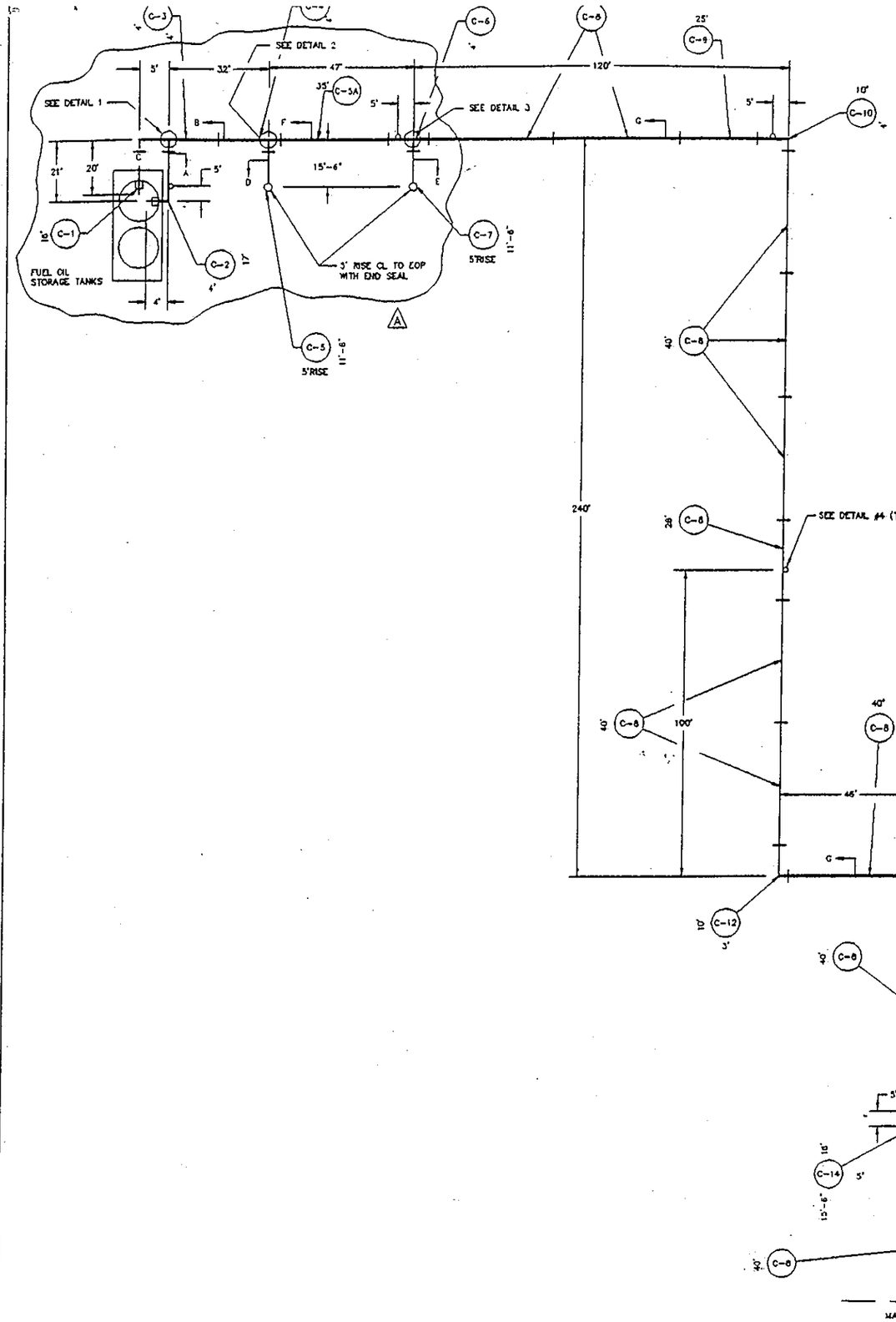
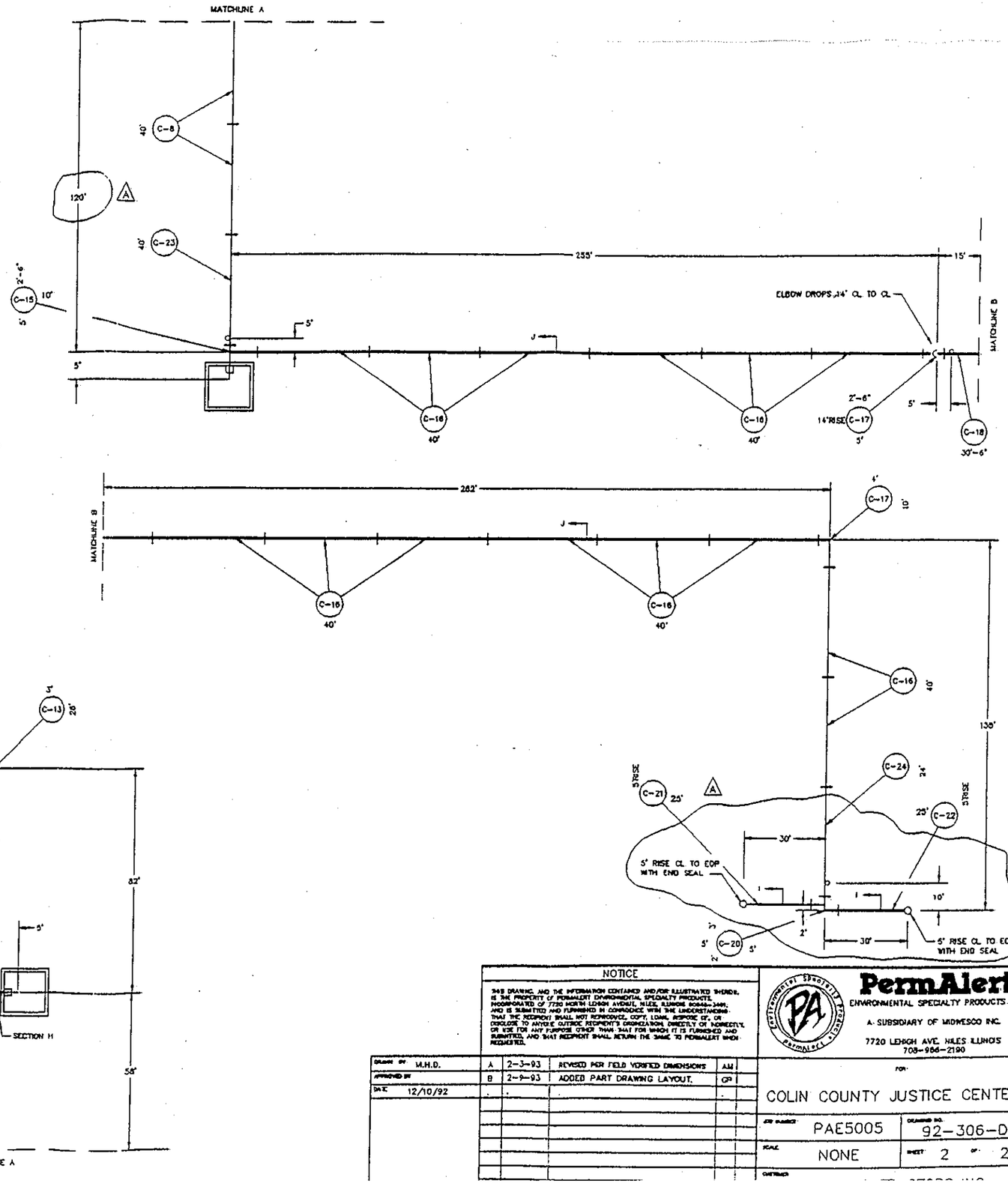


FIGURE 9.10

11. Pay particular attention to the bottom of the overwrap, as this is the area that is most difficult to see.
12. In temperatures above 90°F, protect the overwrap from direct sunlight.

Note: This repair method is suitable for most chemical service, but it is not suitable for permanent repair of some extremely corrosive services handled by GREEN THREAD or POLY THREAD pipe. Some such services could attack the overwrap materials. Contact your Smith Fiberglass Products representative if in doubt about using this repair method.



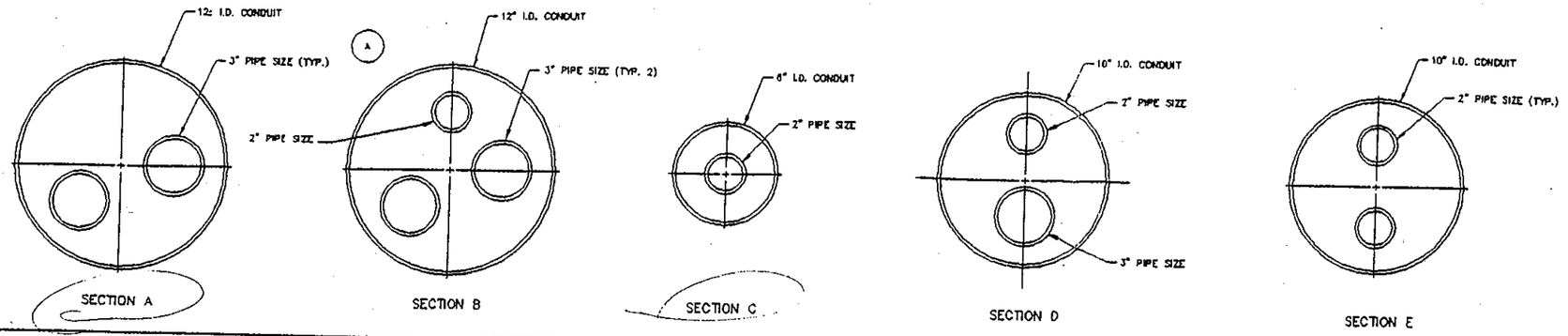


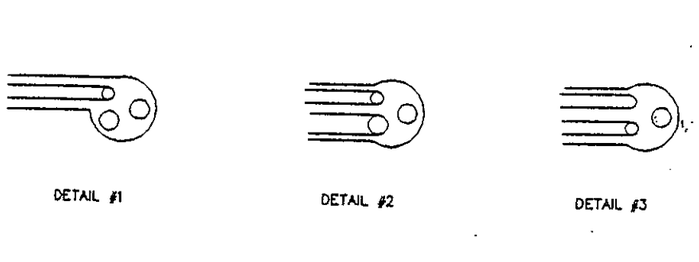
DRAWN BY M.H.D.	A	2-3-93	REVISED PER FIELD VERIFIED DIMENSIONS	AM
APPROVED BY	B	2-9-93	ADDED PART DRAWING LAYOUT.	GP
DATE 12/10/92				

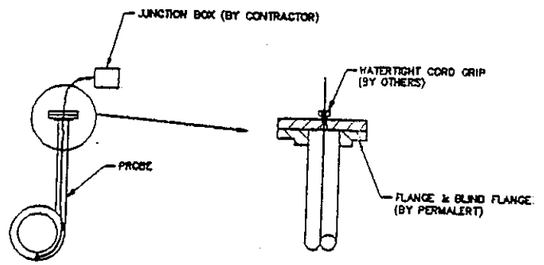
PermAlert
ENVIRONMENTAL SPECIALTY PRODUCTS, INC.
A SUBSIDIARY OF MIDWESCO INC.
7720 LEHIGH AVE. NILES ILLINOIS
708-966-2190

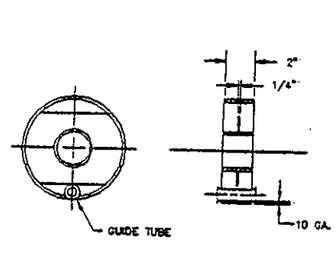
FOR:
COLIN COUNTY JUSTICE CENTER

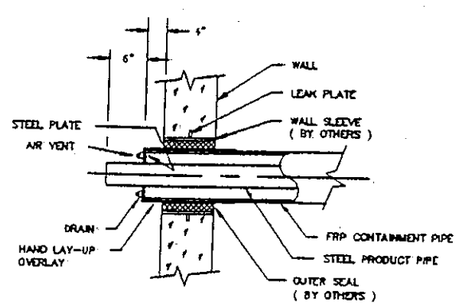
JOB NUMBER PAE5005	DRAWING NO. 92-306-D8
SCALE NONE	SHEET 2 OF 2

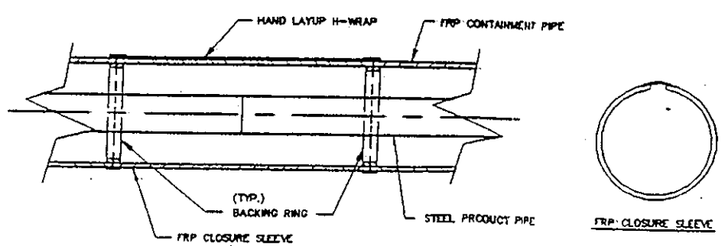












DOUBLE-PIPE GENERAL NOTES

1.0 Product pipe shall be: Sch. 40, A538, ERW FOR 2" AND ABOVE
Sch. 40, A1088, SML FOR 1 1/2" AND BELOW

2.0 Product pipe fittings shall be: BUTTWELDED FOR 2 1/2" AND ABOVE
SOCKETWELD FOR 2" AND BELOW

3.0 Containment pipe shall be: Airtight, pressure testable, multi-layered composite fiberglass reinforced thermo-setting resin pipe with 150 mil wall thickness.

4.0 Supports shall be Steel in accordance with detail #5, and shall be spaced 10 feet on centers for sections A – G, 8' on centers for section H and 5' on centers for sections I and J.

5.0 End seals shall be hand lay-up in accordance with detail #6.

6.0 Product line design temperatures shall be: ambient. Product line design pressures shall be 100 PSI.

7.0 In order to prevent movement during transportation, units shall be shipped with restraint attached to the product pipe and containment pipe. Removal of this restraint and repairs of product pipe or containment shall be the responsibility of the installing contractor.

8.0 All containment pipe factory fabricated joints shall be air pressure tested at the factory to 10 PSIG.

9.0 Straight lengths of containment pipe shall be furnished in 40 foot lengths.

10. Field joints shall be hand lay-up bi-ply over frp closure sleeve, in accordance with detail #7

11. Connections to tanks and equipment, including uncontained or existing piping, pipe all wall sleeves and seals shall be by the installing contractor.

12. Socketweld couplings are required for field joints for pipe sizes 2" and below and shall be supplied by installing contractor.

TANKWATCH GENERAL NOTES

1. Check packing list quantities against received items. Report immediately any shortages or damaged materials to PermAlert ESP's delivering carrier.

2. Care must be taken to store all TankWatch components in a dry and protected area at all times. Electronic monitoring units should be wrapped and sealed with plastic.

3. Electrical work should be performed by a qualified electrician.

4. The TankWatch System consists of a solid state electronic monitoring unit connected by lead-in cable to probes.

5. The TankWatch alarm unit should be mounted indoors where it will not be exposed to vibration, shock, high temperatures, or humidity.

6. Probe lead cable for connecting probes to the monitoring unit shall be Belden #9534, 4 conductor 24 ga. wire or equal. It is recommended this be run in PVC conduit or as required by local codes.

7. Consult TankWatch leak detection monitoring unit owners manual and installation guide for installation instructions. Understanding and following these instructions is essential to avoid installation problems.

8. TankWatch is listed by Underwriters Laboratories, Inc. and provides intrinsically safe output circuits for use in class I groups C & D hazardous locations when used with TankWatch probes or contact adapters and installed in accordance with the instruction manual.

TANK WATCH BILL OF MATERIAL

1 – MULTICHANNEL TANK WATCH ALARM
10 – PHDP QUAL HYDROCARBON / WATER PROBES
JUMPER CABLE SUPPLIED BY INSTALLING CONTRACTOR

DRAWN BY	M.H.D.	A	2-5-93	REV X-SEC B & F.	GP
APPROVED BY					
DATE	12/10/92				

PermAlert
ENVIRONMENTAL SPECIALTY PRODUCTS INC.
A SUBSIDIARY OF MIDWESCO INC.
7720 LEHIGH AVE. NILES ILLINOIS
708-966-2190

FOR:
COLIN COUNTY JUSTICE CENTER

JOB NUMBER PAE5005
DRAWING NO. 92-306-DA
SCALE 1"=20'
SHEET 1 OF 2