

# API 607 Fourth Edition Fire Test Report

*Performed for*

**Flexitallic L.P.**

6915 Highway 225  
Deer Park, TX 77536-2414  
USA



Enviroflex 500 Packing

Project Number: 202102  
March 2003



*Performed by*

**YARMOUTH RESEARCH AND TECHNOLOGY**

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# Yarmouth Research and Technology

## API 607 FIRE TEST REPORT

**Customer:** Flexitallic

**Date:** 3/19/2003

**Specification:** API 607, Fourth Edition, May 1993

**Product Code:** Enviroflex 500 Packing

**Project Number:** PN202102

**Comments:** Packing installed in a 6 inch Class 300 gate valve fixture. Test modified to test only packing leakage.

**YRT Technician:** Matthew J. Wasielewski, P.E.

**Version of YRT's FIRE-Control 607 Software:** A

**Equipment Confirmed to be in Calibration to NIST Standards:** Yes

### ***Burn and Cool Down Test***

Burn Start Time:	<b>10:45:00</b>	
Bonnet Bolt Torque At Start of Test:	<b>55</b>	ft-lb
Average Pressure During Burn:	<b>31.2</b>	psig
External Leak Rate During Burn/Cool Down:	<b>0.6</b>	ml/min
Allowable External Leak Rate:	<b>150</b>	ml/min
Amount of Time of Bonnet > 1200 deg.:	<b>16.3</b>	minutes
Amount of Time of Body > 1100 deg.:	<b>8.8</b>	minutes
Were Test Conditions Within Compliance?	<b>Yes</b>	
Was the Packing Leakage Below the Allowable?	<b>Yes</b>	

### ***Operational Test***

Average Pressure During Test:	<b>30.8</b>	psig
External Leak Rate After Operating:	<b>0.0</b>	ml/min
Allowable External Leak Rate:	<b>150</b>	ml/min
Was the Packing Leakage Below the Allowable?	<b>Yes</b>	
Bonnet Bolt Torque At End of Test:	<b>15</b>	ft-lb
<b>Does the Packing Pass or Fail API 607?</b>	<b>PASS</b>	

**Witnesses**

*Matthew J. Wasielewski*



# **Yarmouth Research and Technology**

**Customer:** Flexitallic

**Test Date:** 19-Mar-03

**Product Code:** Enviroflex 500 Packing

**Project Number:** PN202102

## **Dimensional Information**

Initial Packing Height:	1.850	inches
Stem Diameter:	1.246	inches
Bore Diameter:	1.903	inches
Gland Follower ID:	1.290	inches
Gland Follower OD:	1.863	inches
Gland Follower Length:	0.984	inches
Bottom Bushing ID:	1.288	inches
Bottom Bushing OD:	1.880	inches
Bore Depth with Bushing Installed:	1.450	inches

## **Clearances and Finishes**

	Actual	Allowable
Between Stem and Follower:	0.044	.040-.060
Between Follower and Bore:	0.040	.040-.060
Between Stem and Bottom Bushing:	0.042	.040-.060
Between Bottom Bushing and Bore:	0.023	-
Stem Surface Roughness (Ra):	12	32 max.
Bore Surface Roughness (Ra):	125	125 max.

## **Packing Compression Data**

Packing Free Height:	1.850	inches
Packing Compression Amount:	0.464	inches
% Compression:	25%	
Gland adjustment length:	0.920	inches
This height complies with API 600. (.563 minimum)		

## **Instrumentation**

Differential Pressure Sensor No.:	PT-60-1	
Pressure Gauge Number:	PG-100-2	
	PT-100-1	
Thermocouple Type:	K	

Were all instruments verified to be calibrated to NIST standards?: Yes

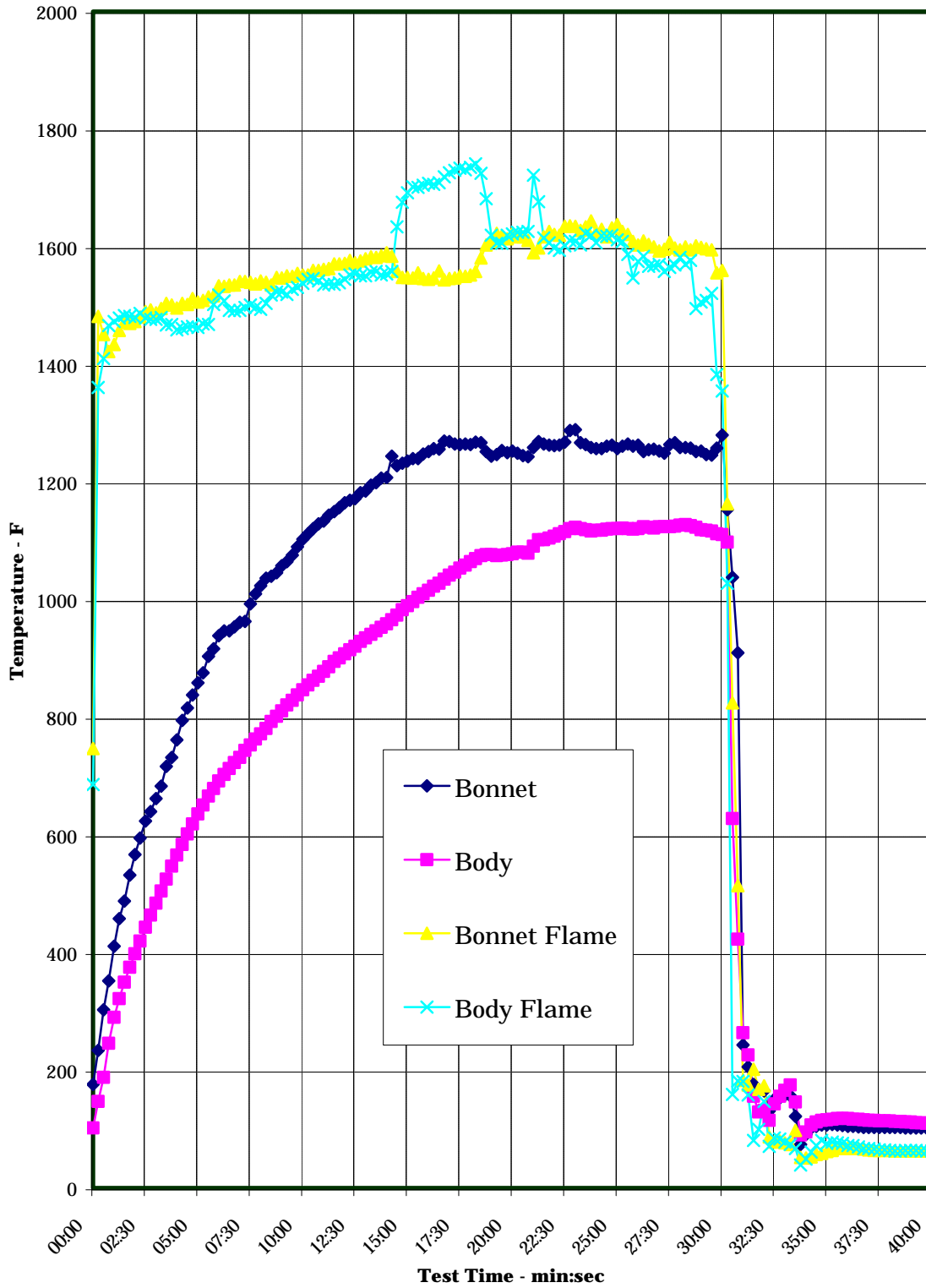
## **Notes**

The fixture has been used previously for several tests.

Stem condition was good with no linear scratches, but several small pits.

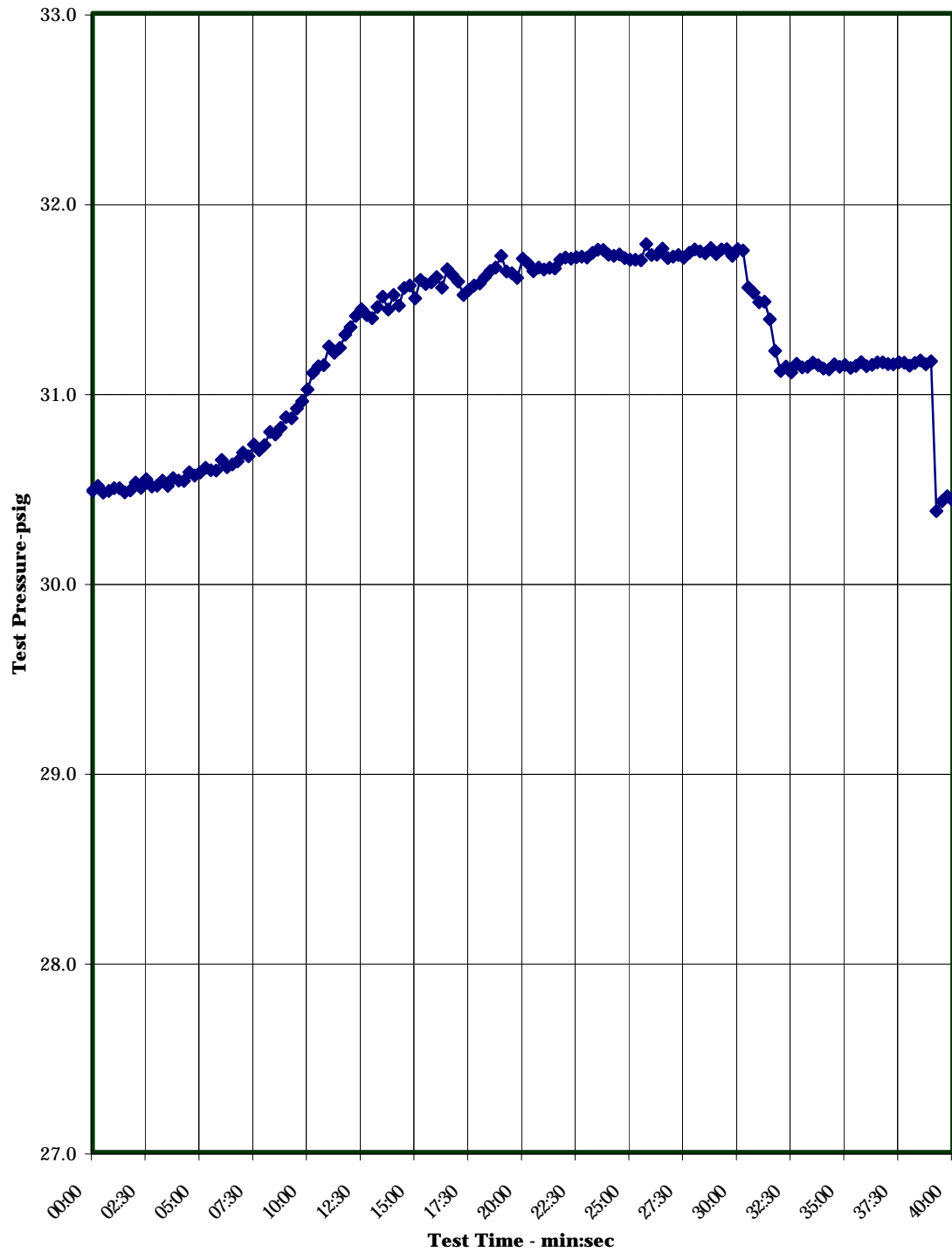
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Temperature verses Time Chart



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**Pressure versus Time Chart**



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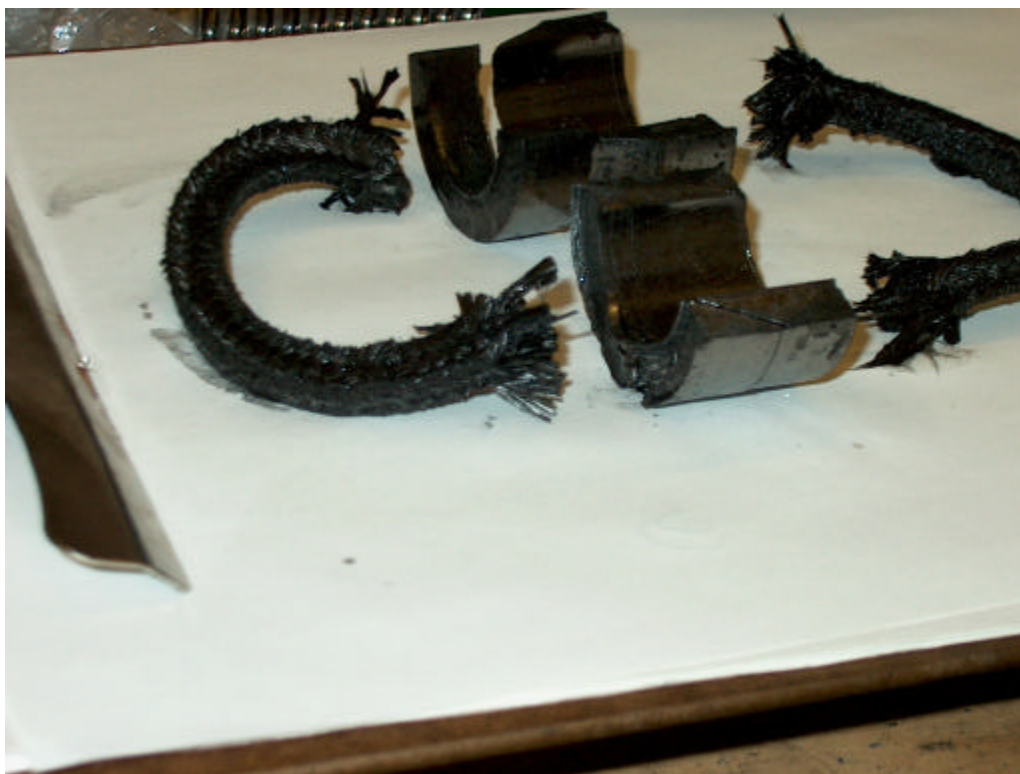
**Packing Prior to Test**

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**Test During Burn**

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### **Packing After Test**



# **Yarmouth Research and Technology**

## **Fire Test Information**

**Customer:** Flexitallic

**Date:** 3/19/2003

**Product Code:** Enviroflex 500 Packing

**Project Number:** PN202102

## ***Fire Test Raw Data***

Time	Pressure (psig)	Water Volume (mls)	Bonnet Temp - F	Body Temp - F	Bonnet Flame Temp - F	Body Flame Temp - F	Average Flame Temp - F	Cavity Pressure (psig)
10:45:00	30.5	19133	176	102	747	686	716	28
10:45:15	30.5	19141	234	147	1482	1361	1482	27
10:45:30	30.5	19174	303	188	1451	1410	1451	29
10:45:45	30.5	19185	352	246	1422	1466	1444	28
10:46:00	30.5	19153	411	290	1434	1473	1454	28
10:46:15	30.5	19162	458	322	1458	1479	1468	30
10:46:30	30.5	19342	488	350	1472	1483	1478	29
10:46:45	30.5	19114	532	375	1470	1482	1476	29
10:47:00	30.5	19200	567	398	1473	1480	1476	26
10:47:15	30.5	19116	595	420	1481	1487	1484	29
10:47:30	30.5	19213	624	443	1490	1479	1484	28
10:47:45	30.5	19036	640	464	1493	1477	1485	28
10:48:00	30.5	19118	662	484	1488	1477	1482	29
10:48:15	30.5	19167	683	505	1495	1480	1488	29
10:48:30	30.5	19126	717	525	1504	1467	1486	30
10:48:45	30.6	19212	732	547	1501	1468	1484	28
10:49:00	30.5	19222	762	566	1496	1459	1478	29
10:49:15	30.5	19164	795	584	1504	1461	1482	29
10:49:30	30.6	19072	816	602	1502	1464	1483	29
10:49:45	30.6	19200	838	619	1512	1465	1488	28
10:50:00	30.6	19141	859	636	1506	1463	1484	28
10:50:15	30.6	19160	876	651	1509	1469	1489	28
10:50:30	30.6	19187	904	666	1515	1468	1492	30
10:50:45	30.6	19243	917	679	1517	1502	1510	28
10:51:00	30.6	19215	939	692	1534	1518	1526	29
10:51:15	30.6	18994	947	703	1533	1508	1520	29
10:51:30	30.6	19214	947	713	1535	1492	1514	29
10:51:45	30.6	19284	954	723	1535	1491	1513	30
10:52:00	30.7	19252	962	732	1541	1492	1516	26
10:52:15	30.7	19314	963	744	1541	1497	1519	30
10:52:30	30.7	19221	993	753	1540	1501	1520	31
10:52:45	30.7	19304	1010	763	1537	1497	1517	29
10:53:00	30.7	19159	1024	772	1542	1494	1518	29

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### ***Fire Test Data - continued***

10:53:15	30.8	19225	1037	781	1540	1504	1522	30
10:53:30	30.8	19238	1040	793	1535	1518	1526	30
10:53:45	30.8	19405	1046	802	1548	1523	1536	29
10:54:00	30.9	19418	1058	811	1547	1523	1535	29
10:54:15	30.9	19542	1065	821	1551	1519	1535	30
10:54:30	30.9	19480	1076	829	1550	1528	1539	29
10:54:45	31.0	19459	1090	838	1555	1531	1543	30
10:55:00	31.0	19745	1103	847	1552	1538	1545	29
10:55:15	31.1	19491	1112	855	1552	1545	1548	30
10:55:30	31.1	19553	1121	863	1560	1546	1553	29
10:55:45	31.1	20060	1129	870	1560	1542	1551	31
10:56:00	31.2	19944	1134	878	1562	1535	1548	29
10:56:15	31.2	19825	1144	886	1563	1537	1550	32
10:56:30	31.2	20056	1150	895	1571	1536	1554	31
10:56:45	31.3	20053	1157	901	1571	1539	1555	30
10:57:00	31.3	20097	1165	908	1572	1545	1558	32
10:57:15	31.4	20336	1169	915	1577	1552	1564	30
10:57:30	31.4	20212	1172	921	1573	1554	1564	30
10:57:45	31.4	19738	1182	929	1576	1551	1564	29
10:58:00	31.4	20127	1185	935	1580	1551	1566	32
10:58:15	31.5	20439	1195	941	1583	1557	1570	31
10:58:30	31.5	19794	1199	947	1582	1558	1570	30
10:58:45	31.4	20212	1207	953	1585	1552	1568	31
10:59:00	31.5	20123	1208	959	1590	1554	1572	29
10:59:15	31.5	19911	1244	966	1584	1558	1571	32
10:59:30	31.6	20520	1228	974	1558	1634	1596	32
10:59:45	31.6	19860	1232	983	1548	1676	1612	29
11:00:00	31.5	20382	1236	990	1548	1692	1620	33
11:00:15	31.6	20250	1240	997	1547	1702	1624	30
11:00:30	31.6	20055	1240	1004	1556	1701	1628	32
11:00:45	31.6	20525	1248	1010	1546	1705	1626	33
11:01:00	31.6	19979	1252	1016	1545	1708	1626	31
11:01:15	31.6	20319	1257	1023	1547	1706	1626	29
11:01:30	31.7	20430	1256	1028	1559	1709	1634	30
11:01:45	31.6	20192	1270	1035	1544	1719	1632	33
11:02:00	31.6	20092	1269	1042	1546	1726	1636	31
11:02:15	31.5	20059	1265	1047	1547	1730	1638	31
11:02:30	31.5	20031	1264	1054	1551	1734	1642	31
11:02:45	31.6	19983	1265	1059	1550	1731	1640	30
11:03:00	31.6	20023	1264	1065	1552	1735	1644	32
11:03:15	31.6	20228	1268	1070	1558	1741	1650	32
11:03:30	31.6	20138	1267	1075	1581	1725	1653	32
11:03:45	31.7	20283	1252	1077	1603	1682	1642	31

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### ***Fire Test Data - continued***

11:04:00	31.7	20262	1244	1077	1609	1620	1614	31
11:04:15	31.6	20136	1247	1075	1623	1606	1614	30
11:04:30	31.6	20054	1254	1076	1619	1606	1612	32
11:04:45	31.6	20020	1250	1077	1614	1620	1617	30
11:05:00	31.7	20171	1253	1078	1623	1622	1622	32
11:05:15	31.7	20200	1249	1081	1617	1625	1621	31
11:05:30	31.6	20148	1245	1081	1617	1625	1621	32
11:05:45	31.7	20253	1243	1079	1611	1626	1618	31
11:06:00	31.6	20173	1259	1091	1590	1722	1656	31
11:06:15	31.7	20141	1269	1102	1598	1677	1638	32
11:06:30	31.7	20075	1265	1102	1617	1615	1616	31
11:06:45	31.7	20151	1263	1105	1626	1607	1616	32
11:07:00	31.7	20146	1262	1108	1621	1598	1610	33
11:07:15	31.7	20116	1263	1112	1620	1594	1607	31
11:07:30	31.7	20147	1268	1116	1635	1602	1618	30
11:07:45	31.7	20149	1288	1121	1636	1611	1624	32
11:08:00	31.7	20293	1289	1123	1635	1609	1622	32
11:08:15	31.7	20005	1267	1121	1628	1603	1616	29
11:08:30	31.8	20300	1264	1119	1634	1623	1628	32
11:08:45	31.8	20033	1259	1117	1644	1620	1632	32
11:09:00	31.7	20107	1257	1118	1625	1607	1616	32
11:09:15	31.7	20233	1257	1118	1630	1619	1624	33
11:09:30	31.7	20131	1261	1120	1617	1618	1618	31
11:09:45	31.7	20177	1263	1121	1632	1620	1626	32
11:10:00	31.7	20028	1257	1121	1638	1612	1625	32
11:10:15	31.7	20111	1261	1122	1626	1609	1618	32
11:10:30	31.7	20040	1265	1121	1621	1587	1604	31
11:10:45	31.8	19999	1261	1120	1609	1547	1578	30
11:11:00	31.7	20007	1263	1121	1603	1575	1589	32
11:11:15	31.7	20165	1252	1124	1610	1584	1597	30
11:11:30	31.8	20101	1255	1123	1604	1567	1586	33
11:11:45	31.7	19999	1256	1122	1600	1568	1584	31
11:12:00	31.7	20019	1253	1124	1593	1570	1582	30
11:12:15	31.7	20169	1249	1124	1596	1558	1577	32
11:12:30	31.7	20071	1264	1124	1608	1565	1586	31
11:12:45	31.7	20172	1267	1125	1598	1569	1584	31
11:13:00	31.8	20106	1259	1127	1595	1582	1588	31
11:13:15	31.7	20093	1259	1128	1600	1570	1585	31
11:13:30	31.7	20002	1258	1126	1595	1577	1586	31
11:13:45	31.8	20119	1252	1123	1602	1495	1548	31
11:14:00	31.7	20099	1253	1119	1599	1506	1552	31
11:14:15	31.8	19877	1247	1118	1597	1509	1553	30
11:14:30	31.8	19994	1246	1117	1595	1521	1558	30

## **Yarmouth Research and Technology**

### ***Fire Test Data - continued***

11:14:45	31.7	20091	1258	1112	1556	1383	1470	33
11:15:00	31.8	20022	1280	1111	1560	1355	1458	31
11:15:15	31.7	19997	1153	1098	1163	1028	1096	31
11:15:30	31.6	19946	1038	628	825	159	492	29
11:15:45	31.5	19753	910	423	514	182	348	30
11:16:00	31.5	19904	243	264	183	181	182	32
11:16:15	31.5	19776	206	226	175	158	166	30
11:16:30	31.4	19811	176	156	202	81	142	30
11:16:45	31.2	19432	165	129	168	100	134	29
11:17:00	31.1	19343	165	132	174	147	160	30
11:17:15	31.1	19359	131	115	87	71	79	29
11:17:30	31.1	19226	151	143	78	85	82	29
11:17:45	31.2	19347	153	156	80	83	82	29
11:18:00	31.1	19272	158	166	77	78	78	30
11:18:15	31.1	19273	157	175	74	74	74	30
11:18:30	31.2	19308	122	146	98	67	82	29
11:18:45	31.1	19323	74	90	52	39	46	30
11:19:00	31.1	19226	91	95	51	49	50	29
11:19:15	31.1	19272	102	107	53	61	57	30
11:19:30	31.2	19221	105	112	57	72	64	29
11:19:45	31.1	19384	107	115	59	81	70	29
11:20:00	31.1	19325	107	116	62	76	69	29
11:20:15	31.1	19246	108	117	64	78	71	29
11:20:30	31.1	19213	107	118	68	77	72	29
11:20:45	31.2	19195	106	118	67	76	72	28
11:21:00	31.1	19259	105	118	68	72	70	29
11:21:15	31.1	19216	105	117	67	72	70	29
11:21:30	31.2	19200	104	117	67	70	68	27
11:21:45	31.2	19244	103	116	66	67	66	27
11:22:00	31.2	19324	103	115	65	67	66	29
11:22:15	31.2	19222	103	115	64	66	65	28
11:22:30	31.2	19341	103	114	64	65	64	29
11:22:45	31.2	19246	103	114	64	65	64	29
11:23:00	31.1	19134	103	114	64	64	64	29
11:23:15	31.2	19156	103	113	63	63	63	28
11:23:30	31.2	19141	103	113	63	63	63	28
11:23:45	31.1	19147	102	112	63	64	64	29
11:24:00	31.2	19123	102	112	63	64	64	29
11:24:15	30.4	19119	102	111	63	64	64	29
11:24:30	30.4	19112	102	111	63	63	63	27
11:24:45	30.5	19108	102	110	63	63	63	28
11:25:00	30.4	19109	102	110	63	63	63	29

# **Yarmouth Research and Technology**

## **Leakage Summary for Burn and Cool Down Periods**

All pressure transducers and thermocouples are in calibration per YRT's QA program.

External leakage was measured electronically.

Total Water Volume Lost Over 40 Minute Burn and Cool Down:	24	mls
Calculated External Leakage During 40 Minute Duration:	24	mls
Average Leak Rate Over 40 Minute Duration:	0.6	ml/min
Allowable Leak Rate:	150	ml/min

<b>Was the Packing Leakage Below the Allowable?</b>	<b>Yes</b>
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## **Summary of Test Parameters During Burn and Cool Down Periods**

Amount of Time Pressure Dropped Below 15 psig:	0.0	minutes
Maximum Allowable Low Pressure Time:	2.0	minutes
Maximum Pressure During Burn/Cool Down:	31.8	psig
Average Pressure During Burn/Cool Down:	31.2	psig
Minimum Pressure During Burn/Cool Down:	30.4	psig

Amount of Time of Bonnet > 1200 deg.:	16.3	minutes
Minimum Allowable Time at Temperature:	15.0	minutes
Maximum Bonnet Temperature:	1289.0	deg. F
Average Bonnet Temperature:	862.6	deg. F
Lowest Bonnet Temperature:	74.0	deg. F

Amount of Time of Body > 1100 deg.:	8.8	minutes
Minimum Allowable Time at Temperature:	5.0	minutes
Maximum Body Temperature:	1128.0	deg. F
Average Body Temperature:	713.4	deg. F
Lowest Body Temperature:	90.0	deg. F

Maximum Body Flame Temperature During Burn:	1741.0	deg. F
Average Body Flame Temperature During Burn:	1560.3	deg. F

Maximum Bonnet Flame Temperature During Burn:	1644.0	deg. F
Average Bonnet Flame Temperature During Burn:	1560.4	deg. F

Average of Both Flame Temperatures During Burn:	1560.3	deg. F
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**Note** Body temperature measured at outer diameter of bonnet flange.

<b>Were Test Conditions Within Compliance?</b>	<b>Yes</b>
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# **Yarmouth Research and Technology**

## **Operational Test Information**

**Customer:** Flexitallic

**Date:** 3/19/2003

**Product Code:** Enviroflex 500 Packing

**Project Number:** PN202102

## **Operational Test Raw Data**

<b>Time</b>	<b>Pressure (psig)</b>	<b>Body Temp - F</b>
11:30:14	30	98
11:30:29	30	98
11:30:44	31	98
11:30:59	31	98
11:31:14	31	98
11:31:29	30	97
11:31:44	31	97
11:31:59	31	98
11:32:14	31	97
11:32:29	31	97
11:32:44	31	97
11:32:59	31	97
11:33:14	30	97
11:33:29	31	96
11:33:44	31	96
11:33:59	31	96
11:34:14	31	96
11:34:29	31	96
11:34:44	31	96
11:34:59	31	96
11:35:14	31	96

*Leakages were collected manually.*

Total External Leakage Collected Over 5 Minute Duration:	0.0	mls
Average Leak Rate Over 5 Minute Duration:	0.0	ml/min
Allowable Leak Rate:	150	ml/min

<b>Was the Packing Leakage Below the Allowable?</b>	<b>Yes</b>
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## **Split Ring Flexitallic Enviroflex 500 – Installation Instructions**

1. Please refer to the attached diagram while following the instructions. Determine the size of the bushing/spacer (HC) required and install in the bottom of the stuffing box. If used, fit the packing washer (HB). The overall packing height is 5 ½ times the packing cross section.

Fit the rings in the following order;

- a) **Braided footer ring.** This may be tamped to locate it in the bottom of the stuffing box.
- b) **Two piece moulded graphite seal.** Form the two sectioned halves of the moulded graphite ring system around the valve stem and carefully introduce, by hand, into the throat of the stuffing box. Care should be taken to make sure that the moulded graphite components are fitted in the same orientation as packaged. This will ensure correct alignment of the cut surfaces. Gentle tamping may be employed to locate the graphite sealing element but care must be taken not to damage the assembly as this may result in seal failure.
- c) **Braided header ring.**

Throughout the procedure care should be taken to ensure all scarfed/cut joints are offset to prevent the possible formation of direct leakage paths.

2. Fit the gland follower (HD), flange plate (HE) and studs (KQ). Using an appropriate bolt lubricant tighten the studs finger tight. At this stage the braided header ring should be fully enclosed in the stuffing box.
3. Note the height of the follower above the throat of the stuffing box and proceed to evenly compress the seal assembly by 20% of its original height.
4. Cycle the valve through a minimum of five complete actuator cycles, re-tightening the gland follower a little after each full cycle. The final overall compression should be 25% of the original pre-stressed packing height.

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Fig. 1 - Stuffing Box Arrangement

