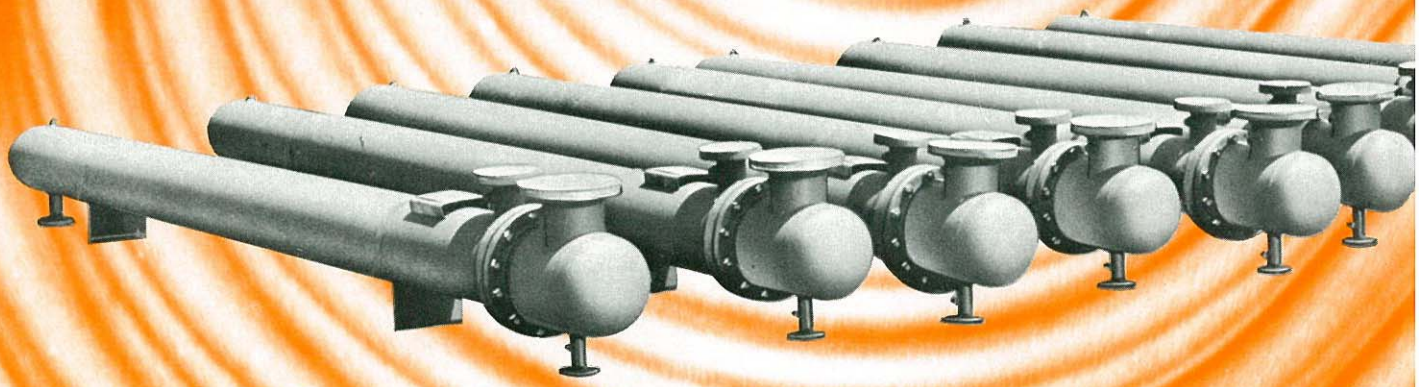
DATA BOOK NO. 966R

DOYLE & ROTH STANDARDIZED HEAT TRANSFER EQUIPMENT



NOTE: ALL D&R HEAT EXCHANGERS ARE DESIGNED AND FABRICATED TO MEET ASME AND TEMA CONSTRUCTION REQUIREMENTS

TYPE "H" REMOVABLE BUNDLE "U" TUBE

DOYLE & ROTH *Manufacturing* CO. INC

26 BROADWAY—SUITE 1275
New York, NY 10004
(212) 269-7840
Telex No. 882094

DOYLE & ROTH MANUFACTURING COMPANY inc.

STANDARD HEAT TRANSFER EQUIPMENT

Since 1932

D&R Type "H" heat exchangers are of the shell and U-tube, removable bundle design. They are the most economical of the tubular exchangers; from the standpoint of first cost, stocking of spare tube bundles and replacement of tube bundles.

Cost requires that shell and U-tube exchangers be considered first where high temperature and thermal expansion differentials between the tube wall and shell is involved. They should also be a first consideration when a removable bundle is desired to facilitate cleaning of the shell side.

Since the units are pre-engineered, materials are purchased to rigid specifications and assembled into stock components. This inventory of components enables D&R to provide you with a wide selection of exchangers, constructed in a variety of materials with substantial savings in Engineering . . . First Cost and the added premium . . . Rapid Delivery.

MARK OF DISTINCTION

TABLE OF CONTENTS

It's so easy to SELECT A UNIT

For convenience of application we have developed several standard designs of the type H exchanger and have assembled the details in this catalog.

HEAT EXCHANGERS:

D & R Model "LL" for fluid to fluid service

D & R Model "LLS" for steam to fluid service with the steam condensing on the shell side

D & R Model "LST" for steam to fluid service with the steam condensing on the tube side

Model numbers of D & R exchangers can be determined easily by assembling a few pertinent factors. The result will generally describe the unit and simplify identification.

Example: D & R Model LLS 105U4-8H reading from L to R describes a fluid heater with steam on the shell side and fluid on the tube side. The unit consists of a 10¾" shell, ⅝" O.D. U-tubes, 4 pass tube side with a nominal tube bundle length of 8'-0" for horizontal installation.

This is determined as follows:

1	2	3	4	5	6
LLS	**10**	**5U**	**4**	**8**	**H**

1. Model **"LLS"** (from the general categories outlined above)
2. Nominal shell size (10¾" O.D.) — **10**
3. U-tube diameter in eighths of an inch — **5U** equals ⅝" O.D. U-tube
4. Tube side pass arrangement — **4**
5. Nominal bundle length in feet — **8**
6. Horizontal installation — **H**

EXAMPLE PROBLEM:

Select a horizontal liquid to liquid heat exchanger with approximately 200 sq. ft. surface. Nickel tube side with ¾" O.D. x 16 BWG tubes, four tube side passes with a maximum overall length of 18'-0".

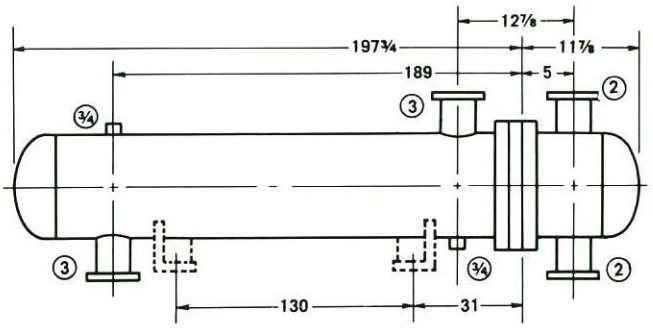
Our general selection in this instance will be a Model "LL" for the liquid to liquid service specified. The tube pass arrangement has been predetermined (4) as well as the tube size, ¾" O.D. x 16 BWG, tube designation group 6. From the table of contents (pg. 1) under Dimensional Standards and Surface Areas we find that Model "LL" exchangers four tube passes are detailed on pages 6, 7. Page 6 covers Dimensional data for four pass tube side arrangements, triangular tube pitch. Group 6 tube size (pg. 7) in the column entitled D&R Standard Model "LL" for Group 6 (the predetermined tube size), find that under Nominal Bundle length of 16'-0" (the specification calls for 18'-0" maximum overall length) the listed surface area nearest the 200 sq. ft. specified has a 10¾" shell and provides 209 sq. ft., a satisfactory selection.

You now have sufficient information for a complete model designation:

Model	**"LL"**
Nom. shell size	**10**
U-tube size	**6U**
Pass Arrangement (tube side)	**4**
Nominal Bundle length, 16'-0"	**16**
Horizontal Installation	**H**

The figures above (in bold type) form a complete D&R Model designation.

D&R Model "LL" 106U4-16H



Dimensions in Inches

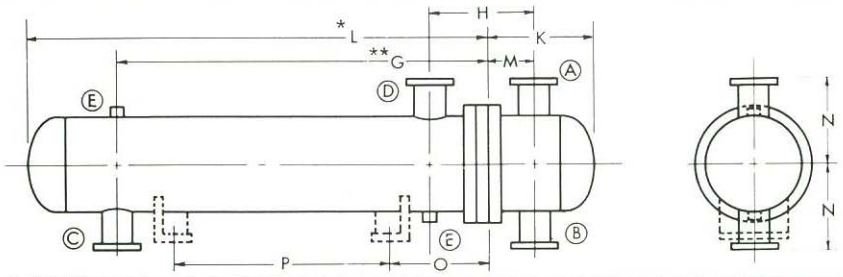
Dimensional data covering this unit is taken from page 6. Materials of Construction section on page 14 Selection IV (a) will provide complete material specifications.

Standard shell supports are described on page 13.

DIMENSIONAL STANDARDS

STANDARD MODEL "LL" — GROUPS 5, 6 & 8

"LL" HEAT EXCHANGER HORIZONTAL LIQUID TUBE SIDE — TWO PASS LIQUID SHELL SIDE — BAFFLED



Shell O. D. (in Inches)	DIMENSIONS (in Inches)						NOZZLES & FITTINGS (in Inches)				
	G	H	K	L	M	N	A	B	C	D	E
6 5/8	2	11 7/8	10 3/8	4 1/4	5	8 5/16	2	2	2	2	3/4
8 5/8	2	12 7/8	11 1/2	4 3/4	5	9 5/16	3	3	3	3	3/4
10 3/4	3	12 7/8	12 1/2	5 3/4	5	10 3/8	3	3	3	3	3/4
12 3/4	4	15	14 1/2	6 3/8	6	11 3/8	4	4	4	4	3/4
14	5	18	18 5/8	6 3/4	8	12	6	6	6	6	3/4
16	5	18 1/8	19 1/8	7 3/8	8	13	6	6	6	6	3/4
18	5	19 1/4	21 5/8	9	9	14	6	6	6	6	3/4
20	5 1/2	21 3/8	22 1/8	9 5/8	9	15	6	6	8	8	3/4
22	5 1/2	23 1/2	26 5/8	10 1/4	11	16	8	8	8	8	3/4
24	5 1/2	23 1/2	27 1/8	10 3/4	11	17	8	8	8	8	3/4
26	5 1/2	24 1/2	27 5/8	11 1/4	11	18	8	8	8	8	1
28	5 1/2	24 5/8	28 1/8	11 7/8	11	19	8	8	8	8	1
30	7	28 3/4	32 3/4	12 1/2	13	20	10	10	10	10	1
32	7	29 7/8	34 1/4	13 1/8	14	21	10	10	10	10	1
34	9	32	34 3/4	13 3/4	14	22	10	10	12	12	1
36	9	34 1/8	39 3/8	14 3/8	16	23	12	12	12	12	1
38	10	35 1/8	39 7/8	14 7/8	16	24	12	12	14	14	1
40	10	36 1/4	42 3/8	15 1/2	17	25	14	14	14	14	1
42	10	36 3/8	43	16 1/8	17	26	14	14	14	14	1

*Dimension equal to nominal bundle length plus dimension "L"

**Dimension equal to nominal bundle length minus dimension "G"

For Physical Dimensions of Shell Supports and Dimensions "O & P" See Standard Support Drawing (Page 13).

D & R STANDARD MODEL "LL"-GROUP 5-TWO PASS TUBE SIDE, 5/8" O.D. TUBES 13/16" △ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL65U2	6 5/8	13	16	21	25	29	33	38	42	46	50	59	67	76
LL85U2	8 5/8	29	35	45	54	64	73	83	92	102	111	130	149	168
LL105U2	10 3/4	50	60	77	93	109	126	142	159	175	191	224	257	289
LL125U2	12 3/4	75	90	115	139	164	188	213	237	262	286	335	384	434
LL145U2	14	93	110	141	171	201	232	262	292	323	353	414	475	536
LL165U2	16	131	151	194	237	279	322	365	408	451	494	579	665	751
LL185U2	18	169	188	243	298	354	409	464	520	575	630	742	824	963
LL205U2	20	212	228	298	367	436	506	575	646	715	784	923	1062	1200
LL225U2	22	263	281	367	453	539	626	712	798	884	970	1142	1314	1486
LL245U2	24	317	334	438	542	646	749	853	957	1061	1164	1372	1580	1787

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL265U2	26	381	628	752	877	1002	1126	1251	1376	1624	1874	2124
LL285U2	28	446	731	877	1023	1169	1315	1461	1607	1898	2190	2482
LL305U2	30	518	830	1000	1169	1339	1508	1678	1847	2186	2525	2864
LL325U2	32	595	948	1143	1337	1532	1727	1921	2116	2505	2895	3284
LL345U2	34	680	1077	1299	1522	1744	1967	2189	2412	2857	3302	3747
LL365U2	36	774	1199	1452	1705	1958	2212	2465	2718	3225	3731	4238
LL385U2	38	864	1328	1610	1893	2176	2459	2741	3024	3589	4155	4720
LL405U2	40	959	1441	1755	2069	2382	2696	3010	3324	3951	4579	5206
LL425U2	42	1062	1557	1904	2252	2599	2946	3294	3641	4336	5031	5726

DIMENSIONAL STANDARDS

STANDARD MODEL "LL" — GROUPS 5, 6 & 8

"LL" HEAT EXCHANGER HORIZONTAL LIQUID TUBE SIDE — TWO PASS LIQUID SHELL SIDE — BAFFLED

D & R STANDARD MODEL "LL"-GROUP 6-TWO PASS TUBE SIDE, 3/4" O.D. TUBES 15/16" △ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL66U2	6 5/8	11	17	21	25	30	34	38	43	47	51	60	68	77
LL86U2	8 5/8	20	29	37	45	53	61	69	76	84	92	108	123	139
LL106U2	10 3/4	36	52	66	80	94	109	123	137	151	166	194	223	251
LL126U2	12 3/4	54	78	99	120	141	163	184	205	226	247	290	332	374
LL146U2	14	69	98	125	152	179	206	233	260	288	315	369	423	477
LL166U2	16	93	128	164	200	236	272	308	344	380	416	488	560	632
LL186U2	18	125	167	215	264	314	363	412	461	510	559	657	755	853
LL206U2	20	157	203	264	326	397	459	521	582	644	705	829	952	1075
LL226U2	22	193	247	323	399	475	551	627	703	779	855	1007	1152	1311
LL246U2	24	234	294	386	478	570	662	754	846	938	1030	1214	1398	1582

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL266U2	26	282	586	696	806	917	1028	1139	1249	1471	1692	1913
LL286U2	28	331	659	781	903	1025	1147	1269	1381	1625	1868	2112
LL306U2	30	386	755	906	1057	1208	1359	1510	1661	1963	2265	2567
LL326U2	32	443	848	1022	1196	1370	1544	1718	1892	2240	2588	2936
LL346U2	34	503	956	1154	1352	1550	1748	1946	2144	2540	2936	3332
LL366U2	36	572	1062	1287	1512	1737	1962	2187	2412	2862	3312	3762
LL386U2	38	643	1168	1420	1672	1924	2176	2428	2680	3184	3688	4192
LL406U2	40	717	1293	1574	1855	2136	2417	2698	2979	3541	4103	4665
LL426U2	42	792	1418	1729	2040	2351	2662	2973	3284	3906	4528	5150

D & R STANDARD MODEL "LL"-GROUP 8-TWO PASS TUBE SIDE, 1" O.D. TUBES 1-1/4" △ PITCH

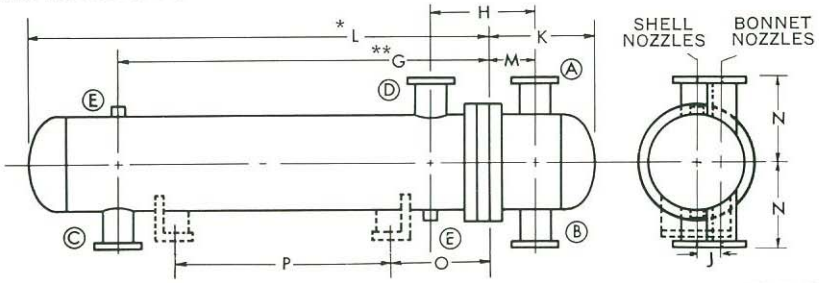
Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL68U2	6 5/8	5	10	13	15	18	21	23	26	28	31	36	42	47
LL88U2	8 5/8	11	22	28	33	39	45	51	57	62	68	80	91	103
LL108U2	10 3/4	20	39	49	60	70	81	91	102	112	122	143	164	185
LL128U2	12 3/4	30	56	72	88	104	119	135	151	166	182	213	245	276
LL148U2	14	38	72	92	112	132	152	171	191	211	231	271	311	351
LL168U2	16	51	93	120	147	174	200	227	254	280	307	360	414	467
LL188U2	18	69	126	162	199	235	272	308	344	380	416	488	560	633
LL208U2	20	84	149	193	237	281	325	369	413	457	501	589	677	765
LL228U2	22	106	181	236	292	347	403	458	514	569	625	736	847	958
LL248U2	24	129	218	286	353	421	489	556	624	691	759	894	1029	1164

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL268U2	26	155	416	497	578	659	740	821	903	1065	1237	1400
LL288U2	28	185	485	582	679	776	873	970	1067	1260	1454	1648
LL308U2	30	212	553	664	775	886	997	1108	1219	1441	1663	1885
LL328U2	32	242	617	744	871	997	1124	1251	1377	1631	1884	2138
LL348U2	34	280	721	868	1014	1161	1307	1454	1600	1894	2187	2480
LL368U2	36	315	793	958	1123	1288	1452	1617	1782	2112	2442	2772
LL388U2	38	355	874	1060	1246	1432	1617	1803	1989	2361	2733	3105
LL408U2	40	394	964	1171	1377	1583	1790	1996	2202	2615	3027	3440
LL428U2	42	437	1043	1272	1500	1729	1958	2187	2416	2873	3310	3788

DIMENSIONAL STANDARDS

STANDARD MODEL "LL" — GROUPS 5, 6 & 8

"LL" HEAT EXCHANGER HORIZONTAL LIQUID TUBE SIDE — FOUR PASS LIQUID SHELL SIDE — BAFFLED



Shell O. D. (in Inches)	DIMENSIONS (in Inches)							NOZZLES & FITTINGS (in Inches)				
	G	H	J	K	L	M	N	A	B	C	D	E
6⅝	2	10⅞	1½	8⅞	4¼	4	8 5/16	1	1	2	2	¾
8⅝	2	12⅞	2	10⅞	4¾	5	9 5/16	2	2	3	3	¾
10¾	3	12⅞	2	11⅞	5¾	5	10⅜	2	2	3	3	¾
12¾	4	14	2½	13	6⅜	5	11⅜	3	3	4	4	¾
14	5	16	3	14⅞	6¾	6	12	4	4	6	6	¾
16	5	16⅛	3	15⅜	7⅜	6	13	4	4	6	6	¾
18	5	17¼	3	17⅞	9	7	14	4	4	6	6	¾
20	5½	19⅜	3	18⅜	9⅝	7	15	4	4	8	8	¾
22	5½	21½	4	22⅝	10¼	9	16	6	6	8	8	¾
24	5½	21½	4	23⅛	10¾	9	17	6	6	8	8	¾
26	5½	22½	4½	23⅝	11¼	9	18	6	6	8	8	1
28	5½	22⅝	4½	24⅛	11⅞	9	19	6	6	8	8	1
30	7	26¾	5½	28⅝	12½	11	20	8	8	10	10	1
32	7	26⅞	5½	29⅛	13⅛	11	21	8	8	10	10	1
34	9	30	5½	30⅝	13¾	12	22	8	8	12	12	1
36	9	32⅛	6½	35¼	14⅜	14	23	10	10	12	12	1
38	10	33⅛	6½	35¾	14⅞	14	24	10	10	14	14	1
40	10	35¼	7½	40¼	15½	16	25	12	12	14	14	1
42	10	35⅜	7½	40⅞	16⅛	16	26	12	12	14	14	1

*Dimension equal to nominal bundle length plus dimension "L"

**Dimension equal to nominal bundle length minus dimension "G"

For Physical Dimensions of Shell Supports and Dimensions "O & P" See Standard Support Drawing (Page 13).

D & R STANDARD MODEL "LL"-GROUP 5-FOUR PASS TUBE SIDE, 5/8" O.D. TUBES 13/16" △ PITCH

No. Model	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL65U4	6⅝	14	18	22	27	31	36	40	45	50	54	63	73	82
LL85U4	8⅝	28	34	43	53	62	71	80	89	98	108	126	144	162
LL105U4	10¾	46	56	71	86	101	116	131	146	161	176	206	236	267
LL125U4	12¾	70	82	105	128	150	173	196	219	242	265	311	357	402
LL145U4	14	90	104	133	163	192	222	251	280	310	339	398	457	516
LL165U4	16	124	142	183	224	264	305	345	386	427	467	548	630	711
LL185U4	18	164	182	235	289	343	397	450	504	558	611	719	826	934
LL205U4	20	204	225	291	358	425	491	558	625	692	758	892	1025	1158
LL225U4	22	256	273	357	441	525	608	692	776	860	944	1111	1279	1446
LL245U4	24	310	318	419	521	622	723	825	926	1028	1129	1332	1535	1737

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL265U4	26	366	601	721	841	961	1081	1200	1320	1560	1799	2039
LL285U4	28	438	718	861	1004	1147	1291	1434	1577	1864	2151	2437
LL305U4	30	506	823	989	1155	1320	1486	1651	1817	2148	2479	2811
LL325U4	32	588	935	1128	1320	1512	1705	1897	2090	2474	2859	3244
LL345U4	34	666	1036	1254	1472	1690	1908	2126	2344	2779	3215	3651
LL365U4	36	756	1168	1415	1662	1909	2157	2404	2651	3146	3641	4135
LL385U4	38	850	1283	1561	1839	2117	2395	2674	2952	3508	4064	4620
LL405U4	40	950	1426	1737	2048	2359	2670	2980	3291	3913	4534	5156
LL425U4	42	1052	1539	1883	2227	2571	2916	3260	3604	4292	4981	5669

DIMENSIONAL STANDARDS

STANDARD MODEL "LL" — GROUPS 5, 6 & 8

"LL"-HEAT EXCHANGER HORIZONTAL LIQUID TUBE SIDE — FOUR PASS LIQUID SHELL SIDE — BAFFLED

D & R STANDARD MODEL "LL"-GROUP 6-FOUR PASS TUBE SIDE, 3/4" O.D. TUBES 15/16" △ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL66U4	6 5/8	8	12	15	18	22	25	28	31	34	37	43	49	56
LL86U4	8 5/8	20	30	37	46	54	61	69	77	85	93	109	125	140
LL106U4	10 3/4	34	50	63	76	90	103	116	130	143	156	183	209	236
LL126U4	12 3/4	50	72	92	111	131	151	170	190	209	229	268	307	347
LL146U4	14	68	94	121	148	174	201	228	254	281	308	361	415	468
LL166U4	16	90	124	159	194	230	265	300	336	371	406	477	548	618
LL186U4	18	120	161	208	255	302	349	396	443	490	530	624	718	812
LL206U4	20	152	201	261	320	380	439	499	558	618	677	797	916	1035
LL226U4	22	190	243	318	394	470	546	622	698	774	850	1002	1154	1306
LL246U4	24	232	286	377	468	560	650	741	832	924	1015	1197	1379	1561

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL266U4	26	266	535	640	745	850	955	1060	1165	1370	1575	1785
LL286U4	28	316	629	753	877	1001	1125	1249	1373	1621	1869	2117
LL306U4	30	370	719	864	1009	1154	1299	1444	1589	1879	2169	2459
LL326U4	32	430	810	980	1150	1320	1485	1655	1825	2160	2495	2830
LL346U4	34	496	937	1131	1325	1519	1713	1907	2101	2489	2877	3265
LL366U4	36	556	1029	1247	1465	1683	1901	2119	2337	2773	3209	3645
LL386U4	38	624	1144	1388	1632	1876	2120	2364	2608	3096	3584	4072
LL406U4	40	686	1227	1496	1765	2034	2303	2572	2841	3379	3917	4455
LL426U4	42	768	1369	1670	1971	2272	2573	2874	3175	3777	4379	4981

D & R STANDARD MODEL "LL"-GROUP 8- FOUR PASS TUBE SIDE, 1" O.D. TUBES 1-1/4" △ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL68U4	6 5/8	—	—	—	—	—	—	—	—	—	—	—	—	—
LL88U4	8 5/8	10	20	25	31	36	41	46	51	57	62	72	83	93
LL108U4	10 3/4	18	35	45	54	63	73	82	92	101	110	129	148	167
LL128U4	12 3/4	24	46	59	71	84	97	109	122	134	147	172	197	222
LL148U4	14	32	61	78	94	111	128	145	161	178	195	228	262	295
LL168U4	16	46	85	109	133	157	181	206	230	254	278	326	374	432
LL188U4	18	64	117	151	184	217	251	284	318	352	385	452	519	586
LL208U4	20	82	145	188	231	274	317	360	402	445	488	574	660	746
LL228U4	22	102	178	232	285	339	392	445	499	552	606	712	819	926
LL248U4	24	124	211	276	341	405	470	535	600	665	730	860	990	1120

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL268U4	26	146	393	469	545	622	698	775	851	1004	1157	1310
LL288U4	28	176	469	561	653	746	837	930	1022	1206	1390	1574
LL308U4	30	204	533	640	746	853	960	1067	1174	1387	1601	1815
LL328U4	32	234	598	721	843	966	1088	1211	1333	1578	1823	2069
LL348U4	34	268	680	820	961	1101	1241	1382	1522	1803	2083	2364
LL368U4	36	312	775	938	1101	1264	1428	1591	1755	2082	2408	2735
LL388U4	38	348	858	1040	1222	1404	1586	1769	1951	2315	2680	3044
LL408U4	40	388	934	1138	1341	1544	1747	1950	2153	2560	2966	3372
LL428U4	42	428	1006	1230	1454	1678	1902	2126	2350	2798	3247	3695

SURFACE AREAS — SQUARE PITCH*

STANDARD MODEL "LL" — GROUPS 6 & 8 —

D & R STANDARD MODEL "LL"-GROUP 6-TWO PASS TUBE SIDE, 3/4" O.D. TUBES 1" □ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL66U2	6⅝	6	9	12	14	16	19	21	23	26	28	33	37	42
LL86U2	8⅝	16	24	30	36	43	49	55	62	68	74	87	99	112
LL106U2	10¾	27	40	51	61	72	82	93	104	114	125	146	167	188
LL126U2	12¾	40	58	73	89	105	120	136	152	167	183	215	246	277
LL146U2	14	52	72	93	113	133	154	174	195	215	236	276	317	358
LL166U2	16	74	102	131	159	189	218	245	276	306	335	393	451	506
LL186U2	18	96	128	166	204	241	279	317	354	392	430	506	581	655
LL206U2	20	120	159	206	253	300	347	394	441	488	536	630	724	818
LL226U2	22	147	188	246	303	361	419	476	534	592	650	765	880	996
LL246U2	24	180	223	293	364	435	505	576	647	717	789	929	1071	1212

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL266U2	26	214	430	514	598	682	766	850	934	1102	1270	1438
LL286U2	28	254	500	600	700	799	899	999	1097	1297	1496	1696
LL306U2	30	295	578	694	809	925	1041	1157	1273	1504	1736	1967
LL326U2	32	338	645	778	911	1044	1176	1309	1442	1707	1973	2238
LL346U2	34	386	733	884	1036	1187	1339	1490	1642	1945	2248	2551
LL366U2	36	438	819	989	1159	1329	1499	1669	1839	2179	2519	2859
LL386U2	38	492	892	1085	1278	1472	1665	1858	2051	2438	2826	3213
LL406U2	40	544	977	1191	1404	1618	1831	2045	2258	2686	3113	3540
LL426U2	42	604	1062	1299	1536	1773	2010	2248	2485	2959	3433	3907

D & R STANDARD MODEL "LL"-GROUP 8-TWO PASS TUBE SIDE, 1" O.D. TUBES 1¼" □ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL68U2	6⅝	4	8	10	12	14	16	19	21	23	25	29	33	37
LL88U2	8⅝	10	19	25	30	35	40	46	51	56	61	72	82	93
LL108U2	10¾	16	32	40	48	57	65	73	82	90	99	115	132	149
LL128U2	12¾	25	48	61	74	87	100	113	126	139	153	179	205	231
LL148U2	14	32	59	75	91	107	122	138	154	170	185	217	249	280
LL168U2	16	42	78	100	122	144	166	188	210	232	254	298	342	386
LL188U2	18	57	103	133	163	193	223	253	282	312	342	402	461	521
LL208U2	20	74	130	169	208	247	285	324	363	401	440	517	595	673
LL228U2	22	93	158	207	255	304	353	402	450	499	548	645	742	840
LL248U2	24	112	184	243	301	360	418	477	536	594	653	770	888	1005

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'-6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL268U2	26	132	359	428	498	567	636	705	774	912	1050	1189
LL288U2	28	158	422	505	588	671	753	836	919	1084	1250	1415
LL308U2	30	184	479	575	672	768	864	961	1057	1250	1442	1635
LL328U2	32	210	543	653	763	873	983	1092	1202	1423	1643	1863
LL348U2	34	242	603	730	857	983	1110	1237	1364	1617	1871	2124
LL368U2	36	270	678	820	961	1102	1244	1385	1527	1809	2092	2375
LL388U2	38	309	761	923	1085	1247	1408	1570	1732	2055	2379	2703
LL408U2	40	344	828	1008	1188	1368	1549	1729	1909	2269	2629	2990
LL428U2	42	379	906	1105	1303	1501	1700	1898	2097	2494	2890	3287

*FOR TRIANGULAR PITCH SEE PAGE 5

SURFACE AREAS — SQUARE PITCH*

STANDARD MODEL "LL" — GROUPS 6 & 8 —

D & R STANDARD MODEL "LL"-GROUP 6-FOUR PASS TUBE SIDE, 3/4" O.D. TUBES 1" □ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL66U4	6⅝	6	9	11	14	16	18	21	23	25	28	33	37	42
LL86U4	8⅝	14	21	26	32	37	43	48	54	59	65	76	87	98
LL106U4	10¾	22	32	41	49	58	66	75	84	92	101	118	136	153
LL126U4	12¾	38	55	70	85	100	115	130	145	159	174	204	234	264
LL146U4	14	52	72	93	113	133	153	174	195	215	236	276	317	358
LL166U4	16	66	90	116	141	167	193	219	245	281	307	359	411	462
LL186U4	18	88	118	152	187	221	256	290	325	359	394	463	532	601
LL206U4	20	118	156	202	249	295	341	388	434	480	527	619	712	805
LL226U4	22	142	181	237	293	349	404	460	516	572	627	739	850	962
LL246U4	24	176	218	287	356	425	494	563	632	701	771	910	1048	1186

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL266U4	26	212	427	509	592	675	759	842	925	1092	1258	1425
LL286U4	28	250	491	590	688	786	884	982	1080	1277	1473	1669
LL306U4	30	290	567	681	795	909	1023	1137	1250	1478	1706	1934
LL326U4	32	332	633	764	894	1024	1155	1285	1415	1676	1937	2197
LL346U4	34	382	726	876	1026	1176	1326	1476	1626	1926	2226	2526
LL366U4	36	426	791	958	1125	1293	1460	1627	1794	2129	2463	2798
LL386U4	38	486	881	1072	1263	1453	1644	1835	2026	2407	2789	3171
LL406U4	40	536	965	1175	1386	1596	1807	2017	2228	2648	3069	3490
LL426U4	42	592	1040	1273	1505	1737	1970	2202	2435	2899	3364	3829

D & R STANDARD MODEL "LL"-GROUP 8-FOUR PASS TUBE SIDE, 1" O.D. TUBES 1¼" □ PITCH

Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH											
			4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	14'-0"	16'-0"	18'-0"
LL68U4	6⅝	—	—	—	—	—	—	—	—	—	—	—	—	—
LL88U4	8⅝	8	16	20	24	29	33	37	41	45	50	58	66	75
LL108U4	10¾	14	27	35	42	49	57	64	71	79	86	101	115	130
LL128U4	12¾	22	42	53	65	77	88	100	111	123	134	157	180	203
LL148U4	14	28	52	67	81	96	111	125	140	155	169	199	228	257
LL168U4	16	40	75	96	117	138	159	180	201	222	243	284	326	368
LL188U4	18	56	102	131	160	190	219	248	278	307	336	395	454	512
LL208U4	20	68	120	155	191	226	262	298	333	369	404	476	547	618
LL228U4	22	86	147	192	237	282	327	372	417	462	507	597	687	777
LL248U4	24	110	181	239	296	354	411	469	527	584	642	757	872	987

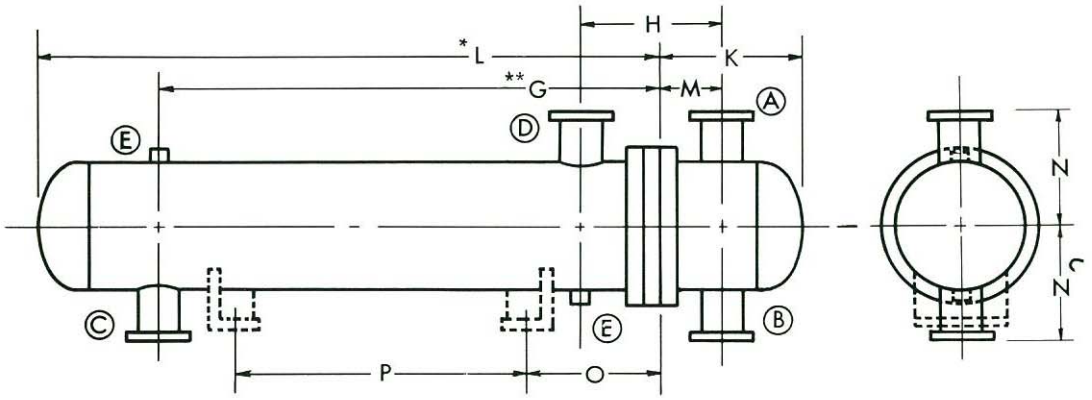
Model No.	Shell O. D. Inches	No. U Tubes	SQUARE FEET SURFACE FOR NOMINAL BUNDLE LENGTH									
			5'6"	6'-6"	7'-6"	8'-6"	9'-6"	10'-6"	11'-6"	13'-6"	15'-6"	17'-6"
LL268U4	26	132	359	428	498	567	636	705	774	912	1051	1189
LL288U4	28	154	410	491	572	652	733	814	894	1057	1218	1379
LL308U4	30	178	464	558	651	744	837	930	1024	1210	1396	1583
LL328U4	32	208	538	647	756	865	974	1083	1192	1410	1627	1845
LL348U4	34	236	587	711	834	958	1082	1205	1329	1576	1823	2070
LL368U4	36	268	675	815	956	1096	1236	1376	1517	1798	2078	2359
LL388U4	38	300	737	896	1053	1211	1368	1525	1682	1996	2310	2624
LL408U4	40	334	800	975	1149	1324	1499	1674	1849	2198	2548	2898
LL428U4	42	374	892	1087	1283	1479	1675	1871	2067	2458	2850	3242

*FOR TRIANGULAR PITCH SEE PAGE 7

DIMENSIONAL STANDARDS

STANDARD MODEL "LLS" HEAT EXCHANGER
GROUPS 5, 6 & 8

"LLS" HEATERS — HORIZONTAL
LIQUID TUBE SIDE — TWO PASS
CONDENSING MEDIUM SHELL SIDE — TUBE SUPPORTS



Shell O. D. (in Inches)	DIMENSIONS (in Inches)						NOZZLES & FITTINGS (in Inches)				
	†G	†H	K	†L	M	N	A	B	C	D	E
6⅝	TO MEET NOZZLE REQUIREMENTS	TO MEET NOZZLE REQUIREMENTS	10⅜	TO MEET NOZZLE REQUIREMENTS	5	8⅝16	2	2	TO MEET YOUR REQUIREMENTS	TO MEET YOUR REQUIREMENTS	¾
8⅝			11½		5	9⅝16	3	3			¾
10¾			12½		5	10⅜	3	3			¾
12¾			14½		6	11⅜	4	4			¾
14			18⅝		8	12	6	6			¾
16			19⅛		8	13	6	6			¾
18			21⅝		9	14	6	6			¾
20			22⅛		9	15	6	6			¾
22			26⅝		11	16	8	8			¾
24			27⅛		11	17	8	8			¾
26			27⅝		11	18	8	8			1
28			28⅛		11	19	8	8			1
30			32¾		13	20	10	10			1
32			34¼		14	21	10	10			1
34			34¾		14	22	10	10			1
36			39⅜		16	23	12	12			1
38			39⅞		16	24	12	12			1
40			42⅜		17	25	14	14			1
42			43		17	26	14	14			1

†For appproximate dimensions use dimensional table Standard Model "LL" on page 4

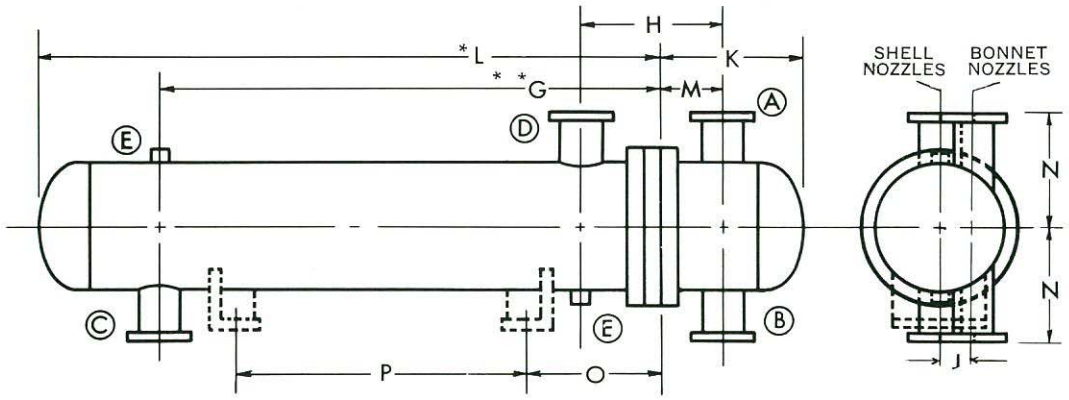
*Dimension equal to nominal bundle length plus dimension "L"
**Dimension equal to nominal bundle length minus dimension "G".

For Physical Dimensions of Shell Supports and Dimensions "O & P" See Standard Support Drawing (Page 13).

DIMENSIONAL STANDARDS

STANDARD MODEL "LLS" HEAT EXCHANGER
GROUPS 5, 6 & 8

"LLS" HEATERS — HORIZONTAL
LIQUID TUBE SIDE — FOUR PASS
CONDENSING MEDIUM SHELL SIDE — TUBE SUPPORTS



Shell O.D. (in Inches)	DIMENSIONS (in Inches)							NOZZLES & FITTINGS (in Inches)				
	†G	†H	J	K	†L	M	N	A	B	C	D	E
6⅝	TO MEET NOZZLE REQUIREMENTS	TO MEET NOZZLE REQUIREMENTS	1½	8⅞	TO MEET NOZZLE REQUIREMENTS	4	8⅝	1	1	TO MEET YOUR REQUIREMENTS	TO MEET YOUR REQUIREMENTS	¾
8⅝			2	10⅞		5	9⅝	2	2			¾
10¾			2	11⅞		5	10⅜	2	2			¾
12¾			2½	13		5	11⅜	3	3			¾
14			3	14⅞		6	12	4	4			¾
16			3	15⅜		6	13	4	4			¾
18			3	17⅞		7	14	4	4			¾
20			3	18⅜		7	15	4	4			¾
22			4	22⅜		9	16	6	6			¾
24			4	23⅛		9	17	6	6			¾
26			4½	23⅜		9	18	6	6			1
28			4½	24⅛		9	19	6	6			1
30			5½	28⅜		11	20	8	8			1
32			5½	29⅛		11	21	8	8			1
34			5½	30⅝		12	22	8	8			1
36			6½	35¼		14	23	10	10			1
38			6½	35¾		14	24	10	10			1
40			7½	40¼		16	25	12	12			1
42			7½	40⅞		16	26	12	12			1

†For approximate dimensions use dimensional table Standard Model "LL" on page 6

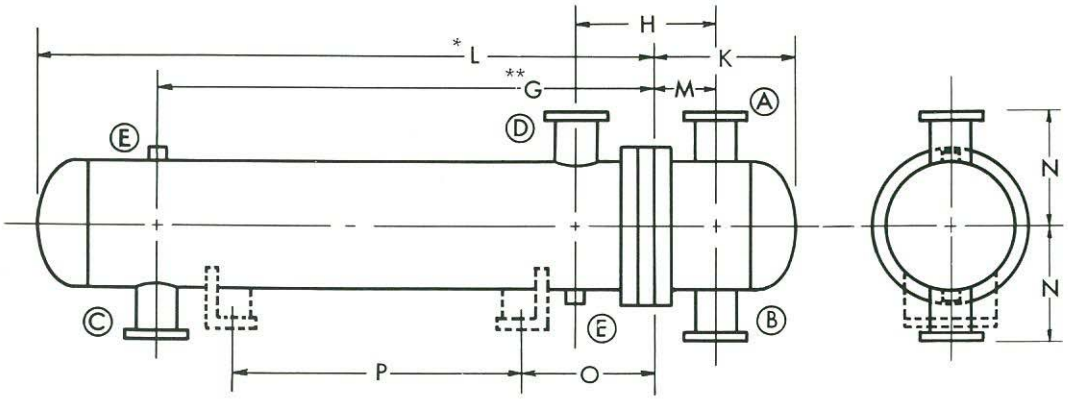
*Dimension equal to nominal bundle length plus dimension "L"
**Dimension equal to nominal bundle length minus dimension "G".
For Physical Dimensions of Shell Supports and Dimensions "O & P" See Standard Support Drawing (Page 13).

DIMENSIONAL STANDARDS

STANDARD MODEL "LST" HEAT EXCHANGER

GROUPS 5, 6 & 8

"LST" HEATERS — HORIZONTAL
LIQUID SHELLSIDE — BAFFLED
CONDENSING MEDIUM TUBE SIDE — 2 PASS



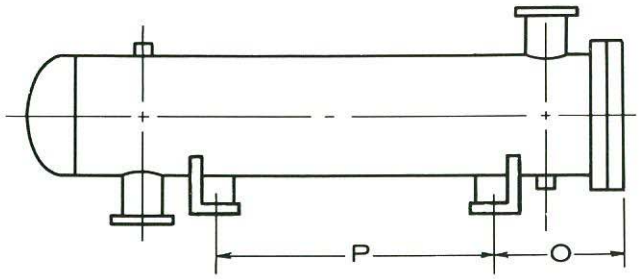
TWO PASS

Shell O. D. (in Inches)	DIMENSIONS (in Inches)						NOZZLES & FITTINGS (in Inches)				
	G	†H	†K	L	†M	N	A	B	C	D	E
6⅝	2	TO MEET NOZZLE REQUIREMENTS	TO MEET NOZZLE REQUIREMENTS	4¼	TO MEET YOUR REQUIREMENTS	8 5/16	TO MEET YOUR REQUIREMENTS	TO MEET YOUR REQUIREMENTS	2	2	¾
8⅝	2			4¾		9 5/16			3	3	¾
10¾	3			5¾		10⅜			3	3	¾
12¾	4			6⅜		11⅜			4	4	¾
14	5			6¾		12			6	6	¾
16	5			7⅜		13			6	6	¾
18	5			9		14			6	6	¾
20	5½			9⅝		15			8	8	¾
22	5½			10¼		16			8	8	¾
24	5½			10¾		17			8	8	¾
26	5½			11¼		18			8	8	1
28	5½			11⅞		19			8	8	1
30	7			12½		20			10	10	1
32	7			13⅛		21			10	10	1
34	9			13¾		22			12	12	1
36	9			14⅜		23			12	12	1
38	10			14⅞		24			14	14	1
40	10			15½		25			14	14	1
42	10			16⅛		26			14	14	1

†For approximate dimensions use dimensional table Standard Model "LL" on page 4

*Dimension equal to nominal bundle length plus dimension "L"
**Dimension equal to nominal bundle length minus dimension "G".
For physical dimensions of shell supports and dimensions "O" and "P" see standard support drawing (page 13).

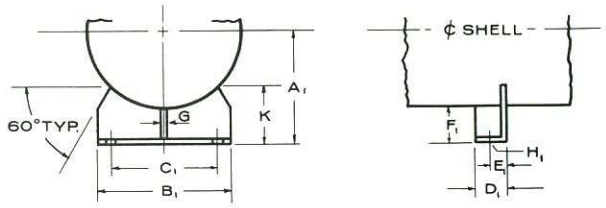
FABRICATED SHELL SUPPORTS FOR STANDARD D & R HEAT EXCHANGERS



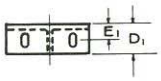
Shell O.D. Inches	Dimen.	DIMENSIONS O & P FOR NOMINAL BUNDLE LENGTH											
		4′	5′	6′	7′	8′	9′	10′	11′	12′	14′	16′	18′
6⅝ thru 10¾	O	12″	12″	18″	21″	2′-1″	2′-1″	2′-1″	2′-1″	2′-1″	2′-7″	2′-7″	2′-7″
	P	21″	2′-7″	2′-11″	3′-6″	3′-10″	4′-10″	5′-10″	6′-10″	7′-10″	8′-10″	10′-10″	12′-10″
12¾ thru 18	O	12″	12″	18″	2′-1″	2′-3″	2′-3″	2′-3″	2′-3″	2′-3″	2′-9″	2′-9″	2′-9″
	P	17″	2′-3″	2′-7″	2′-10″	3′-6″	4′-6″	5′-6″	6′-6″	7′-6″	8′-6″	10′-6″	12′-6″
18 thru 24	O	12″	12″	18″	2′-3″	2′-5″	2′-5″	2′-5″	2′-5″	2′-5″	2′-11″	2′-11″	2′-11″
	P	14″	24″	2′-5″	2′-6″	3′-2″	4′-2″	5′-2″	6′-2″	7′-2″	8′-2″	10′-2″	12′-2″

Shell O.D. Inches	Dimen.	DIMENSIONS O & P FOR NOMINAL BUNDLE LENGTH								
		5′-6″	6′-6″	7′-6	8′-6″	9′-6″	10′-6″	11′-6″	13′-6″	15′-6″	17′-6″
26 thru 32	O	12″	12″	2′-0″	2′-6″	2′-6″	2′-6″	2′-6″	2′-9″	2′-9″	2′-9″
	P	2′-6″	3′-3″	3′-2″	3′-6″	4′-6″	5′-6″	6′-6″	8′-0″	10′-0″	12′-0″
34 thru 42	O	12″	12″	2′-0″	3′-0″	3′-0″	3′-0″	3′-0″	3′-0″	3′-6″	3′-6″
	P	1′-11″	2′-9″	2′-7″	2′-6″	3′-6″	4′-6″	5′-6″	7′-6″	8′-6″	10′-6″

FOR SHELL SIZES 6⅝″ THRU 24″

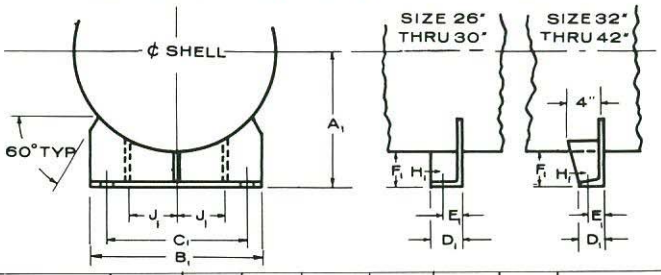


Shell Size Inches	A_1	B_1	C_1	D_1	E_1	F_1	$*H_1$
			(in Inches)				
6⅝	8 3/16	6	4	3½	2	4⅞	¾
8⅝	9 3/16	7	5	3½	2	4⅞	¾
10¾	10¼	9	7	3½	2	4⅞	¾
12¾	11¼	11	9	4	2½	4⅞	¾
14	11⅞	12	10	4	2½	4⅞	⅞
16	12⅞	14	12	4	2½	4⅞	⅞
18	13⅞	16	14	4	2½	4⅞	⅞
20	14⅞	17	15	4	2½	4⅞	⅞
22	15⅞	19	17	4	2½	4⅞	⅞
24	16⅞	21	19	4	2½	4⅞	⅞

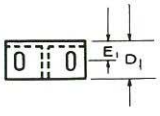


Note:
*Holes (2) in one support to be slotted with slots 1½″ to 1⅝″ long parallel to longitudinal axis of shell.

FOR SHELL SIZES 26″ THRU 42″



Nom. Shell Size Inches	A_1	B_1	C_1	D_1	E_1	F_1	$*H_1$	J_1
				(in Inches)				
26	17½	22	18	4	2½	4½	⅞	—
28	18½	24	20	4	2½	4½	⅞	—
30	19½	26	22	4	2½	4½	⅞	—
32	20½	28	24	4	2½	4½	⅞	7½
34	21½	29	25	4	2½	4½	⅞	7½
36	22½	27	23	3⅛	1¾	4½	⅞	7½
38	23½	28	24	3⅛	1¾	4½	⅞	7½
40	24½	29	25	3⅛	1¾	4½	⅞	7½
42	25½	30	26	3⅛	1¾	4½	⅞	7½



Note:
*Holes (2) in one support to be slotted with slots 1⅝″ long parallel to longitudinal axis of sheel.

MATERIALS OF CONSTRUCTION AND DESIGN CONDITIONS

D & R STANDARD MODELS LL, LLS & LST
GROUPS 5, 6 & 8

Selection I:
(a) All Steel construction.

Selection II:
(a) Steel shell side and Stainless Steel tube side (Type 304 or Type 316).
(b) Stainless Steel shell side (Type 304 or 316) and Steel tube side.

Selection III:
(a) Steel shell side and Monel tube side.
(b) Monel shell side and Steel tube side.

Selection IV:
(a) Steel shell side and Nickel tube side.
(b) Nickel shell side and Steel tube side.

Selection V:
(a) Steel construction with Copper Alloy tubes.
(a-1) Steel construction with Naval Brass tube sheet and Copper Alloy tubes.

Standard Design Conditions

Selection I:
Design pressure 150 p.s.i. @ 500°F shell and tube sides.

Selections II, III, IV & V:
Design pressure 75 p.s.i. @ 350°F shell and tube sides (300°F for Copper Alloy). Higher pressure and temperature ratings are available upon request.

CONSTRUCTION

All Selections are designed and constructed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code.

SHELL ASSEMBLY

ALL (a) SELECTIONS

Shell: Seamless Steel A-53B, rolled Steel A-285C (Above 26" O.D.).

Shell Cover: Steel A-285C semi-elliptical ASME head.

Shell Ring Flange: Steel A-285C, A-181CL60.

Nozzles: 150# Std. ANSI, R.F. S/O Steel A-105 flanges with Steel A-53B Pipe.

Fittings: 3000# F.S. half couplings A-105.

Supports: Steel A-36.

ALL (b) SELECTIONS

Shell: Type 304 Stainless Steel A-240/312, Type 316 Stainless Steel A-240/312, Monel B-127, or Nickel B-162.

Shell Cover: Semi-elliptical ASME head, same materials as shell.

Shell Ring Flange: Steel A-285C, A-181CL60 faced with same material as shell.

Nozzles: (a) For sizes 1" N.P.S. through 4" N.P.S.: 150# Std. ANSI L.J. A-105 flanges with stub ends (same materials as shell); (b) For sizes 6" N.P.S. and above: 150# Std. ANSI S/O Steel A-105 flanges, Stainless Steel, Monel or Nickel faced, with nozzle of same material as facing.

Fittings: 3000# half couplings, SA182.

Supports: Steel A-36, with saddles same material as shell.

MATERIALS OF CONSTRUCTION AND DESIGN CONDITIONS

TUBE BUNDLE ASSEMBLY

TUBE SHEET

Selection I (a):
Steel A-285C or 516-70.

Selection II (a) & (b):
Stainless Steel Type 304 A-240 or Type 316 A-240.

Selection III (a) & (b):
Monel B-127

Selection IV (a) & (b):
Nickel B-162

Selection V:
(a) Steel A-285C or 516-70.
(a-1) Naval Brass B-171.

TUBES

Selection 1 (a):
Steel A-214 and A-179, #16, #14, or #12 BWG.

Selection II (a) & (b):
Stainless Steel A-249 Type 304 or Type 316, average wall full finished annealed and pickled, #18 or #16 BWG.

Selection III (a) & (b):
Monel B-163 annealed, #18 or #16 BWG.

Selection IV (a) & (b):
Nickel B-163 annealed, #18 or #16 BWG.

Selection V (a) & (b).
Copper Alloy B-111.

BAFFLES, TUBE SUPPORTS, TIE RODS AND SPACERS

All Selections same material as shell.

BONNET ASSEMBLY

Selections II (a), III (a) & IV (a):

Cylinder: Type 304 Stainless Steel A-240, Type 316 Stainless Steel A-240, Monel B-127, or Nickel B-162.

Cover: Semi-elliptical ASME head same material as cylinder.

Ring Flange: Steel A-285C, A-181 faced with same material as cylinder.

Nozzles: (a) For sizes 1" N.P.S. through 4" N.P.S.: 150# Std. ANSI L.J., A-105 flanges with stub ends (same materials as cylinder); (b) For sizes 6" N.P.S. and above: 150# Std. ANSI S/O Steel A-105 flanges, Stainless Steel, Monel or Nickel faced, with nozzle of same material as facing.

Fittings: 3000# half couplings, same material as cylinder.

Selections 1 (a), II (b), III (b), IV (b), V (a), V (a-1):

Cylinder: Seamless Steel A-53B, rolled Steel A-285C (above 24" O.D.).

Cover: Steel A-285C Semi-elliptical ASME head.

Ring Flange: Steel A-285C, A-181.

Fittings: 3000# F.S. half couplings, A-105.

Miscellaneous All Selections: Gaskets: Compressed Asbestos; Bolting: Alloy A-193 B7 Full threaded studs with A-194 Class 2H heavy hex. nuts.

OTHER AVAILABLE DOYLE & ROTH STANDARD HEAT TRANSFER EQUIPMENT

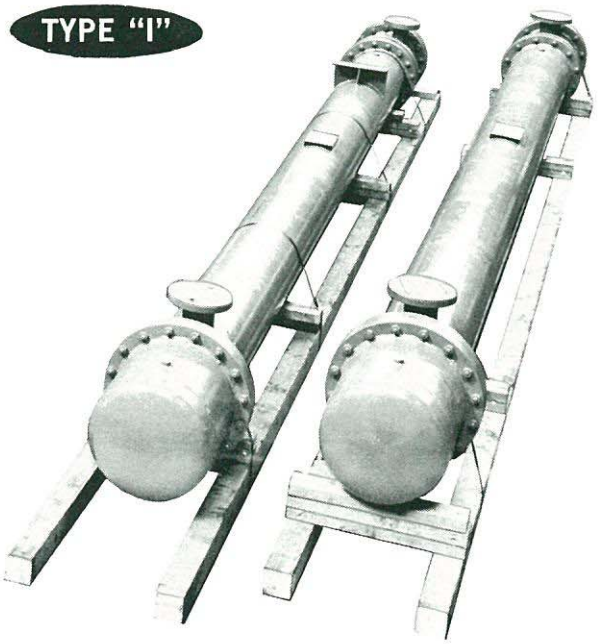
TYPE "F"

D & R Type "F" heat exchangers are of Fixed Tube Sheet design. This relatively inexpensive unit is the "Work Horse" of the industry and has received almost universal acceptance.

Since the shell is welded to the tube sheets eliminating gasketed or bolted joints on the shell side, the possibility of intermixing the shell and tube side fluids is only possible through tube failure. A full tube bundle and shell baffles, which are closely fitted to the shell and tubes, provide the optimum in surface area with a minimum of by-passing and maximum heat transfer.

Available upon request—D & R Cat. No. 174
20 pages of information . . . a "must" for your files.

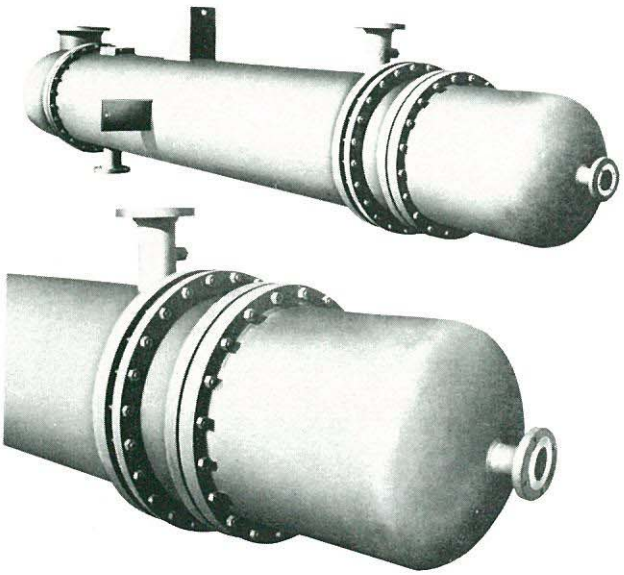
TYPE "I"



INTERNAL FLOATING HEAD

REMOVABLE BUNDLE

TYPE "O"

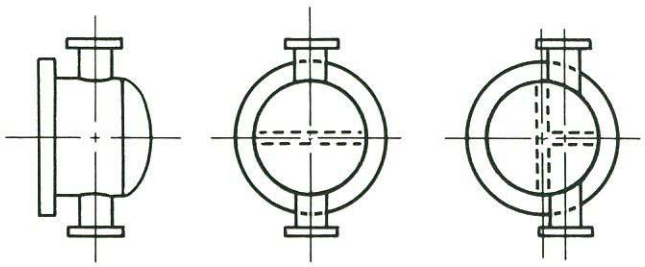


OUTSIDE PACKED HEAD

REMOVABLE BUNDLE

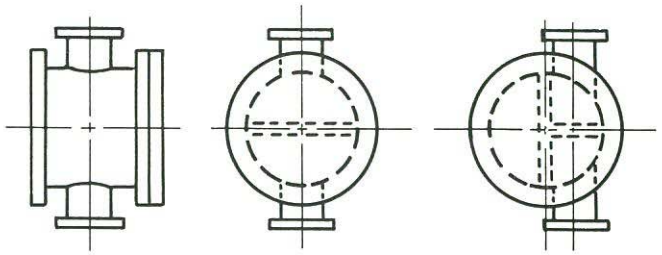
ALTERNATE HEAD SELECTIONS

FABRICATED BONNETS



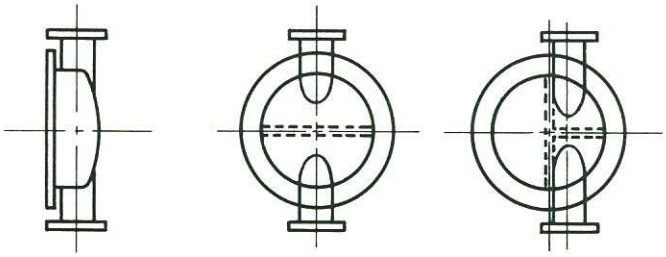
TWO PASS FOUR PASS

FABRICATED CHANNEL



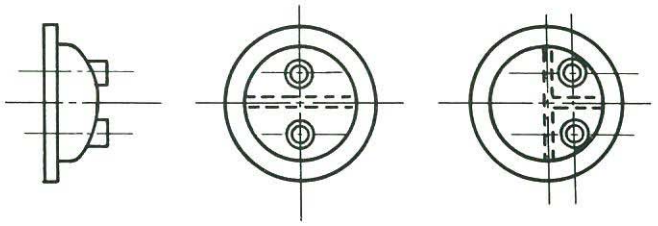
TWO PASS FOUR PASS

CAST HEAD (with Flanged Nozzles)



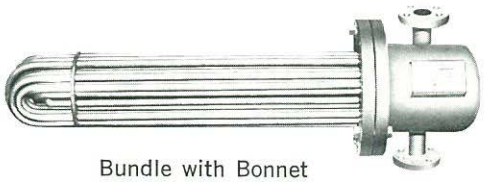
TWO PASS FOUR PASS

CAST HEAD (with Threaded Nozzles)



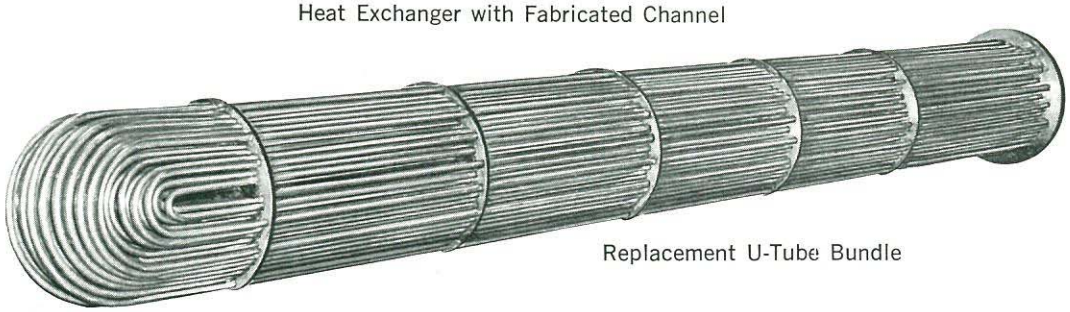
TWO PASS FOUR PASS

Typical D & R
Type "H"
Removable U-Tube Bundle
Heat Exchangers

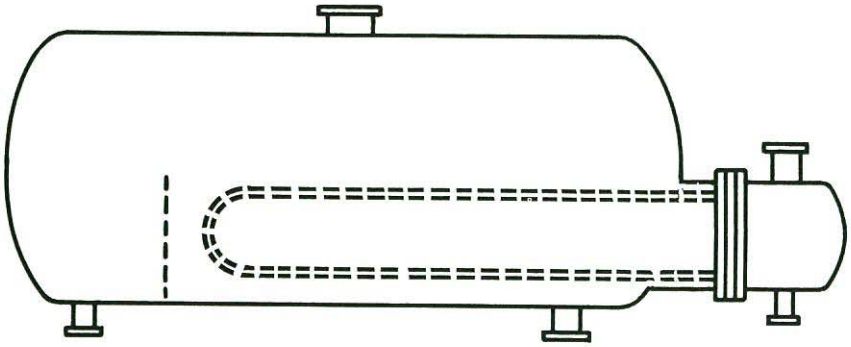


Bundle with Bonnet

Heat Exchanger with Fabricated Channel



Replacement U-Tube Bundle



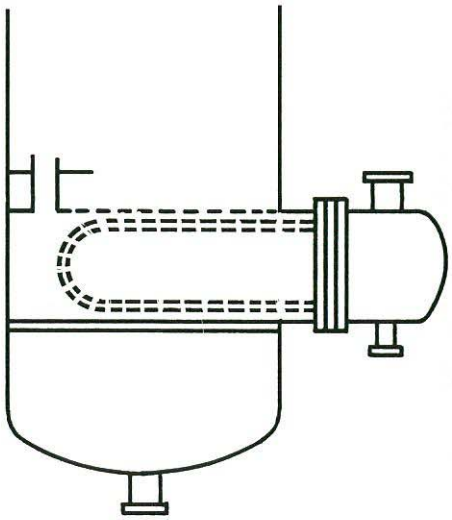
TYPE "KH" KETTLE REBOILERS

D & R Type "KH" Reboilers are designed for highly efficient vaporizing of process fluids. Fabricated of "U" tube construction, ideal for steam or heat transfer fluid service with the tube bundle placed low in the shell . . . insuring maximum heat transfer surface with adequate vapor or liquid disengaging space. Sufficient space is also provided below the tube bundle for removal of bottoms material without interfering with proper heat transfer.

The units are pre-engineered with materials purchased to rigid specifications and assembled into stock components. This inventory enables D & R to provide you with a wide selection of sizes, constructed in a variety of materials, providing substantial savings in Engineering . . . First Cost and Rapid Delivery.

BUNDLE IN-COLUMN REBOILERS

The Bundle In-column Reboiler can be used where space is a problem and it is advantageous to eliminate process piping. Many of the tube bundles described in this data book will prove satisfactory for this service.



FOR VERTICAL THERMOSYPHON REBOILERS REFER TO D & R DATA BOOK No. 174.

DOYLE & ROTH Manufacturing CO. INC.

since 1932

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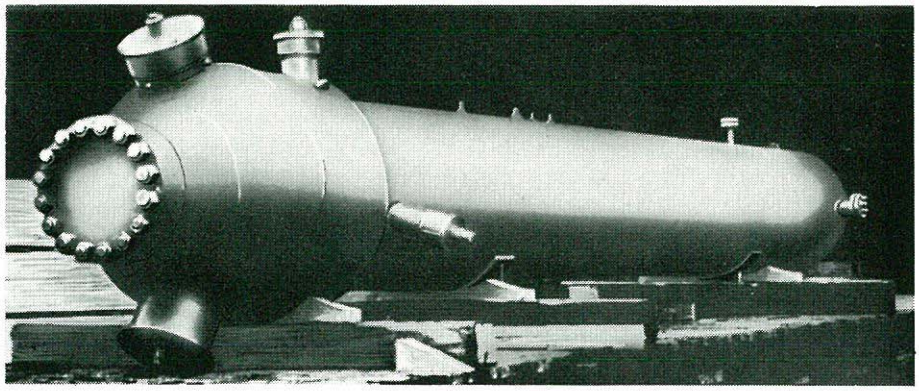
FEEDWATER HEATERS
designed for SUPERIOR PERFORMANCE

D & R will Custom-build Feedwater Heaters to precise requirement . . . or, REBUILD and IMPROVE EXISTING UNITS* of ANY manufacturer.



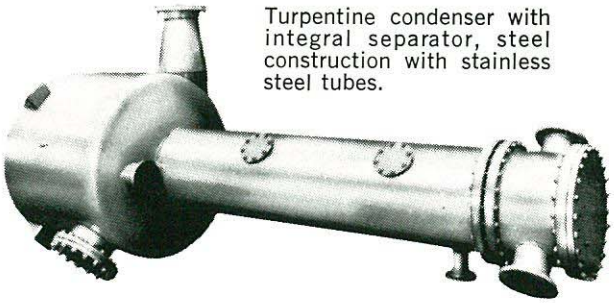
In the construction of each Feedwater Heater (H.P. or L.P.) D & R employs the vast experience acquired in more than 35 years of diversified installation in both Industrial and Power-generating Plants (nuclear and fossil fuel fired).

Whether it be a new or rebuilt unit, D & R strives for the ultimate in performance and efficiency . . . using quality control techniques such as close tolerance, precision drilling with horizontal multiple (lahr) gun drills.

*** NOTE: Upon request, D & R will furnish a representative listing of leading major utilities for whom we have built or rebuilt Feedwater Heaters.**

CUSTOM-BUILT HEAT EXCHANGERS

D & R is thoroughly equipped to design and fabricate Heat Exchangers in a wide range of materials, custom-built to meet the most exacting requirements of the chemical, petrochemical and process industries.



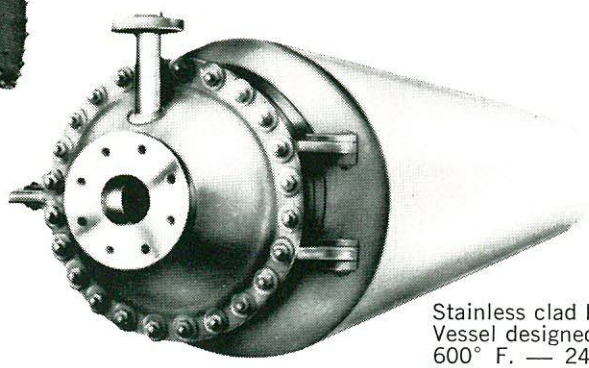
Turpentine condenser with integral separator, steel construction with stainless steel tubes.

Titanium Reboiler for nitric acid service.

Years Ahead

in Engineering

and Design



Stainless clad Food Processing Vessel designed for 450 psi @ 600° F. — 24" O.D. x 16 ft. long.

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