

Shell & Tube Heat Exchanger

Heat Exchanger Design, Inc. offers shell and tube exchangers starting at 2" IPS in all TEMA types. We design and fabricate to ASME code and TEMA standards. Our shell and tube line utilizes bare tube (straight and u-tubes), helical low-fin outside, longitudinal fins (inside & outside are available). These exchangers are suitable for a variety of applications and are offered in fixed tube sheets or removable bundles. The surface area ranges from (1) square foot to 40,000 square feet. Pressure range is from full vacuum to over 14,000 PSI (limited by size, material and design condition).

Types and applications of shell & tube heat exchangers:

1. Type U – U-Tube Exchangers: These units are constructed using U shape tubes that are attached to the same tubesheet. This design may be used with A, B, C, N, or D type front end.

Advantages:	Limitations:
<ol style="list-style-type: none">1. Tube bundle is removable; therefore mechanical cleaning is possible on the shell side.2. Attachment of tubes to single tubesheet eliminates the need for differential expansion joint.3. This type is suitable for high pressure.4. High degree of protection from leakage is possible.5. Double tubesheet is possible to provide further protection from leakage.	<ol style="list-style-type: none">1. Only chemical tube side cleaning is possible.2. Access to the tubes other than the outside row is limited.

For the above reason, this type is recommended for clean process fluids and those subject to chemical removal.

2. Type L, M, and N – Fixed tubesheets: These units are constructed with the tubesheets integral with the shell. They may be used with A, B, or N Type front head.

Advantages:	Limitations:
<ol style="list-style-type: none">1. High degree of protection against contamination of streams.2. Double tubesheet is possible.3. Mechanical tube side cleaning is possible.	<ol style="list-style-type: none">1. Differential expansion is possible only by using expansion joint.2. High pressure application is limited.3. Tube bundle is not removable.4. Shell side mechanical cleaning is not possible.

These types are recommended for low and high pressure, and low fouling fluids.

3. Type W – Externally sealed tubesheets: The shell side and tubeside streams are individually sealed by individual packing and are separated by a lantern ring. This is the lowest cost of the floating head designs and can be used with type A, B, or C front head.

<p>Advantages:</p> <ol style="list-style-type: none"> 1. Differential expansion between tubes is possible thru the floating head design, therefore eliminates the need for an expansion joint. 2. Tube bundle is removable. (Also individual tubes) 3. Tube side mechanical cleaning is possible. 4. Shell side mechanical cleaning is possible. 	<p>Limitations:</p> <ol style="list-style-type: none"> 1. Maximum of only two tube side passes is possible. 2. The shell and tube side leakage is possible. 3. Maximum temperatures of 375 degrees F and maximum pressure of 300 psi limits the usage of these units at higher pressure and temperature.
<p>This type is recommended for low pressure, low temperature and non-hazardous fluids.</p>	

4. Type P – outside packed floating head: A skirt attached to the floating tubesheet passes through the back end of the shell. The space between the skirt and the shell is sealed by several layers of packing and packing gland.

<p>Advantages:</p> <ol style="list-style-type: none"> 1. High pressure on tube side is possible. 2. Tube bundle is removable. (Also individual tubes) 3. Shell and tube mechanical cleaning is possible. 4. More than two tube passes is possible to utilize the allowable pressure drop. 5. Packing failure is externally visible under operation. 6. Double tubesheet is possible. 7. Differential expansion is provided by the packing. 	<p>Limitations:</p> <ol style="list-style-type: none"> 1. Hazardous material should not be used on the shell side because of the possible leakage. 2. Packing will tend to limit shell fluids to temperatures below 300 degrees F and pressure below 150 psi.
<p>The above types are recommended for low pressure, low temperature non-hazardous fluids.</p>	

5. Type T – pull through floating heads: The floating tubesheet is designed with a larger diameter than required for the tube array.

<p>Advantages:</p> <ol style="list-style-type: none"> 1. Tube bundle is removable. (Also individual tubes) 2. Differential expansion is provided by the floating head. 3. Shell and tube side mechanical cleaning is possible. 4. Double tubesheets are possible. 	<p>Limitations:</p> <ol style="list-style-type: none"> 1. The seal is not externally visible; therefore leakage might be undetected for some time. 2. This type will tend to be more expensive than other types.
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6. Type S – Inside split backing ring: The floating tubesheet is sealed to a floating head cover using a split backing ring and a gasketed surface.

Advantages:

1. High pressure is possible.
2. Differential expansion is provided by the floating head.
3. Shell and tube mechanical cleaning is possible.
4. Tube bundle is removable.

Limitations:

1. Failure of gasket is not externally visible, therefore leakage might go undetected for sometime.

The above type is recommended for high pressure, non-hazardous process fluids.

The following are Tube Counts for "FIXED TUBE SHEET", "U-TUBE" AND "STRAIGHT TUBE" removable bundles on triangular pitch. For other tube pitch or exchanger configuration consult the factory.

Shell I.D. (Inches)	5/8" OD Tubes 13/16" Δ Pitch						3/4" OD Tubes 15/16" Δ Pitch						1" OD Tubes 1 1/4" Δ Pitch					
	Fixed Tube Sheet			U-Tubes			Fixed Tube Sheet			U-Tubes			Fixed Tube Sheet			U-Tubes		
	No. of			Passes			No. of			Passes			No. of			Passes		
	1	2	4	2	4		1	2	4	2	4		1	2	4	2	4	
5.047	31	24	18	12	8		19	14	12	3	2		8	6	4	0	0	
6.065	42	36	28	16	12		25	20	16	7	4		14	14	8	2	2	
7.981	64	62	50	28	24		52	48	36	16	12		26	26	16	7	4	
10.02	110	106	88	49	44		85	76	68	28	26		42	40	36	13	12	
12.00	170	156	140	76	66		126	114	100	46	40		64	61	56	22	18	
13.25	208	196	172	96	88		147	140	128	57	52		85	78	72	28	26	
15.25	283	266	246	127	118		265	156	176	83	74		110	106	100	43	38	
17.25	364	348	318	171	160		263	252	234	110	102		147	138	128	57	52	
19.25	454	442	410	214	202		335	326	302	145	134		184	175	168	76	68	
21.25	547	530	486	255	242		416	397	376	180	170		227	220	212	96	88	
23.25	661	642	598	311	300		493	480	460	220	210		280	265	252	116	110	
25.00	778	754	724	372	354		576	558	533	253	244		316	313	294	135	128	
27.00	925	894	848	441	420		675	661	632	307	290		371	370	358	161	152	
29.00	1069	1036	990	510	492		790	773	736	300	342		434	424	403	189	182	
31.00	1225	1200	1148	586	566		856	875	858	415	402		503	489	463	222	212	
33.00	1398	1366	1302	671	648		1013	1011	976	477	458		576	558	534	254	246	
35.00	1578	1544	1484	757	734		1155	1137	1038	535	520		643	634	604	269	260	
37.00	1765	1732	1664	854	830		1307	1277	1242	600	592		738	703	684	330	316	
39.00	1968	1926	1866	953	926		1454	1425	1336	683	662		804	787	772	370	356	
42.00	2282	2246	2180	1112	1080		1635	1663	1618	800	770		946	928	898	436	418	
45.00	2635	2598	2518	1277	1248		1943	1912	1878	927	900		1087	1059	1042	505	480	
48.00	3004	2968	2876	1470	1430		2229	2150	2134	1061	1032		1249	1230	1196	578	562	
51.00	3126	3050	2950	1510	1450		2513	2129	2132	1205	1178		1337	1339	1354	661	632	
54.00	3500	3400	3332	1650	1590		2623	2752	2752	1366	1334		1592	1561	1530	748	726	
60.00	4300	4220	4120	2020	1900		3527	3477	3114	1609	1668		1969	1915	1904	933	914	