

TEMA Shell & Tube Nomenclature

API Heat Transfer is a proud member of TEMA - Tubular Exchanger Manufacturer's Association. TEMA members set the standards by which virtually all custom shell & tube heat exchangers are specified and built. Basco has been a member since the 1950's, and consequently we have a complete and comprehensive understanding of the engineering, manufacturing and testing requirements to meet this world-recognized standard. While other manufacturers may simply interpret the regulations, API Basco has the requisite member design and fabrication capabilities to lead the industry by helping to shape and define those standards for the long-term benefit of all users.

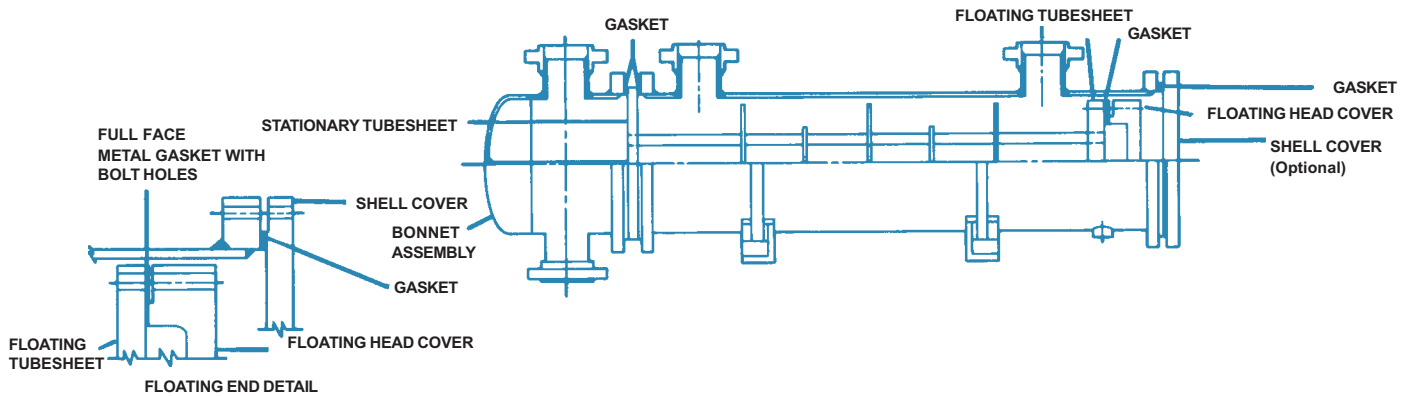


FRONT END STATIONARY HEAD TYPES		SHELL TYPES		REAR END HEAD TYPES	
A	 CHANNEL AND REMOVABLE COVER	E	 ONE PASS SHELL	L	 FIXED TUBESHEET LIKE "A" STATIONARY HEAD
B	 BONNET (INTEGRAL COVER)	F	 TWO PASS SHELL WITH LONGITUDINAL BAFFLE	M	 FIXED TUBESHEET LIKE "B" STATIONARY HEAD
C	 REMOVABLE TUBE BUNDLE ONLY CHANNEL INTEGRAL WITH TUBESHEET AND REMOVABLE COVER	G	 SPLIT FLOW	N	 FIXED TUBESHEET LIKE "N" STATIONARY HEAD
N	 CHANNEL INTEGRAL WITH TUBESHEET AND REMOVABLE COVER	H	 DOUBLE SPLIT FLOW	P	 OUTSIDE PACKED FLOATING HEAD
D	 SPECIAL HIGH PRESSURE CLOSURE	J	 DIVIDED FLOW	S	 FLOATING HEAD WITH BACKING DEVICE
		K	 KETTLE TYPE REBOILER	T	 PULL THROUGH FLOATING HEAD
		X	 CROSS FLOW	U	 U-TUBE BUNDLE
				W	 EXTERNALLY SEALED FLOATING TUBESHEET

TEMA BET

Description: Pull through tube bundle studded internal floating head to tubesheet joint multi-pass tubeside or single pass with Slip Tube design channel or bonnet tubeside connection pressure range – 75 psi to 300 psi.

Applications: Liquid heaters with low pressure steam on the shell side single and double shell (gas in shell) compressor intercoolers on refinery applications shellside gas or oil coolers



Advantages:

1. Relatively large annulus around outer tube limit (O.T.L.) and shell I.D. permits entrance to the tube bundle with little resistance. The results are low entrance-exit velocities and pressure loss.
2. Easily removable tube bundle.
3. Tube bundle expands freely with no special provisions for expansion.

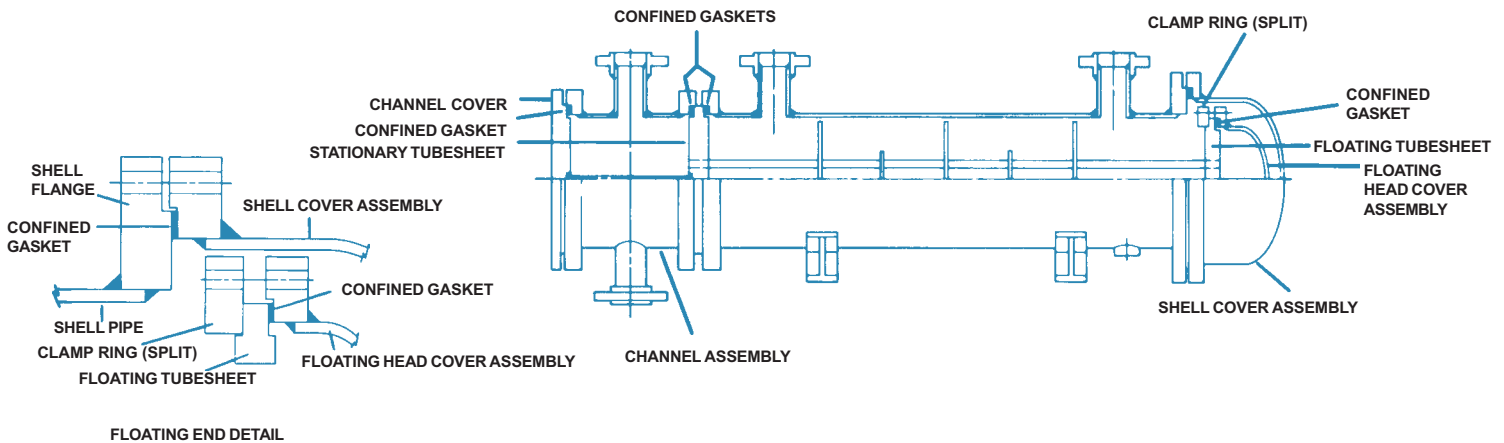
Limitations:

1. No gasket leak detection at floating head and tubesheet.
2. Relatively low thermal efficiency due to large annulus between outer tube limit (O.T.L.) and shell I.D. (results in low shell side heat transfer coefficient).
3. Less tubes for any given shell size compared to other types.

TEMA AES

Description: Removable tube bundle, split clamp-ring floating head multi-pass tubeside or single pass with Slip Tube design floating head bolted to split clamp-ring (requires shell cover larger than shell to accommodate floating head) pressure range – 75 psi to 600 psi.

Applications: Often used in refineries gas in shell units up to 600 psi high pressure seal oil coolers up to 600 psi API 660 oil coolers



Advantages:

1. Higher efficiency compared to Type BET units because of smaller annulus and more tubes per shell size.
2. Tube bundle expands freely with no special provisions for expansion.

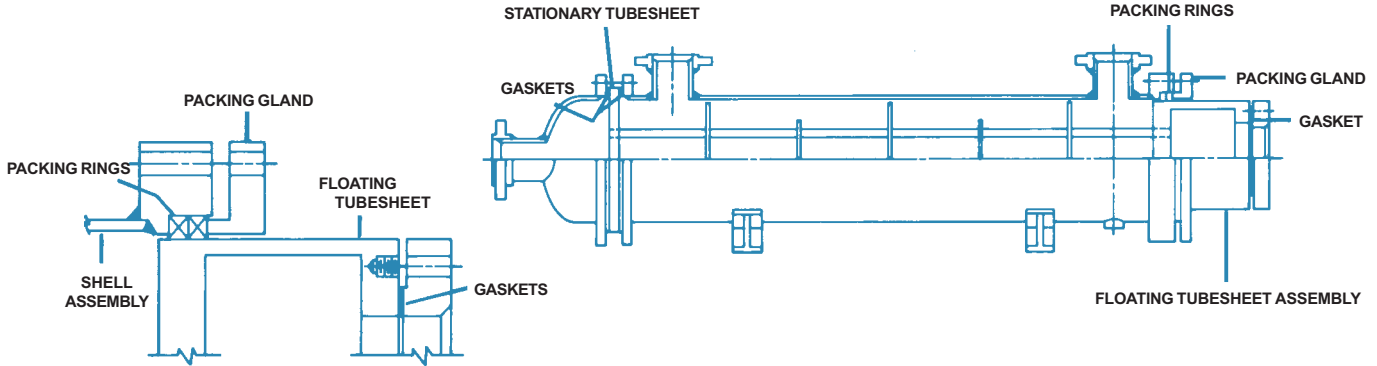
Limitations:

1. No gasket leak detection at floating head.
2. Floating head and fixed end connection must be unbolted to remove tube bundle.

TEMA BEP

Description: Removable tube bundle, outside packed floating tubesheet design. Tubesheet assembly may be of fabricated or forged steel to satisfy design pressure requirements tubeside fluid is fully gasketed; shellside packing available in various materials tubeside pressure range – to 3000 psi. Max 150 psi shellside.

Applications: Where lethal or explosive gasses are involved Where high pressure is applied only on the tubeside Where gasket malfunction must be detectable.



Advantages:

1. No packing exposed to tubeside fluid.
2. Compared to BET and BES, outer tube limit (O.T.L.) relatively close to shell I.D. resulting in increased heat transfer efficiency.
3. No possibility of shell and tubeside fluids intermixing through packing or gaskets.

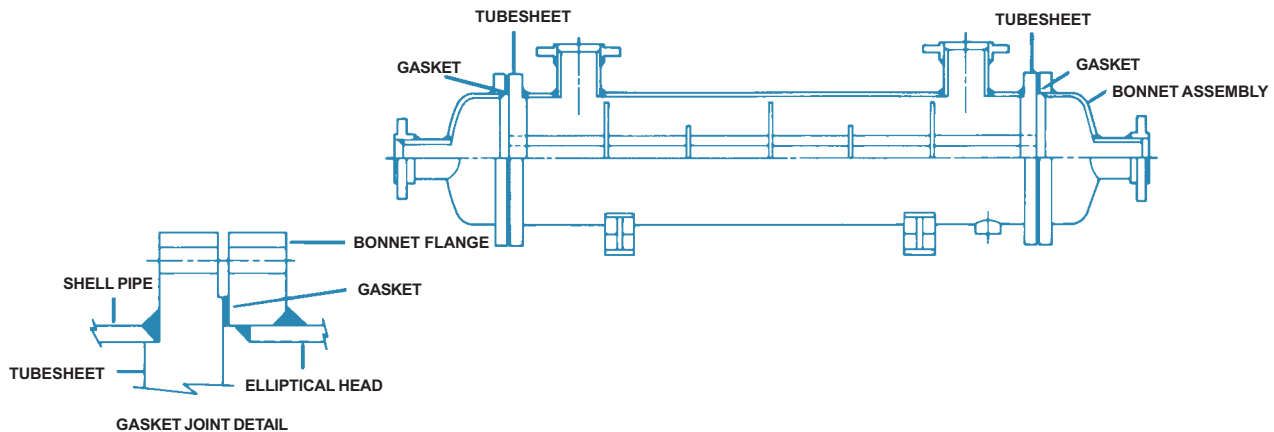
Limitations:

1. One or two pass configurations only.
2. Shellside pressure up to 150 psi because of packing rings at floating tubesheet head.
3. Bundle expands into customer's piping.

TEMA BEM

Description: Fixed tubesheet, non-removable bundle tubesheet welded directly to shell single or multi-pass design

Applications: Chemical processes high pressure air and nitrogen chillers (gas in tubes, freon shellside).



Advantages:

1. Economical design.
2. No possibility of contamination compared to designs with floating head gaskets (except in tube failures).
3. High pressure shellside designs more easily accomplished than in floating head types.
4. Extremely efficient shellside heat transfer due to small annulus between outer tube limit (O.T.L.) and shell I.D.
5. Shell design can be modified for large expansion area where partial vaporization of liquid occurs.
6. No gasketed joints on shellside.

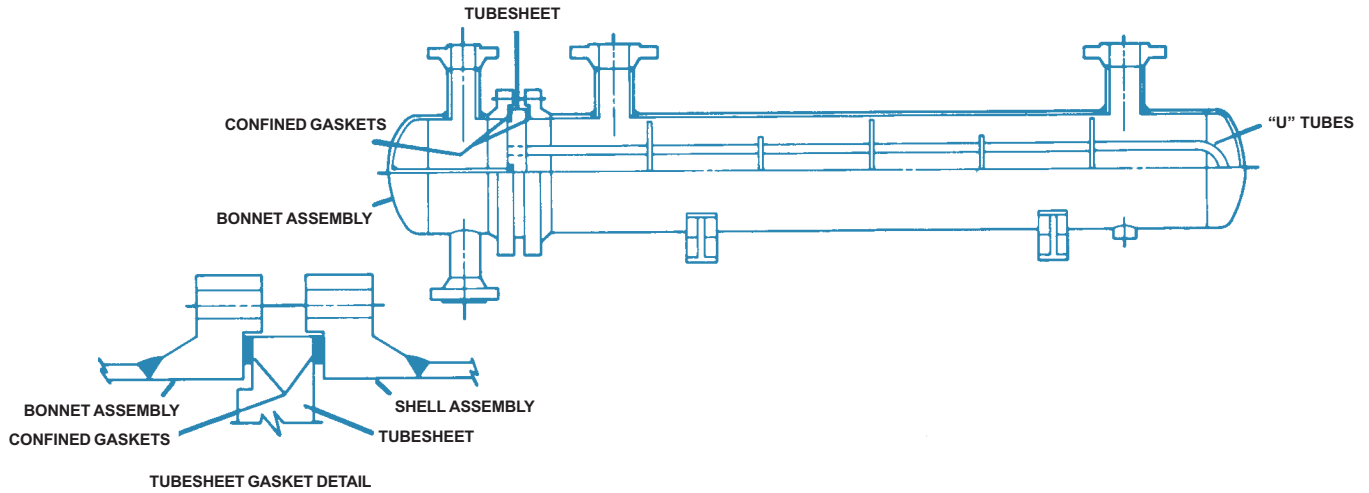
Limitations:

1. No provisions for differential expansion of tubes and shell without expansion joint.
2. Shell and tubesheet material must be weldable
3. Tube bundle is not removable for cleaning.

TEMA BEU

Description: U-tube design with pull through, removable or non-removable tube bundle
 furnished in multi-pass design only
 pressure range – 75 psi to 3000 psi tubeside and 75 psi to 1500 psi shellside.

Applications: Chemical processes tank suction heater liquid heaters vaporizers (where partial vaporization of liquid occurs).



Advantages:

1. Tubes expand freely without special provisions.
2. Single tubesheet minimizes number of tubeside joints.
3. Economical construction.
4. Highly efficient heat transfer – small annulus between outer tube limit (O.T.L.) and shell I.D.
5. Tube bundle easily removable.

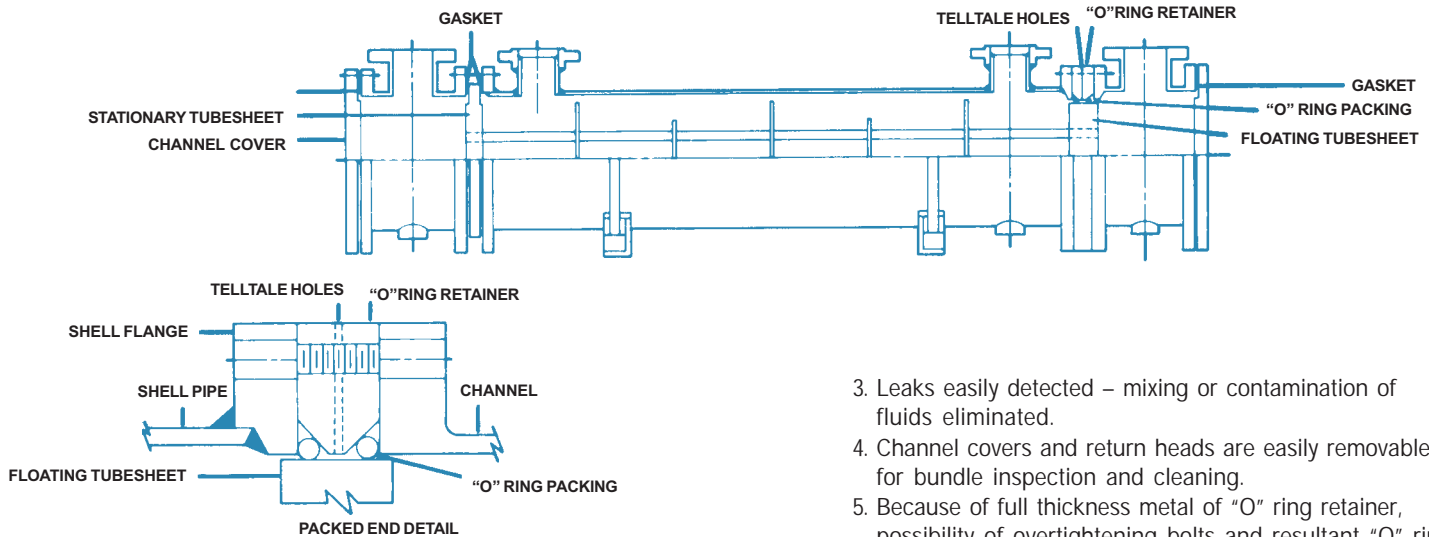
Limitations:

1. Outer tube rows must be removed before replacing inner rows.
2. Requires chemical cleaning.
3. May not be advisable for use where tubeside fouling is anticipated.

TEMA AEW

Description: Removable tube bundle, one or two-pass design double packed floating tubesheet with "O" rings and threaded retainer with telltale holes for leak detection shell sizes from 6" to 42" pressure range – 75 psi to 600 psi.

Applications: Lube oil coolers jacket water coolers aftercoolers.



Advantages:

1. Highly efficient heat transfer – small annulus between outer tube limit (O.T.L.) and shell I.D.
2. Threaded "O" ring retainer permits tube inspection and cleaning without releasing shellside pressure.

3. Leaks easily detected – mixing or contamination of fluids eliminated.
4. Channel covers and return heads are easily removable for bundle inspection and cleaning.
5. Because of full thickness metal of "O" ring retainer, possibility of overtightening bolts and resultant "O" ring damage is eliminated.

Limitations:

1. Should not be used for explosive or lethal fluids where packing leak cannot be tolerated.
2. One or two-pass configuration only.