# MATERIALS FOR FERROUS TUBE BUNDLES

## TABLE 3

**(Numbers in brackets refer to notes overleaf).**

**BASIC TUBE MATERIAL SPECIFICATION AND GRADES FOR TUBE BUNDLE COMPONENTS versus FLUID STREAM ALLOCATION AND TUBE-TO-TUBE SHEET JOINT**

| COMPONENT OF TUBE BUNDLE | CARBON STEEL | | 1 1/4% Cr-Mo STEEL | | | | 5% Cr-Mo STEEL | | | | AUSTENITIC STAINLESS STEEL FOR EXPANDED (ROLLED) TUBE JOINTS (4) | | AUSTENITIC STAINLESS STEEL FOR WELDED TUBE JOINTS (4) | | MOLYBDENUM-BEARING AUSTENITIC STAINLESS STEL | | | | | | | | 9% NICKEL STEEL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TUBE SIDE CORROSIVE SERVICE | | SHELL SIDE CORROSIVE SERVICE | | TUBE SIDE CORROSIVE SERVICE | | SHELL SIDE CORROSIVE SERVICE | | | | | | FOR EXPANDED (ROLLED) TUBE JOINTS | | | | FOR WELDED TUBE JOINTS | | | | | |
| | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM | BS | ASTM |
| TUBES (3) | 3606 -320 or-440 | A179 A214 | 3606 -621 | A199 -T11 | 3606 -621 | A199 -T11 | 3606 -625 | A199 -T5 | 3606 -625 | A199 -T5 | 3606 304S25 | A213 TP 304 | 3606 321S22 347S17 304S22 | A213- 321 347 304L | 3606- 316S25 | A213- TP316 | 3606- 316S25 | A213- TP316 | 3606 316S24 | A213 TP316L | 3606- 316S24 | A213 TP316L | - | A334 Gr.8 |
| TUBESHEETS (1) | EN 10028 -2 P265<br>1503 -221 | A515 Gr.55 or 60<br>A105 | EN 10028 -2 13CrMo 4-5<br>1503 -621 | A387 Gr.11<br>A336 | EN 10028 -2 13CrMo 4-5<br>1503 -621 | A387 Gr.5<br>A336 | 1503 -635 | A387 Gr.5<br>A336 | 1503 -635 | A387 Gr.5<br>A336 | 1501 Pt.3 -304S31<br>1503 | A240- 304 or A264- 304<br>A336 | 1501 Pt.3 -321S31 347S31 304S11<br>1503 | A240- 321 347 304L or A264- 321<br>A336 | 1501 Pt.3 -316S33<br>1503 | A240 316 or A264- 316<br>A336 | 1501 Pt.3 -316S13<br>1503 316S13 | A240- 316<br>A336 | 1501 Pt.3 -316S13<br>1503 | A240- 316L or A264- 316L<br>336 | 1501 Pt.3 -316S13<br>1503 316S13 | A240- 316<br>A316 | 1503 -509 | A353 or A553 Type 1 |
| BAFFLES | EN 10028 -2 FE430 | A283 | EN 10028 -2 FE430 | A283 | EN 10028 -2 13Cr Mo 4-5 | A387 Gr.11 | EN 10028 -2 FE430 | A283 | - | A387 Gr.5 | 1501 Pt.3 -304S31 | A240- 304 | 1501 Pt.3 -304S31 | A240- 304 | 1501 Pt.3 -304S31 | A240- 304 | 1501 Pt.3 -316S33 | A240- 316 | 1501 Pt.3 -304S31 | A240- 304 | 1501 Pt.3 -316S33 | A240- 316 | - | A353 or A553 Type 1 |
| BAFFLE SPACERS (3) | 3601 | A53 | 3601 | A53 | 3604 -621 | A335 -P11 | 3601 | A53 | 3604 -625 | A335 -P5 | 3605 -304S18 | A312- TP 304 | 3605- 304S18 | A312- TP 304 | 3605- 304S18 | A312- TP 304 | 3605 -316S18 | A312 TP 304 | 3605 - 316S18 | A312- TP 316 | 3605- 316S18 | A312 TP 316 | - | A334- Gr.8 or A333- Gr.8 |
| TIE RODS | EN 10025 FE430 | A675 | 1502 -151 | A675 | 1506 631 | A739 B11 | 1502 -151 | A675 | 1502 -625 | - | 1502- 304S31 | A479 304 | 1502- 304S31 | A479 304 | 1502- 304S31 | A479 - 304 | 1502- 316S33 | A479- 316 | 1502- 304S31 | A479- 304 | 1502- 316S33 | A479- 316 | | |
| FLOATING HEAD COVERS (1) | EN 10028 -2 P265<br>1503- 221 (7) or 1504- 161 | A515<br>A105 or A216 -WCB | -<br>1503 -621 or 1504 -621 | A387 Gr.11<br>A336 or A217 -WC6 | -<br>1503 -621 or 1504 -621 | A387 Gr.11<br>A336 or A217 -WC6 | -<br>1503 -625 1504 -625 | A387 Gr.5<br>A336 or A217 -C5 | -<br>1503 -625 1504 -625 | A387 Gr.5<br>A336 A217 -C5 | 1501 Pt.3 -321S31 347S31 304S11<br>1503 | A240 -321 347 304L<br>336 | 1501 Pt.3 -321S31 347S31 304S11<br>1503 | A240 -321 347 304L<br>336 | 1501 Pt.3 -316S13<br>1503 | A240 -316L<br>336 | 1501 Pt.3 -316S13<br>1503 | A240 -316L<br>336 | 1501 Pt.3 -316S13<br>1503 | A240 -316L<br>336 | 1501 Pt.3 -316S13<br>1503 | A240 -316L<br>336 | | |
| CLAMP RINGS | 1503 -221 (6) | A105 | 1503 -221 (6) | A105 | 1503 621 | A336 F11 | 1503 -221 (6) | A105 | 1503 -625 | A336 F5 | 1501 Pt.3 -304S31 or 1503 -304S31 | A240 -304 or A336 -F304 | 1501 Pt.3 -304S31 or 1503 -304S31 | A240 304 or A336- F304 | 1501 Pt.3 -304S33 or 1503 -304S33 | A240 316 or A336- F316 | 1501 Pt.3 -304S31 or 1503 -304S31 | A240 304 or A336- F304 | 1501 Pt.3 -304S33 or 1503 -304S33 | A240 316 or A336- F316 | 1501 Pt.3 -316S33 | A240- 316 or A336- F316 | | |
| FLOATING HEAD NUTS (5) | 4882 Gr.2H | A194 Gr.2H | 4882 Gr.2H | A194 Gr.2H | 4882 Gr.7 | A194 Gr7 | 4882 Gr.2H | A194 Gr2H | 4882 Gr.6 | A194 Gr.3 | 4882 Gr.8 | A194 Gr8 | 4882 Gr.8 | A194 Gr.8 | 4882 Gr.8 | A194 Gr.8 | 4882 Gr.8M | A194 Gr.8M | 4882 Gr.8 | A194 Gr.8 | 4882 Gr.8M | A194 Gr.8M | | |
| FLOATING HEAD BOLTS (5) | 4882 B7 | A193 B7 | 4882 B7 | A193 B7 | 4882 B7 | A193 B7 | 4882 B7 | A193 B7 | 4882 B6 | A193 B5 | 4882 B8 | A193 B8 | 4882 B8 | A193 B8 | 4882 B8 | A193 B8 | 4882 B8M | A193 B8M | 4882 B8 | A193 B8 | 4882 B8M | A193 B8M | | |