

# VALVE MATERIALS & SERVICE APPLICATIONS

## Valve Casting Materials

| ASTM Casting Specification  | Common Designation            | Service Applications   |
|-----------------------------|-------------------------------|--|
| ASTM A216 Grade WCB         | Carbon Steel                  | Non-corrosive applications including water, oil and gases at temperature between -20°F (-30°C) and 800°F (425°C)   |
| ASTM A352 Grade LCB         | Low Temp Carbon Steel         | Low temperature applications to -50°F (-46°C). Not for use above 650°F (345°C)   |
| ASTM A352 Grade LCC         | Low Temp Carbon Steel         | Low temperature applications to -50°F (-46°C). Not for use above 650°F (345°C)   |
| ASTM A352 Grade LC1         | Low Temp Carbon Steel         | Low temperature applications to -75°F (-59°C). Not for use above 650°F (340°C)   |
| ASTM A352 Grade LC2         | Low Temp Carbon Steel         | Low temperature applications to -100°F (-73°C). Not for use above 650°F (340°C)  |
| ASTM A352 Grade LC3         | 3 1/2% Nickel Steel           | Low temperature applications to -150°F (-101°C). Not for use above 650°F (340°C)   |
| ASTM A217 Grade WC6         | 1 1/4% Chrome 1/2% Moly Steel | Non-corrosive applications including water, oil and gases at temperatures between -20°F (-30°C) and 1100°F (593°C)   |
| ASTM A217 Grade C9          | 2 1/4% Chrome                 | Non-corrosive applications including water, oil and gases at temperatures between -20°F (-30°C) and 1100°F (593°C)   |
| ASTM A217 Grade C5          | 5% Chrome 1/2% Moly           | Mild corrosive or erosive applications as well as non-corrosive applications at temperatures between -20°F (-30°C) and 1200°F (649°C)  |
| ASTM A217 Grade C12         | 9% Chrome 1% Moly             | Mild corrosive or erosive applications as well as non-corrosive applications at temperatures between -20°F (-30°C) and 1200°F (649°C)  |
| ASTM A487 Grade CA6NM       | 12% Chrome Steel              | Corrosive application at temperatures between -20°F (-30°C) and 900°F (482°C)  |
| ASTM A217 Grade CA15        | 13% Chrome                    | Corrosive application at temperatures up to 1300°F (740°C)   |
| ASTM A351 Grade CF8M        | 316 SS                        | Corrosive or either extremely low or high temperature non-corrosive services between -450°F (-268°C) and 1200°F (649°C). Above 800°F (425°C) specify carbon content of 0.04% or greater                          |
| ASTM A351 Grade CF8C        | 347 SS                        | Primarily for high temperature, corrosive applications between -450°F (-268°C) and 1200°F (649°C). Above 1000°F (540°C) specify carbon content of 0.04% or greater   |
| ASTM A351 Grade CF8         | 3014 SS                       | Corrosive or extremely high temperatures non-corrosive services between -450°F (268°C) and 1200°F (649°C). Above 800°F (425°C) specify carbon content of 0.04% or greater.                                       |
| ASTM A351 Grade CF3         | 304L SS                       | Corrosive or non-corrosive services to 800°F (425°C)   |
| ASTM A351 Grade CF3M        | 316L SS                       | Corrosive or non-corrosive services to 800°F (425°C)   |
| ASTM A995 Grade 4A-CD3MN    | F51 Duplex                    | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics) |
| ASTM A995 Grade 5A-CE3MN    | F53 Super Duplex              | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics) |
| ASTM A995 Grade 6A-CD3MNCuN | F55 Super Duplex              | Concentrate brine, fatty acids, potable water, pulp water, pulp liquors at 220°F (104°C), sea water, steam, sulfuric acid (15-30% @ 140-160°F (60-71°C), sulfuric acid (35-40% @ 185°F (85°C), plus 5% organics) |
| ASTM A351 Grade CN7M        | Alloy 20                      | Good resistance to hot sulfuric acid -51°F (-46°C) to 300°F (150°C)  |
| ASTM A990 Grade CN3MCu*     | Alloy 20 (New*)               | Good resistance to hot sulfuric acid -51°F (-46°C) to 300°F ~ 800°F (150°C ~ 425°C)  |
| ASTM A743 Grade M3-35-1     | Monel                         | Weldable grade. Good resistance to corrosion by all common organic acids and salt water. Also highly resistant to most alkaline solutions to 750°F (400°C)   |
| ASTM A743 Grade N-12M       | Hastelloy B                   | Is well suited for handling hydrofluoric acid at all concentrations and temperatures. Good resistance to sulphuric and phosphoric acids to 1200°F (649°C)  |
| ASTM A743 Grade CW-12M      | Hastelloy C                   | Good resistance to strong oxidation conditions. Good properties at high temperatures. Good resistance to sulphuric and phosphoric acids to 1200°F (649°C)  |
| ASTM A743 Grade CY-40       | Inconel                       | Very good for high temperature service. Good resistance to strongly corrosive media and atmosphere to 800°F (425°C)  |
| ASTM B62                    | Bronze/ Copper Alloy          | Water, oil or gas: up to 400°F (205°C). Excellent for brine and seawater service.  |
| ASTM B148                   | Nickel Aluminium-Bronze       | (C95800) Stronger than copper alloy, excellent for low temperature use as low as -190°C and marine use up to 316°C.  |

\* The specially controlled process of this alloy provides castings with heat resistance neat or equal to wrought grades of alloy 20, that is say 800°F (425°C) but at time of this publication this had not yet been established by ANSI B16.34.

## Common Forged Valve Materials

| ASTM Designation | Description                          | Common Service Recommendations Body/Bonnet Material  | Casting Comparison |
|------------------|--------------------------------------|--|--------------------|
| A105 (1)         | Carbon Steel                         | General service such as oil, oil vapor, gas, steam and water at temperatures -20° to 1000°F (-28°C to 537°C) | A216-WCB           |
| A350-LF2 CL1     | Low Temperature Carbon Steel         | Suitable for temperatures -50°F (-46°C) and not above 650°F (343°C)  | A352-LCB           |
| A182-F11 CL2     | 1 1/4% Cr, 1/2% Mo Alloy Steel       | For high temperatures from -20°F (-28°C) to 1100°F (593°C) to minimise graphitisation                        | A217-WC6           |
| A182-F22 CL3 (2) | 2 1/4% Cr, 1% Mo Alloy Steel         | For services requiring greater strength than F11 at temperatures from -20°F (-28°C) to 1100°F (593°C)        | A217-WC9           |
| A182-F5          | 5% Cr, 1/2% Mo Alloy Steel           | For corrosive/erosive refinery use requiring resistance at temperatures from -20°F (-28°C) to 1100°F (593°C) | A217-C5            |
| A182-F9          | 9% Cr, 1% Mo Alloy Steel             | For services involving media with higher sulphur content to combat oxidation to 1100°F (593°C)               | A217-C12           |
| A182-F304        | 18% Cr, 8% Ni Stainless Steel        | For corrosive services and atmospheres from -450°F (-268°C) to 1000°F (537°C)                                | A351-CF8           |
| A182-F316        | 18% Cr, 8% Ni, 2% Mo Stainless Steel | For superior resistance to corrosion from -450°F (-268°C) to 1000°F (537°C)                                  | A351-CF8M          |

(1) Permissible but not recommended for prolonged use above 800°F (425°C)

(2) Consideration should be given to the possibility of excessive oxidation (scaling) when used above 1050°F (563°C)

## Special Forged Valve Materials

| Material        | Description                         | Service Recommendations   |
|-----------------|-------------------------------------|---|
| HASTELLOY       | Nickel Alloy                        | Good high temperature properties. Excellent corrosion resistance in hydrochloric acid       |
| INCONEL INCOLOY | Nickel Alloy                        | For high temperature service. Used for nuclear applications                                 |
| MONEL           | Nickel-Copper Alloy                 | For corrosive service up to 842°F (450°C). Resistant to sea water, acids, alkalies          |
| TITANIUM        | Transition Metal                    | Good resistance to corrosion together with low specific weight                              |
| ASTM A182 F20   | Alloy 20 - Specialty Alloy          | For corrosive service such as hot sulphuric acid. Resists -49°F (-45°C) to 600°F (316°C)    |
| ASTM A182 F51   | Ferritic-Austenitic Stainless Steel | Very high strength, resistance to corrosion, pitting and stress corrosion in chloride media |
| ASTM A182 F44   | Austenitic Stainless Steel          | Very high strength, high resistance to corrosion  |

## Common Trim Materials

| Trim Description                  | Application  |
|-----------------------------------|--|
| 13% Cr, Type 410 Stainless Steel  | For oil and vapors and general services with heat treated seats and wedges   |
| 13% Cr, Type 410 plus Hard-facing | Universal trim for general service requiring long service life up to 1100°F (593°C)*                                 |
| Type 316 Stainless                | For liquids and gases which are corrosive to 410 stainless steel, up to 1000°F (537°C)                               |
| Monel                             | For corrosive service to 842°F (450°C) such as acids, alkalies, salt solutions, etc.                                 |
| Alloy 20                          | For corrosive service such as hot acids -49°F (-45°C) to 608°F (320°C)   |
| NACE                              | Specially treated 316 or 410 trim combined optionally with B7M Bolts and 2HM nuts to meet NACE MR-01-75 requirements |
| Full Stellite                     | Full hard faced trim, suitable for abrasive & severe services up to 1200°F (650°C)                                   |

\* Dependant upon base material grade

Note: These charts are for general reference only. Australian Pipeline Valve recommends that customers' engineers analyse service requirements and specify the materials they consider optimum for their service conditions. Temperatures shown will vary depending on pressure, media type, manufacturer. Many of the body and trim material temperatures are indicative and can vary widely depending on manufacturers: - grade, form, class of valve, end connections, duration, carbon content, annealing process, impact testing, fluid type, application, etc. Note: - Body cold working pressure rating (CWP) decreases as temperature increases. Refer to ASTM P/T charts.

*If we don't have the valve in stock we can source it from our overseas network of stockists and very short lead-time specialty manufacturers. We can even supply exotic grades like Nickel, Super Duplex F55 and Monel (ASTM A494-M35-1) Cd4M-Cu, Hastelloy C (ASTM A-494 CW12MW), 317 (C8G8M) in short lead-time.*

*For other ANSI, ASME, ISO, API, valve related technical cross references relating to pressure, temperature, application, suitability, equivalents, valve body & trim materials, valve manufacturing & test standards, go to the technical section of our website.*

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