## Where Different Grades Are Used

Environment	Grades	Environment	Grades
Acids Hydrochloric acid	Stainless generally is not recommended except when solutions are very dilute and at room temperature.		used for fractionating equipment, for 30 to 99% concentrations where Type 304 cannot be used, for storage vessels, pumps and process equipment benefits a least a solid which would be after the solid which we have the solid
"Mixed acids"	There is usually no appreciable attack on Type 304 or 316 as long as sufficient nitric acid is present.		handling glacial acetic acid, which would be dis colored by Type 304. Type 316 is likewise applicable for parts having temperatures above 120 °C (50°C), for dilute temperatures above 120°C (50°C),
Nitric acid	Type 304L or 430 is used.		for dilute vapors and high pressures. Type 317 has somewhat greater corrosion resistance than Type 316 under severely corrosive conditions. None of the
Phosphoric acid	Type 304 is satisfactory for storing cold phosphoric acid up to 85% and for handling concentrations up to 5% in some unit processes of manufacture. Type 316 is more resistant and is generally used for storing and manufacture if the fluorine content is not too high. Type 317 is somewhat more resistant than Type 316. At concentrations up to 85%, the metal temperature should not exceed 212 °F (100 °C) with Type 316 and slightly higher with Type 317. Oxidizing ions inhibit attack and other inhibitors such as arsenic may be added.		stainless steels has adequate corrosion resistance to glacial acetic acid at the boiling temperature or at superheated vapor temperatures.
		Aldehydes	Type 304 is generally satisfactory.
		Amines	Type 316 is usually preferred to Type 304.
		Cellulose acetate	Type 304 is satisfactory for low temperatures, but Type 316 or Type 317 is needed for high temperatures.
Sulfuric acid	Type 304 can be used at room temperature for concentrations over 80%. Type 316 can be used in contact with sulfuric acid up to 10% at temperatures up to 120 °F (50 °C) if the solutions are aerated; the attack is greater in airfree solutions. Type 317 may be used at temperatures as high as 150 °F (65 °C) with up to 5% concentration. The presence of other materials may markedly change the corrosion rate. As little as 500 to 2000 ppm of cupric ions make it possible to use Type 304 in hot solutions of moderate concentration. Other additives may have	Citric, formic and tartaric acids	Type 304 is generally acceptable at moderate temperatures, but Type 316 is resistant to all concentrations at temperatures up to boiling.
		Esters	From the corrosion standpoint, esters are comparable with organic acids.
		Fatty acids	Up to about 300 °F (150 °C), Type 304 is resistant to fats and fatty acids, but Type 316 is needed at 300 to 500 °F (150 to 260 °C) and Type 317 at higher temperatures.
Sulfurous acid	the opposite effect.  Type 304 may be subject to pitting, particularly if some sulfuric acid is present. Type 316 is usable at moderate concentrations and temperatures.	Paint vehicles	Type 316 may be needed if exact color and lack of contamination are important.
		Phthalic anhydride	Type 316 is usually used for reactors, fractionating columns, traps, baffles, caps and piping.
Bases Ammonium hydroxide, sodium hydroxide, caustic solutions  Organics	Steels in the 300 series generally have good corrosion resistance at virtually all concentrations and temperatures in weak bases, such as ammonium hydroxide. In stronger bases, such as sodium hydroxide, there may be some attack, cracking or etching in more concentrated solutions and at higher temperatures. Commercial purity caustic solutions may contain chlorides, which will accentuate any attack and may cause pitting of Type 316 as well as Type 304.	Soaps	Type 304 is used for parts such as spray towers, but Type 316 may be preferred for spray nozzles and flake-drying belts to minimize offcolor product.
		Synthetic detergents	Type 316 is used for preheat, piping, pumps and reactors in catalytic hydrogenation of fatty acids to give salts of sulfonated high molecular alcohols.
		Tall oil (pulp and paper industry)	Type 304 has only limited usage in tall-oil distillation service. High-rosin-acid streams can be handled by Type 316L with a minimum molybdenum content of 2.75%. Type 316 can also be used in the more
Acetic acid	Acetic acid is seldom pure in chemical plants but generally includes numerous and varied minor constituents. Type 304 is used for a wide variety of equipment including stills, base heaters, holding		corrosive high-fatty-acid streams at temperatures up to 475 °F (245 °C), but Type 317 will probably be required at higher temperatures.
	tanks, heat exchangers, pipelines, valves and pumps for concentrations up to 99% at temperatures up to about 120 °F (50 °C). Type 304 is also satisfactory for contact with 100% acetic acid vapors, and—if small amounts of turbidity or color pickup can be tolerated—for room temperature storage of glacial acetic acid. Types 316 and 317 have the broadest range of usefulness, especially if formic acid is also present or if solutions are unaerated. Type 316 is	Tar	Tar distillation equipment is almost all Type 316 because coal tar has a high chloride content; Type 304 does not have adequate resistance to pitting.
		Urea	Type 316L is generally required.
		Pharma- ceuticals	Type 316 is usually selected for all parts in contact with the product because of its inherent corrosion resistance and greater assurance of product purity.