Procurement White Paper

ALLOY 20

UNS N08020 | Ni-Fe-Cr-Cu-Mo alloy optimized for sulfuric-acid service and corrosion-resistant fasteners used in chemical processing

Audience: procurement, sourcing, and quality teams supporting chemical processing equipment and corrosion-resistant fasteners.

At-a-glance	
What it is A low-carbon, niobium-stabilized austenitic Ni-Fe-Cr alloy with Cu and Mo additions; engineered for strong resistance to sulfuric-acid service and good resistance to chloride stress-corrosion cracking.	**Typical reasons to specify** Sulfuric-acid process equipment and mixed-acid service where 316/316L can suffer rapid corrosion or SCC; corrosion-resistant fasteners for chemical processing, pickling, and emissions-control systems.
Common supply forms Plate/sheet/strip, bar/rod, pipe/tube (seamless & welded), fittings; fasteners are typically machined from bar or produced from wire/rod where available.	**Key identifiers** UNS N08020 (also sold as Alloy 20 / 20Cb-3 / INCOLOY alloy 020). Frequently ordered to ASTM/ASME B463 (plate), B473 (bar/wire), B729 (seamless pipe/tube), B468 (welded tube), and B366 (fittings).

This document is a purchasing guide (not an engineering design standard). Final material selection, code compliance, sour-service limits, and welding procedures must be validated for the specific service environment and applicable regulations.

Version 1.0 | February 17, 2026

Executive summary

Alloy 20 (UNS N08020) was developed to handle aggressive acid service—especially sulfuric acid—while remaining more economical than many higher-nickel alloys. It is widely specified for chemical processing equipment such as tanks, piping, heat exchangers, and flue-gas cleanup systems, and it is also used for corrosion-resistant fasteners where stainless steels may fail by general corrosion or stress-corrosion cracking (SCC). [1][2]
For procurement teams, the primary success factors are: (1) quoting the correct product-form standard (plate vs bar vs pipe), (2) locking in the required heat treatment condition (stabilized/annealed) and documentation, and (3) controlling fastener risks such as galling, thread fit, and property verification for sour or chloride-bearing environments. [3][4][5]

Where Alloy 20 fits

Alloy 20 typically sits between common austenitic stainless steels (304/316) and high-moly nickel alloys (e.g., C-276) on the cost vs corrosion-resistance curve. It is often selected when sulfuric acid (and mixed-acid streams) drive corrosion rates beyond 316/316L, but where the environment does not justify the added cost of the most highly alloyed Ni-Cr-Mo materials. [1][2]

Common chemical-processing use cases

- Sulfuric-acid handling: storage, mixing, transfer piping, pump and valve components (where compatible with process conditions). [1]
- Mixed-acid service involving sulfuric with chlorides, phosphoric, or nitric acid in many chemical manufacturing streams. [1]
- Pickling lines and acid process equipment where chloride SCC or pitting/crevice corrosion can limit stainless performance. [2]
- Scrubbers / emissions-control components and corrosive utility systems where fasteners must survive wet, chloride-bearing conditions.

Fastener-focused considerations for procurement

- **Manufacturing route:** many Alloy 20 fasteners are machined from ASTM B473 bar stock; some sizes may be produced from wire/rod depending on supplier capability. [4]
- **Galling control:** specify anti-seize/lubrication requirements, consider surface treatments approved by engineering, and define torque-tension or K-factor expectations for critical joints.
- **Thread and geometry:** call out ASME B18 geometry and thread class; define any underhead radius, washer face, or venting requirements up front.
- **Environment match:** use Alloy 20 where the driver is acid corrosion and/or chloride SCC risk; for highly oxidizing chlorides at elevated temperature, engineering may prefer alternatives.

Buying it right: product forms and specifications

A frequent procurement issue is mixing product-form standards (for example, buying plate chemistry for bar applications, or quoting a tube standard for pipe). Use the table below as an RFQ/PO checklist and always align the standard with the actual form factor being purchased.

Product form (common)	Typical standards / specs to cite in RFQs	Procurement notes
Plate / Sheet / Strip	ASTM/ASME B463 (UNS N08020 plate, sheet, strip). Also seen: ASTM/ASME A240/SA240 (where permitted by code or customer spec).	Confirm stabilized-annealed condition for corrosion service; define finish, thickness tolerance, and surface (pickled, annealed, bright). Require heat/lot traceability.
Rod / Bar / Wire	ASTM/ASME B473 (UNS N08020 bar & wire).	For machined fasteners, specify bar size/straightness, grain flow for critical parts, and ultrasonic testing when required.
Pipe (seamless)	ASTM/ASME B729 (UNS N08020 seamless pipe & tube for corrosive service).	Define NDE (ET/UT), hydrotest, and corrosion test requirements where applicable. Specify solution/stabilized anneal per standard.
Pipe (welded)	ASTM/ASME B464/B464M (welded UNS N08020 alloy pipe).	Some ASTM listings note withdrawal of certain editions—confirm the exact spec your end user accepts and whether B775/B775M general requirements apply for welded pipe. [ASTM cross-reference].
Tube (welded)	ASTM B468 (welded UNS N08020 tubes for boiler/heat exchanger/condenser service).	Confirm current revision/availability (some editions are withdrawn); call out weld method, heat treatment, and NDE. Consider seamless for higher-risk corrosion duties.
Fittings	ASTM/ASME B366/B366M (factory-made wrought nickel-alloy fittings). Dimensional: ASME B16.9/B16.11 as applicable.	Match fittings chemistry to parent pipe/tube; require PMI on lots; define class (seamless vs welded) and NDE requirements per B366/B366M.

Product form (common)	Typical standards / specs to cite in RFQs	Procurement notes
Fasteners	Common purchase paths: • Finished fasteners per ASTM F467 (bolting) / ASTM F468 (nuts) where applicable. • Machined fasteners from ASTM B473 bar stock with mechanical/property requirements in PO.	Define thread class, head style, and geometry per ASME B18.2.1/B18.2.2; consider anti-galling measures (lubricants/coatings) and verify hardness for sour service if applicable.
Welding products	Filler metals commonly specified as ER320LR (AWS A5.9) for GTAW/GMAW where compatible with procedure.	Weld procedure qualification drives risk. Call out PWHT/solution anneal needs, max interpass temperature, and any post-weld pickling/passivation.
Sour service / H2S	If required: NACE MR0175 / ISO 15156 compliance language.	Carpenter documentation notes UNS N08020 acceptance with hardness limit (32 HRC max). Verify latest edition and service limits with your engineering/QA team.

Documentation and traceability

- Require mill test reports (MTRs) showing heat/lot, chemistry, mechanical properties, and heat treatment condition per the cited ASTM/ASME standard. [3][4][5][7]
- Define positive material identification (PMI) expectations for received lots (especially for fittings and finished fasteners).
- For critical service, specify additional tests as needed (e.g., UT/ET, corrosion testing, or intergranular corrosion testing) per engineering requirements and applicable standards.

Lead time and risk drivers

Lead time is usually driven by melt availability, required size (bar diameter or plate thickness), and downstream processing (forging, machining, heat treatment, testing). For fasteners, long lead time is often caused by limited qualified machining capacity and the need for lot-level testing and documentation.

Fabrication and welding notes

Procurement teams are often asked to source both base metal and welding consumables. Weld procedure qualification governs the acceptable filler and post-weld treatment; however, ER320LR (AWS A5.9) is commonly used as a matching filler for Alloy 20 type materials in GTAW/GMAW applications. [9]

Procurement call-outs for welded assemblies

- Confirm whether the buyer requires solution/stabilized anneal after fabrication; specify heat treatment requirements before placing orders. [3][5]
- Define surface condition expectations after welding (pickling, passivation, or mechanical cleaning) to avoid embedded iron and to restore corrosion resistance.
- If purchasing welded pipe/tube, clarify current accepted revision and ensure the supplier can provide required NDE and heat treatment records. [6][8]

Sour service / H2S note

If equipment or fasteners may see H2S-containing environments, include explicit compliance language for ANSI/NACE MR0175 / ISO 15156 and verify hardness limits and condition requirements with QA/engineering. Carpenter guidance for 20Cb-3 (UNS N08020) notes acceptance with a maximum hardness of 32 HRC in annealed or cold-worked condition. [2]

Procurement checklist (copy/paste for RFQs)

- **Material designation:** Alloy 20 / UNS N08020 (include alternate trade names only if helpful).
- **Product form & standard:** cite the exact ASTM/ASME standard for the purchased form (B463, B473, B729, B464, etc.). [3][4][5][6]
- **Heat treatment condition:** stabilized-annealed/annealed as required; do not assume.
- **Dimensions & tolerances:** size, schedule/thickness, surface finish, straightness, and any machining allowances.
- **Testing & inspection:** MTRs, PMI, NDE, hydrotest, and any supplemental corrosion tests required by spec or customer.
- **Fastener specifics:** thread class, head style, length under head, washers, coatings/lube, packaging, and lot traceability.
- **Marking:** part marking requirements (manufacturer ID, heat/lot, material grade) and packaging labels.
- **Compliance:** code/standard requirements (ASME, NACE/ISO for sour service, customer specs), plus export or documentation constraints.

References

[1] Special Metals, INCOLOY alloy 020 (UNS N08020) Technical Bulletin (PDF): https://www.specialmetals.com/documents/technical-bulletins/incoloy/incoloy-alloy-020.pdf

[2] Carpenter Technology, 20Cb-3 (Alloy 20) Alloy Finder page: https://www.carpentertechnology.com/alloy-finder/20cb-3-alloy-20

[3] ASTM International, ASTM B463 (UNS N08020 plate/sheet/strip): https://www.astm.org/b0463-21.html

[4] ASTM International, ASTM B473 (bar and wire) latest edition varies (e.g., B473-24): https://www.astm.org/b0473-24.html

[5] ASTM International, ASTM B729 (seamless UNS N08020 pipe and tube): https://www.astm.org/b0729-20.html

[6] ASTM International, ASTM B464/B464M (welded UNS N08020 alloy pipe): https://store.astm.org/b0464_b0464m-15r20.html

[7] ASTM International, ASTM B366/B366M (factory-made wrought nickel alloy fittings): https://www.astm.org/b0366_b0366m-20.html

[8] ASTM International, ASTM B468 (welded UNS N08020 tubes): https://www.astm.org/b0468-10r20.html

[9] Lincoln Electric, ER320LR (AWS A5.9) product information: https://www.lincolnelectric.com/en/products/lincolner320lr_gtaw

[10] Nickel Systems, Carpenter 20 overview (reference): https://www.nickel-systems.com/materials/carpenter-20/