

Material Selection Brief

Questions to answer before choosing a metal or engineering polymer. The objective is to connect material properties to actual operating conditions and manufacturing constraints.

Mechanical demand

- What are the steady, peak, impact and cyclic loads?
- Is stiffness, strength, wear resistance, toughness or dimensional stability the controlling requirement?
- Could creep, fatigue, notch sensitivity or stress concentration govern life?
- What is the consequence and detectability of failure?

Environment

- What are the minimum, normal and maximum operating temperatures?
- Will the component see water, oils, fuels, cleaners, UV, humidity or corrosive chemicals?
- Are flammability, food-contact, electrical, medical or other regulatory requirements relevant?
- Will the material absorb moisture or change dimensions in service?

Manufacturing route

- Is the material readily available in the required stock form, grade and quantity?
- Can it be machined, moulded, printed, welded, bonded or coated as intended?
- Do heat treatment or finishing operations change dimensions or properties?
- Can the selected supplier inspect the relevant characteristics?

Commercial and verification

- Are lead time, minimum order and price compatible with the programme?
- Is traceability or a material certificate required?
- Can a lower-cost material meet the requirement with a geometry change?
- What prototype, test or inspection will verify the selection before release?

Final check

Avoid selecting material from strength alone. A technically suitable grade can still fail because of creep, temperature, chemical exposure, moisture, surface condition or an unsuitable manufacturing process.