The supplier shall establish and maintain threaded fastener and torque procedures. The supplier's procedures shall be traceable to a military or an industry standard and include requirements for training and qualification. The supplier should consider NASA-STD-5020 requirements for threaded fastening systems in spaceflight hardware as guidance for threaded fastening systems.

General Torque Requirements

The extensive use of bolts, studs, and nuts as fastening elements and an avoidable quality problem history makes proper selection and tightening of fasteners essential. The supplier shall ensure that fastener selection and tightening meet or exceed industry best practices and the following generalized requirements derived from industry specifications and standards.

a. Holes shall be verified as deburred before fasteners are installed.

b. No lubricant or sealant shall be applied to fasteners or threads unless it is specifically called out on the engineering drawing.

c. Threaded fastening system hardware shall be inspected prior to installation to verify that part number(s), cleanliness, and orientation are in accordance with the engineering documentation.

d. Locking torque shall be measured during installation and verified to be within the minimum-maximum range.

e. Fasteners removed may be reinstalled but shall be reinstalled using the same procedures as for new fasteners. Fasteners shall be examined for wear or deformation before being reinstalled.

f. Tools and instruments used to install fastening system hardware shall be used within their design and calibration ranges.

g. Torque instruments should be chosen so the torque (running or final assembly) being measured or controlled is between 20 and 90 percent of the instruments' full-scale torque.

h. All torque wrenches shall be verified to be in calibration before they are used.

i. If a calibrated tool or instrument is dropped, struck, or otherwise damaged or suspected of being out of calibration, the calibration shall be re-verified before further use.

j. The tool or instrument name, serial number, calibration due date, and torque value shall be recorded on the planning for traceability.

k. Fasteners shall be tightened to the installation torque specified by the engineering drawing.

l. The engineering documentation shall specify the installation torque range or specify an applicable standard that defines the installation torque range.
m. The engineering documentation shall clearly identify when the installation torque is the torque above running torque. Running torque shall be recorded on the planning documentation.

n. Personnel installing fastening system hardware shall be qualified through experience and formal training per program, project, or organization specific quality processes.

o. Tightening sequence shall be a star pattern unless system design requirements require alternate tightening scheme. A verification check shall be performed either in a clockwise or counter clockwise direction to ensure all fasteners are tight.

p. Mechanical locking features shall be verified by visual inspection after installation.

q. Adhesive locking features dependent upon substrate or configuration for cure shall be verified by torque measurements on witness coupons that are representative of and processed with hardware being verified.

r. All other adhesive locking features shall be verified using cure samples processed at the time of application/processing.