Fastener Training

Presented by

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Why are we here?

- Protect Flight hardware
- NASA independent audit
- Avoid more paper
- Answer question

When we torque a bolt where does it go?

50% of the torque applied is used up in overcoming the nut bearing friction
40% of the torque applied is used to dissipate the thread friction
10% of the torque is used to raise the load “generate preload”

Variations in the coefficient of friction have a huge effect upon the preload

Aerospace threaded fasteners are pre-lubed to try and control the friction coefficient
These include: Cadmium plating, silver plating, cetyl alcohol, dry film lube

NO GREASE !

What happens when we torque a bolt?

- We apply a torque to the nut
- The nut turns
- The bolt stretches
- Creates preload on the joint

What affects a bolts torque?

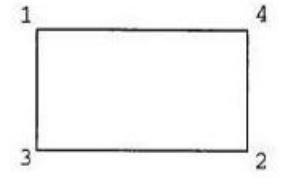
- Friction
- Bolt coating and lubricants
- Running torque of the locking device
- Surface condition of the mating parts
- Soft goods or gaskets

Shop Responsibilities

- Torque pattern
- Incremental torque
- Torque value
- Thread protrusion / engagement
- Fastener Substitutions
- Running torque
- Fasteners in good condition
- No lube

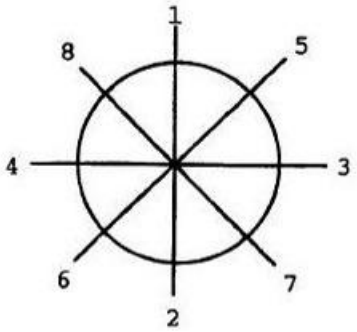
Why we use torque Pattern

- Allows all fasteners in a joint to take the load evenly
- Prevents uneven tightness
- Extremely important in soft goods



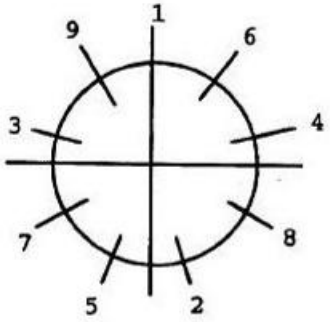
FOUR BOLT PATTERN

EVEN NO. OF FASTENERS

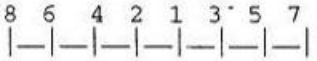


SINGLE ROW

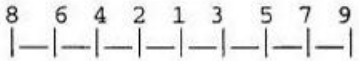
ODD NO. OF FASTENERS



SINGLE ROW



STRAIGHT LINE



STRAIGHT LINE

Incremental torque/ final value

- Incremental
  - 2 less than .250”
  - 3 .250” or greater
- Final torque
  - Midrange when torqueing nut
  - High end for head side or fastener with retorque

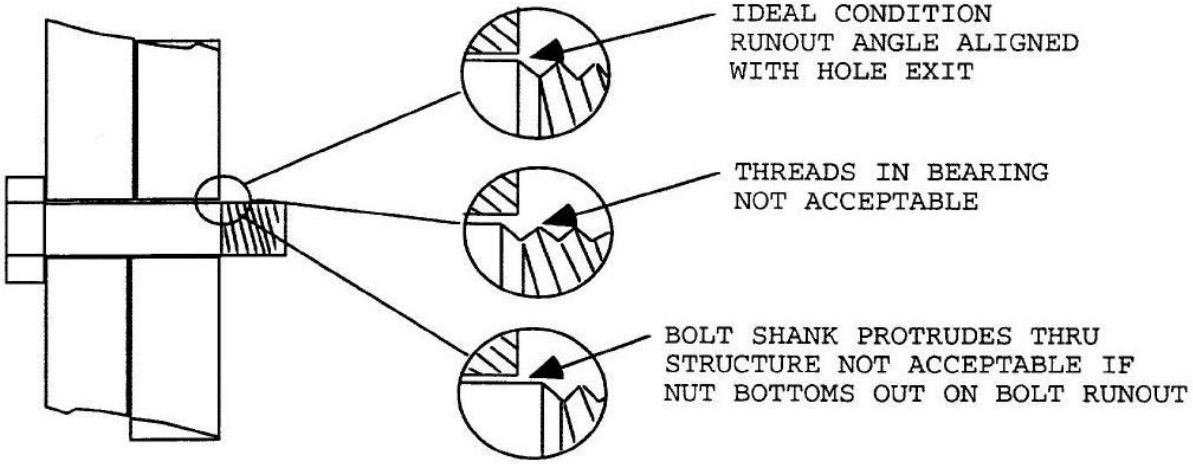
Protrusion or Engagement

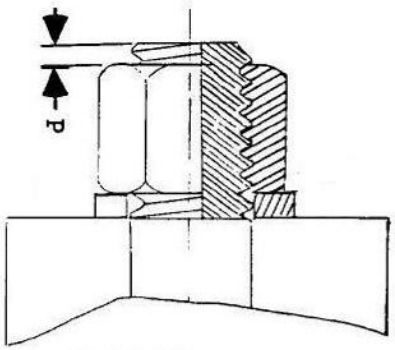
- Inserts
  - 3 full turns after engaging the locking
- Bolts/ Screws
  - Equivalent of 1 thread beyond the nut
  - 2-3 full turns beyond the the locking feature in blind locations

Running torque

- Running torque/ locking torque shall be verified in all installations
- For smaller fasteners it is not much more than felt resistance

What is shank-out? What is tread protrusion?



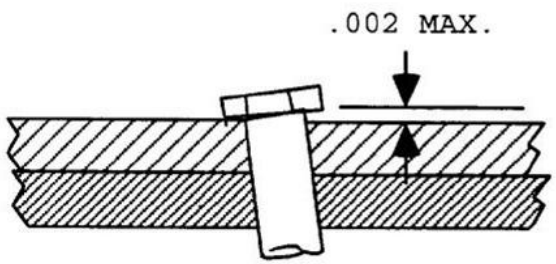


EXAMPLE:
1/4-28
28 TPI
P = 1/28 (.0357 in.)

Rules of fastener use

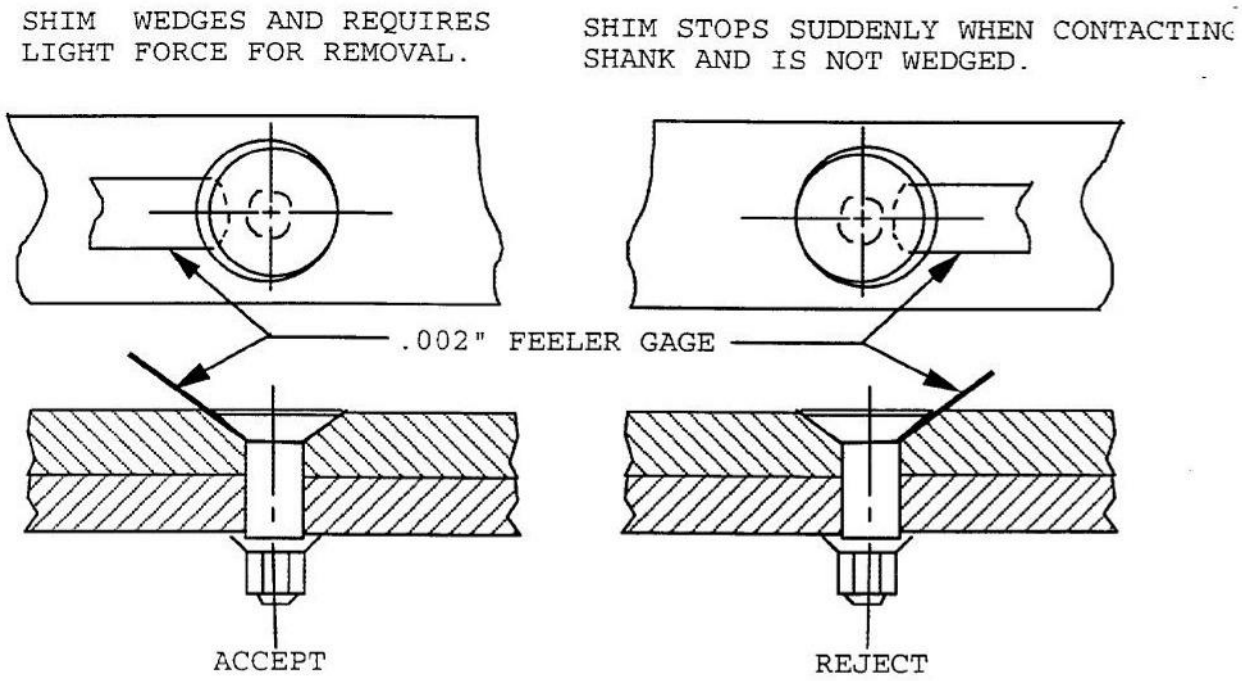
- Fasteners with a shank may be up or down 1 grip
- All thread fasteners up or down two grips
- 1 or 2 washers may be added of same basic part of existing washer may be used
- “L” series washers are acceptable
- Not allowed in blind areas unless the hole is measured
- Blind location must be documented
- May combine 1 & 2
- If 2 or more washers are called out washer removal is allowable provided 1 remains

Are gaps under the head allowable



Allowable if you can you install a .002 shim and not contact the shank?

Gap is allowable up to 40% of the circumference.



Closing

- Questions