

AD 539:

Locking devices for fasteners subject to vibration

SCI is occasionally asked about nuts coming loose if joints are subject to vibration.

A number of solutions are possible of which the following are examples. Each application should be carefully considered and an appropriate solution chosen to satisfy the design requirements.

Solutions include:

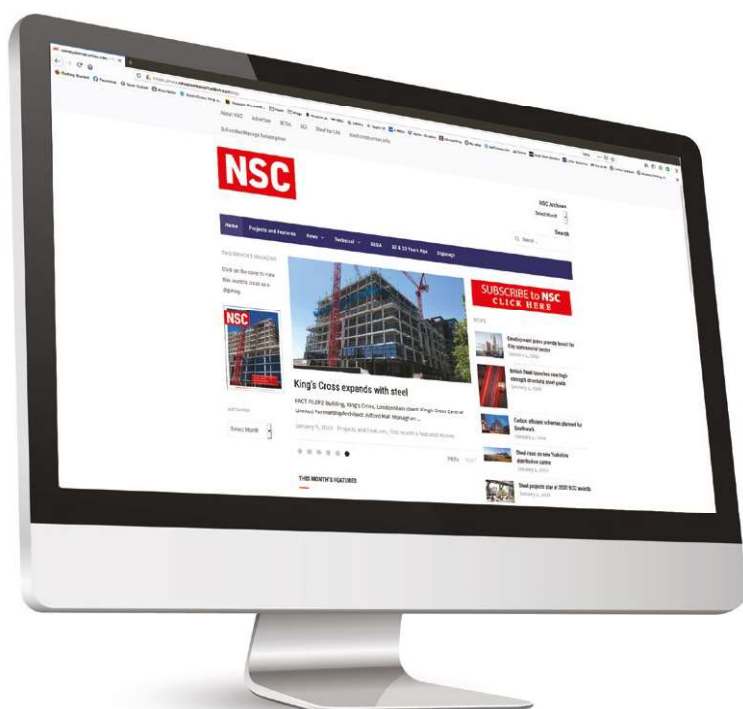
- Simple spring washers, which are a ring of square or rectangular cross section which has been cut and deformed into a spiral. Spring washers introduce a small preload into the fastener and may also “bite” into the nut and component surface, inhibiting rotation.
- Counter nuts (often referred to as Palnuts®), which are manufactured from relatively thin sheet steel. They have a number of protruding tabs which flatten and lock in place during their installation. In structural steelwork Counter nuts may be used (for example) to prevent bolts vibrating loose during transportation.
- Wedge lock washers, which comprise a mating pair of washers with cams on their mating surfaces and serrations on the external faces of the pair. The serrations on the external faces of the mating washer pair bind against the nut face and component surface. If the nut were to rotate, the overall thickness of the washer pair must expand due to the wedge effect, increasing the reaction between the nut and component, which introduces preload in the fixing to stop the nut loosening.
- Nuts with nylon inserts, which increases friction on the threads.
- Lock nuts, which may also be known as half nuts, and as the name suggests have a height

approximately half the height of a standard nut. Half nuts should be plated on the bolt first, followed by the standard nut.

- Various bespoke specialised lock nuts, not commonly used in the UK, but well-known in the United States. These include nuts with special cuts, so that the nut deforms into the threads of the bolt, nuts with an internal wedging action similar to wedge lock washers, nuts with serrated faces and nuts with a locking pin which deforms the threads to prevent removal.
- Using preloaded assemblies.

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