



Langley Research Center Safety Alert

National Aeronautics and
Space Administration

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SA-07-99

TO: Distribution

FROM: 429/Head, Office of Safety and Facility Assurance, OSEMA

SUBJECT: Use of O-Ring Seal CPV-type Unions in High Pressure Systems

Several recent failures of CPV-type unions in various high pressure systems have resulted in significant damage to LaRC facilities and had the potential to cause serious injury to personnel. CPV-type unions are comprised of two flat-faced fittings with an O-ring seal that are joined together with a union nut (see figure 1). They are used to provide a separable connection in pipe

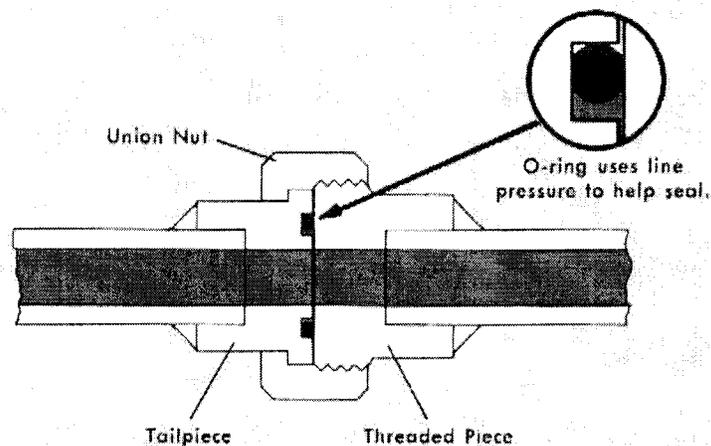


Figure 1
O-Ring Seal CPV Type Union

and tube systems and are available in pipe sizes up to two and a half inches. CPV-type unions are used extensively in LaRC piping systems.

Reported problems have included blown O-rings, stripped threads, excessive torque requirements, and cracked nuts. As a result of these problems, some unions have experienced failures including loose fits, leaks and separation. The Pressure Systems Committee has investigated the cause of these failures and concluded that problems with this type of union stem from their sensitivity to piping misalignment and to bending loads applied to the joint. These conditions can lead to a loss of the sealing capacity of the o-ring seal, which precipitates the catastrophic failure of the union joint. Symptoms of a poorly aligned CPV union include (1) needing to cold spring the pipe to make the joint and (2) needing to apply a torque to the union nut in excess of the manufacturer's recommendations in order to achieve a leak free joint.

Personnel involved in the design of systems utilizing CPV type unions, or in the installation or maintenance of these unions should be aware that failures have occurred, and that the potential for equipment damage and/or personnel injury exists. Existing systems should be inspected for signs of misalignment or damage, and new installations should be in accordance with manufacturer's recommendations. Personnel operating valves or equipment in pressurized systems with CPV type union ends should ensure that both ends of the union are restrained to prevent the system piping from "whipping" should the union fail.

Facility Safety Heads (FSH), Facility Coordinators (FC), and their alternates shall be familiar with the requirements for approval of the use of CPV type unions in high pressure systems (>125 psig) at LaRC. A revision to LAPG 1710.40 – "*Safety Regulations Covering Pressurized Systems*" currently requires vent holes to be drilled in CPV type union nuts in systems operating above 3000 psig (it is important that the vent holes be drilled in the thread relief area of the nut, as shown in LAPG 1710.40, and not through a threaded area). A revision will be issued to include a special requirement to have Standard Practice Engineer (SPE) approval prior to the use of CPV-type unions 2 inch or larger in size, in any pneumatic system above 2400 psi. In addition, training in the proper installation and maintenance of CPV-type unions will be offered at LaRC in the near future.

Questions regarding the design, installation, and use of CPV type union fittings should be referred to Robbie Kerns (46932), Standard Practice Engineer for Pressurized Systems.


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