

Subject: Urgent Inspection of DLSS Union Nuts

Background: The US Navy has experienced failure of Silica Aluminum Bronze (SAB) union nuts in high-pressure air systems. It is assumed that SAB union nuts are installed throughout all of the Diver's Life Support Systems (DLSS) that are certified by NAVFAC. While it is known that some of the installed union nuts are fabricated from material other than SAB, the NAVFAC SCA has confirmed with vendors that the majority of union nuts installed in shore based hyperbaric systems, built since 1998, are in fact SAB. This investigation has also determined that the installation of SAB union nuts pre-dates 1998. Thus the expenditure of time and effort to identify material by acid spot check is not warranted. SAB union nuts are known to be highly susceptible to Stress Corrosion Cracking (SCC), especially when subjected to Ammonia. SCC can also be induced/accelerated via other agents such as sulfates, nitrates, nitrites, as well as chloride-containing species. NAVFAC SCA does not believe that a significant safety problem exists in currently certified shore based hyperbaric systems. However, obtaining field data is required to substantiate this belief. NAVSEA 00C systems have identified failures and cracks in portable and afloat systems necessitating union nut removal and repairs. The current NAVFAC position is based upon the distinction that shore based systems are different than NAVSEA systems by design and mission application. Due to numerous variables such as differences in applied torque, mission environments (less likely sources of ammonia), as well as differences in structural loadings, establishing a current health baseline of NAVFAC certified systems by 100% visual inspection is required. Pending the field feedback, a long term NAVFAC solution will be implemented.

1.0 Action:

1.0.1 Inspect all union nuts installed in diver's life support systems in the following order of priority:

- a) All HAZCAT I union nuts – those union nuts installed between chamber backup valves and chamber shell (ie all union nuts whose failure would require immediate action to mitigate impact to diver and/or chamber occupants).
- b) All high-pressure divers air and oxygen system union nuts.
- c) All union nuts critical to the integrity of Fire Suppression Systems.
- d) All remaining union nuts in Scope of Certification (ie medium and low pressure air and oxygen systems).

1.1 Perform a 5X visual surface inspection of each union nut for cracks on external surfaces (no disassembly required). Clean nut for inspection if necessary. Pay particular attention to high stress areas such as thinnest part of flats at open end, area near approximate end of thread engagement with mating piece, and near vibro-tool markings. Qualified diver or equivalent should perform inspection. Complete data sheet as identified in section 1.2 below.

1.2 Union Nut Inspection Data Sheet Instructions

- 1.2.1 BLOCK 1: Joint Identifier & System Location - Enter enough information to determine which union was inspected. Use of additional identification information such as sketches or drawings is acceptable.
- 1.2.2 BLOCK 2: System & Joint Size – Enter system and joint size.
- 1.2.3 BLOCK 3: General Union Nut Condition – The purpose of this block is to capture the in-service condition, wear and tear, of the union nut. Some union nuts are disassembled more than others leading to tool marks, and wrench flats worn from disassembly.
- 1.2.4 BLOCK 4: General Environment – Document the environment that the union assembly is subjected to (ie, Union is outside in pier side charging panel, corrosion of other adjacent items present). Annotate if there is a source of Ammonia or Salts?
- 1.2.5 BLOCK 5: Comments – Inspect with 5X minimum magnification and provide comments such as “No Cracks Found Nut in Good Condition” or “1/16th Inch Crack Found See Photo #s”. This is the block that should contain the information regarding % of inspection. The intent is to identify 100% of all union nuts, and then denote those that could not be inspected and those only partially inspected.
- 1.2.6 Complete the data sheet by ensuring the facility name and location are entered at the top of the table and complete the signature block, as well as the total page count. Append any additional information such as photos or sketches to the data sheets.
- 1.2.7 Forward completed package and any questions to NAVFAC SCA via fax, e-mail (PDF) and/or mail as follows:

Attention: Rob Smith (202-433-8772) or Bob Bauer (202-433-8766)

FAX # 202-433-2280

robert.c.smith@navy.mil

robert.m.bauer@navy.mil

Hyperbaric System Certification Authority
NAVFACENG SERCEN ECDDET
Code 07FH, BLDG 36
720 Kennon St. SE, Suite 333
Washington Navy Yard, DC 20374-5063

Union Nut Inspection Data Sheet

FACILITY NAME & LOCATION _____

<u>BLOCK 1</u> Joint Identifier & System Location (ie Union between AHP-V1 & V2)	<u>BLOCK 2</u> System & Joint Size	<u>BLOCK 3</u> General Union Nut Condition (ie, Numerous tool marks, wrench flats worn from disassembly)	<u>BLOCK 4</u> General Environment (ie, Union is outside in pier side charging panel, corrosion of other adjacent items present). <i>Is there a source of Ammonia or Salts?</i>	<u>BLOCK 5</u> Comments – Inspect with 5X minimum magnification and provide comments (ie, No Cracks Found Nut in Good Condition or 1/16 th Inch Crack Found See Photo #s). Clean Nut For Inspection If Necessary

Signature and Date (Print Name and Rank) _____