Process Specification for the Installation of Helical Coil Inserts

Engineering Directorate

Structural Engineering Division

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Verify correct version before use.

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Prepared by:  
Jay E. Bennett  
Materials and Processes Branch  
ES4

Approved by:  
Bradley S. Files, Chief  
Materials and Processes Branch  
ES4

REVISIONS

<table>
<thead>
<tr>
<th>VERSION</th>
<th>CHANGES</th>
<th>DATE</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>Original version</td>
<td>4/19/99</td>
</tr>
<tr>
<td>A</td>
<td>Changed Division name. Added information and requirements for specifying thread class in Usage section, and added verification requirement for proper class of tap to Process Verification section. Moved threadform verification requirement from Process Requirements to Process Verification Section. Moved Work Instructions from section 3.1 to section 6.1 and revised them, restructured section 6.</td>
<td>10/2004</td>
</tr>
<tr>
<td>B</td>
<td>Updated document numbers in Section 4.0 (References)</td>
<td>2/2007</td>
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<tr>
<td>C</td>
<td>Clarified the effect of fit on insert performance, made changes in the usage section, including a table for standard insert part numbers, added specification for metric insert installation, added requirements on hole countersinking and tang removal, and tightened up the verification requirements,</td>
<td>11/17/2010</td>
</tr>
<tr>
<td>D</td>
<td>Changes to Section 3.2 to clear up confusion with NASM and MS part numbering system.</td>
<td>4/18/2011</td>
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1.0 **SCOPE**

This process specification establishes the engineering requirements for the installation of helical coil inserts.

2.0 **APPLICABILITY**

This specification shall be applicable whenever the installation of helical coil inserts is invoked per section 3.0, “Usage”.

3.0 **USAGE**

3.1 **BACKGROUND:**

Helical coil inserts are made from a coil of wire with a diamond shaped cross section, which forms both internal and external threads. The inserts have a tang that is used to install the insert into tapped holes. After installation the tang is typically broken off and removed to allow the insert to accommodate threaded fasteners.

In their free state, helical coil inserts are larger than the tapped hole into which they are installed. During assembly, torque applied to the tang reduces the diameter of the first coil so that it can enter the tapped hole. The subsequent coils are reduced in diameter as they are screwed into the tapped hole. When the applied torque is removed, the coils expand to provide an interference fit with the tapped threads.

Holes for helical coil inserts are tapped with a special tap known as a Screw Thread Insert (STI) tap. Helical coil STI taps are available in both Class 2B and Class 3B fits. The class of fit of the tapped hole determines the class of fit of the assembled insert. Class 2B threads provide the maximum production tolerances and reduce galling and interference, but may result in lower running torques for locking inserts. Class 3B threads may result in higher or more consistent running torques for locking inserts. There is only one class of fit for metric series inserts.

3.2 **USAGE INSTRUCTIONS:**

Wet installation of inserts with corrosion preventative primer is standard for aluminum and dissimilar metal joints. However, in some design cases, (for example, very small helical coil inserts) the use of primer may not be recommended. The decision not to use sealant should be reviewed in advance with an ES Materials Engineer.
This process specification, insert part number, and thread class for helical coil inserts shall be specified on the engineering drawing using local notes, general notes, flag notes, or a combination thereof. Some examples of acceptable insert callouts are given in Figure 1 and Figure 2. These figures are guidelines and are not intended to be representative of every possible design concept.

*Field of Drawing*

![Field of Drawing Diagram]

*General Notes*

4. INSTALL HELICAL COIL INSERTS PER NASA/ISC PRC-9008. SEAL WITH SUPER KOROPON EPOXY PRIMER PER NASA/ISC PRC-4004.

*Parts List*

<table>
<thead>
<tr>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>MATERIAL</th>
<th>SPECIFICATION ITEM</th>
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<tr>
<td>3</td>
<td>525-700/910-704</td>
<td>SUPER KOROPON EPOXY PRIMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MS21209-4-10L</td>
<td>INSERT</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>.001</td>
<td>BRACKET</td>
<td>7075-T73 K AL ALLOY 6.00 x 5.75 x 3.75</td>
<td>AMS-QQ-A-220/A2</td>
</tr>
<tr>
<td>1</td>
<td>KE5334G10G</td>
<td>BRACKET ASSY</td>
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*Figure 1: Specification of Insert Thread Class Using a Local Note*
Figure 2: Specification of Thread Class Using a Flag Note

Since tang removal after installation is required by this specification, it is unnecessary to specify the removal of tangs on the engineering drawing.

The standard installation is countersinked as specified in NASM33537 or MA1567. The countersink also affects the depth the insert should be set below the surface. If a different (or no) countersink is required, it must be noted on the engineering drawing, along with the new insert depth.

Although the inch series part military standard (MS) inserts were converted to industry standard (NASM) inserts, the part numbers for inserts remain as MS part numbers.
The standard insert part numbers used at JSC are:

<table>
<thead>
<tr>
<th></th>
<th>Inch Series</th>
<th>Metric Series</th>
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<tr>
<td>Locking</td>
<td>MS21209</td>
<td>MA3329</td>
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<tr>
<td></td>
<td></td>
<td>MA3330</td>
</tr>
<tr>
<td>Free-Running</td>
<td>MS122076-122115</td>
<td>MA3279</td>
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<tr>
<td></td>
<td>MS122116-122155</td>
<td>MA3280</td>
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<td>MS122156-122195</td>
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<tr>
<td></td>
<td>MA3279</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MA3280</td>
<td></td>
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</table>

Other insert part numbers may be used, but may require special installation instructions to be placed on the engineering drawing. Alternate usage should be reviewed in advance with an ES Materials Engineer.

4.0 REFERENCES

All documents listed are assumed to be the current revision unless a specific revision is listed.

JPR 8500.4  Engineering Drawing System Manual

NASM8846  Inserts, Screw Thread, Helical Coil

NASM33537  Insert, Screw Thread, Helical Coil, Inch Series, Coarse and Fine Thread, Standard Assembly Dimensions for

MA1567  Insert, Screw Thread, Helical Coil Metric Series, Standard Assembly Dimensions For

5.0 MATERIAL REQUIREMENTS

None identified.
6.0 **PROCESS REQUIREMENTS**

6.1 **WORK INSTRUCTIONS**

All work procedures shall be performed to written procedures.

For work performed at JSC facilities, these work procedures shall consist of Detailed Process Instructions (DPI's).

For contracted work, the contractor shall be responsible for preparing and maintaining, and certifying written work procedures that meet the requirements of this specification.

6.2 **GENERAL REQUIREMENTS**

Hole preparation, installation and removal shall meet the requirements of NASM33537 and MA1567.

The holes shall be countersinked to the standard dimensions unless specifically called out on the engineering drawing.

Tangs shall be removed unless the engineering drawing specifically requires otherwise.

7.0 **PROCESS QUALIFICATION**

The helical coil insert installation process shall be qualified and accepted prior to assembly of production parts. This qualification shall provide documented evidence that the installation procedures are capable of meeting the requirements of this process specification and the engineering drawing. Any change to the procedure, tools, or insert type shall require requalification.

8.0 **PROCESS VERIFICATION**

Process verification shall be performed according to the requirements of NASM33537 or MA1567. In-process verification is required to assure that the correct STI tap is used (2B or 3B). The minor diameter, countersink, and threadform of the holes shall be verified prior to installation of helical coil inserts. Post-process verification of insert depth and tang count is required.
9.0 TRAINING AND CERTIFICATION OF PERSONNEL

This process shall be performed by personnel qualified through training or experience and certified by their supervision to conduct the process.

10.0 DEFINITIONS

None.