

Process Specification for Lockwiring

Engineering Directorate

Structural Engineering Division

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Process Specification for Lockwiring

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REVISIONS		
VERSION	CHANGES	DATE
--	Original version	5/15/96
A	Revised Section 4, 8	7/30/99
B	Changed Division name. Revised Section 3.1 (Work Instructions) and moved to Section 6.1, restructured Section 6, removed process qualification requirement in Section 7.0., revised Section 8.0, and revised Section 9.0 (Training).	10/2004
C	Updated document number in Section 4.0 (References)	1/2007
D	Updated Signatories, updated 3.0 Usage Section, added references in 4.0, added new requirements in 6.2, split out verifications in 8.0	5/2020

1.0 SCOPE

This process specification establishes the requirements for lockwire and safety cable installation in flight hardware.

2.0 APPLICABILITY

This specification shall be applicable whenever a lockwire or safety cable installation application is invoked per section 3.0, "Usage".

3.0 USAGE

This process specification shall be called out on the engineering drawing using a drawing note. Some examples:

LOCKWIRE PER NASA/JSC PRC-9005.

LOCKWIRE PER NASA/JSC PRC-9005 USING DOUBLE TWIST METHOD

SAFETY CABLE PER NASA/JSC PRC-9005.

The material and part number for the lockwire or safety cable shall be called out in the parts list.

If single twist or double twist is required by design, it shall be called out on engineering drawing, otherwise technician and inspector will determine which is more appropriate for the application.

4.0 REFERENCES

The following references were used to develop this process specification:

SOP-007.1 *Preparation and Revision of Process Specifications*

JPR 8500.4 *Engineering Drawing System Manual*

The following documents are referenced as an extension of the requirements given in this specification:

NASM33540 *Safety Wiring and Cotter Pinning, General Practices for*

NASM20995 *Wire, Safety or Lock*

AS3510 *Cable, Safety, Kit, Corrosion and Heat Resistant Steel, UNS32100*

Verify correct version before use.

AS3509	<i>Cable, Safety, Kit Nickel Alloy UNS N0660</i>
AS3655	<i>Cable, Safety, Kit Nickel Alloy UNS N0625</i>
AS4536	<i>Safety Cable Kit Procurement Specification and Requirement for Use</i>

5.0 MATERIAL REQUIREMENTS

No special materials are needed for this process.

6.0 PROCESS REQUIREMENTS

6.1 WORK INSTRUCTIONS

All work shall be performed to written procedures. The work instructions shall contain sufficient detail to ensure that the manufacturing process produces consistent, repeatable products that comply with this specification.

For work performed at JSC facilities, these work procedures 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

All lockwiring and safety cabling shall be performed according to the installation requirements of NASM33540.

Under torque or over torque to achieve hole alignment is prohibited.

In-process rework is allowed but new wire or cable shall be used.

7.0 PROCESS QUALIFICATION

None required.

8.0 PROCESS VERIFICATION

The following verifications shall be performed after installation is complete, in accordance with the engineering drawing and NASM33540:

Verify correct version before use.

- a. Verify, by color, the correct safety wire or safety cable material, was installed.
- b. Verify the correct diameter lockwire or safety cable was installed.
- c. Verify the correct lockwire or safety cable configuration geometry was used (including maximum length, span, and number in series).
- d. Verify the lockwire or safety cable is put in tension when the part tends to loosen.
- e. Verify the lockwire is tight but not overstressed.
- f. Verify lockwire looped around the head of a bolt/screw does not tend to come up over the head, creating slack in the lockwire.
- g. Verify safety cable meets the flex requirements of NASM33540.
- h. Verify positive attachment of ferrule to safety cable.
- i. Verify daily calibration of safety cable installation tool.
- j. Verify the method (single or double twist) meets the drawing requirements. If method is not specified, verify that the method is appropriate according to NASM33540
- k. Verify that lockwire pigtail has been bent back or under to prevent snagging per NASM33540, Section 5.

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.