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# Industry Vs. Military Standards...Know the Difference!

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# Industry Vs. Military Standards Know the Difference!

- Who is Josh Ohl

- 20 Years USAF 2W1X1 (ACFT Weapons)

- Flightline and Back-shop (Troubleshoot, repair, replace) USAF TO 1-1A-14 was the Bible!
    - FTD Instructor (Weapons, Basic Soldering, Advanced Wire Repair)



- 10 Years at KIHOMAC

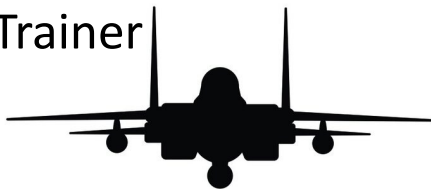
- Tech-writer, Wire Harness and Electronic MFG, Contract Field Team Installs



U.S. AIR FORCE

- Certifications

- CCAF Occupational Instructor
    - IPC J-STD-001 Space Trainer
    - IPC/WHMA-A-620 Space Trainer
    - NASA 8739.4 Trainer





# Industry Vs. Military Standards Know the Difference!

- What is the industry standard? History of IPC
  - IPC (Institute for Printed Circuits (1957), Institute for Interconnecting and Packaging Electronic Circuits (1960ish), IPC. (1999))
    - “Build Electronics Better” was their Goal (Standardize electronics MFG)
  - In 2025 they became “The Global Electronics Association”
    - This name better aligns with our mission, vision, and direction.





# Industry Vs. Military Standards Know the Difference!

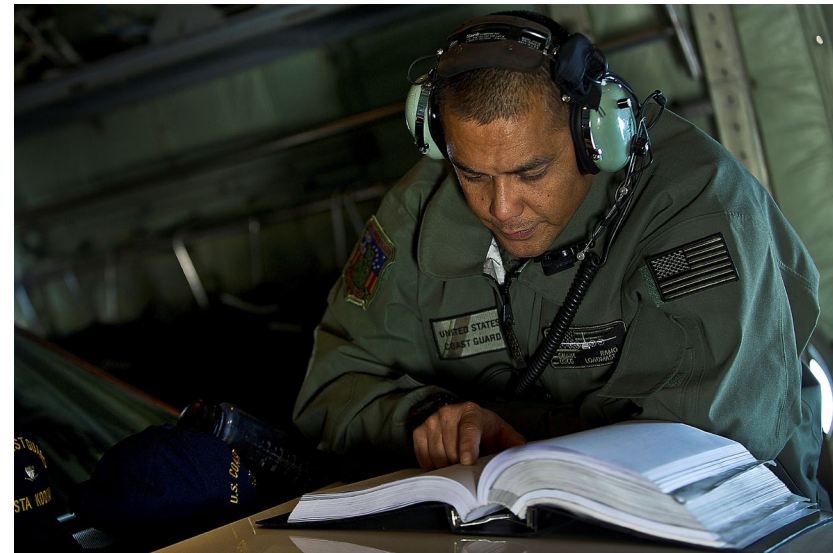
- Common Industry Standards

- IPC J-STD-001, Requirements for Soldered Electrical and Electronic Assemblies
- IPC-A-600, Acceptability of Printed Boards
- IPC-A-610, Acceptability for Electronic Assemblies
- IPC/WHMA-A-620, Requirements and Acceptance for Cable and Wire Harness Assemblies
- IPC-7711/7721, Rework, Modification and Repair of Electronic Assemblies
- Multiple Levels of Certification:
  - Certified IPC Specialist (CIS), Certified IPC Trainer (CIT), Master IPC Trainer (MIT), Certified Standards Expert (CSE)
- NASA-STD-8739.4, Workmanship Standard for Crimping, Interconnecting Cables, Harnesses, and Wiring



# Industry Vs. Military Standards Know the Difference!

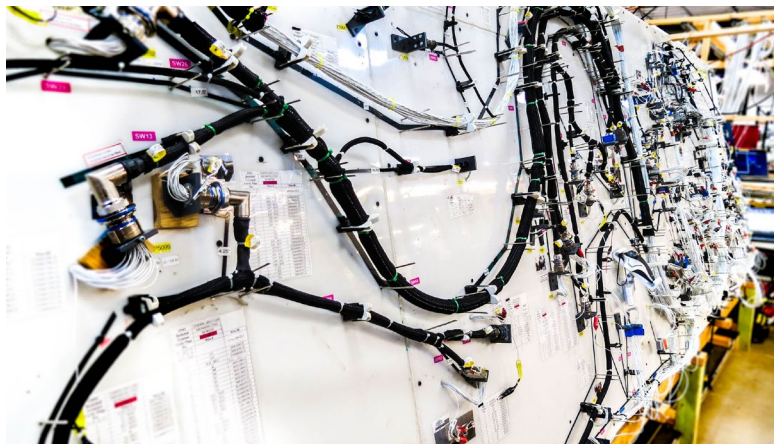
- Common Military Standards
  - AS50881, Wiring Aerospace Vehicle
  - NAVAIR 01-1A-505-1, TO 1-1A-14, TM 1-1500-323-24-1
    - INSTALLATION AND REPAIR PRACTICES, VOLUME 1 AIRCRAFT ELECTRIC AND ELECTRONIC WIRING
    - Wiring Bible!
  - Individual aircraft manuals
    - 1F-16XX-00-GV-00-X, WD, TM, Etc.
  - OEM Procedure Manuals
    - LM, Boeing, SNC, Etc.





# Industry Vs. Military Standards Know the Difference!

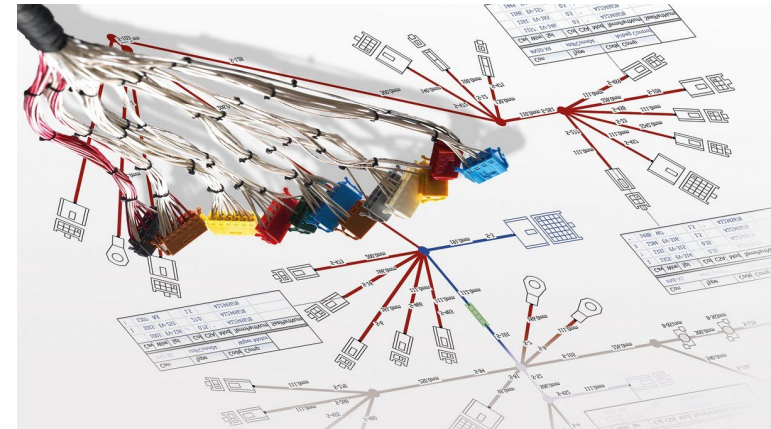
- What are your requirements?
  - Typically notes on the upper left of a drawing reference the STDs.
    - FABRICATE IAW SAE AS50881 AND INSPECT IAW IPC/WHMA-A-620, CLASS 3, UNLESS OTHERWISE NOTED.
      - AS50881 references many standards and also NAVAIR 01-1A-505-1
    - Fabrication conform IPC-620 Class III
    - Fabricate per OEM XXXXXXXXX





# Industry Vs. Military Standards Know the Difference!

- Major Differences between IPC/WHMA-A-620 and NAVAIR 01-1A-505-1
  - Make sure you are using the correct reference.
  - If a discrepancy exists, know the order of precedence
    - Verify customer desire and intent.
    - Get customer approval.
    - Be able to back up your decision with references.
  - Often a safer bet to adopt the more stringent standard.





# Industry Vs. Military Standards Know the Difference!

- Example 1: Strand Damage

- IPC mentions severed strands acceptable for Class 3, NAVAIR states None Broken or Severed

- Quantity of Nicked strands is more lenient in NAVAIR vs IPC

Table 3-1 Allowable Strand Damage<sup>1,2,3</sup>

| Number of Strands   | Maximum allowable strands scraped, nicked or severed for Class 1,2 | Maximum allowable strands scraped, nicked or severed for Class 3 for wires that will not be tinned before installation | Maximum allowable strands scraped, nicked or severed for Class 3 for wires that will be tinned prior to installation |
|---------------------|--|--|--|
| 1 (solid conductor) | No damage in excess of 10% of conductor diameter                   |  |  |
| 2-6                 | 0  | 0  | 0  |
| 7-15                | 1  | 0  | 1  |
| 16-25               | 3  | 0  | 2  |
| 26-40               | 4  | 3  | 3  |
| 41-60               | 5  | 4  | 4  |
| 61-120              | 6  | 5  | 5  |
| 121 or more         | 8%   | 5%   | 5%   |

**Note 1:** No damaged strands for wires used at a potential for 6 kV or greater.

**Note 2:** For plated wires, a visual anomaly that does not expose basis metal is not considered to be strand damage.

**Note 3:** Nicks or scrapes less than 10% of conductor diameter are not considered to be strand damage.

IPC/WHMA-A-620 Table 3-1

| Number of Strands per Conductor <sup>a</sup>   | Total Allowable Nicked or Broken Strands |
|--|--|
| 7  | None Nicked, Broken or Severed           |
| 19   | 2 Nicked, None Broken or Severed         |
| 37   | 4 Nicked, None Broken or Severed         |
| More than 37   | 6 Nicked, None Broken or Severed         |
| <sup>a</sup> No nicked or broken strands are permitted for aluminum conductor regardless of the number of conductor strands. |  |

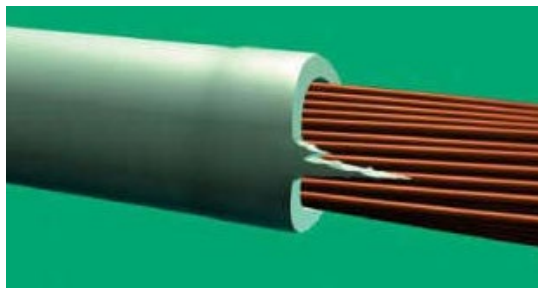
1-1A-14 WP 009 00 Pg 9 Table 5



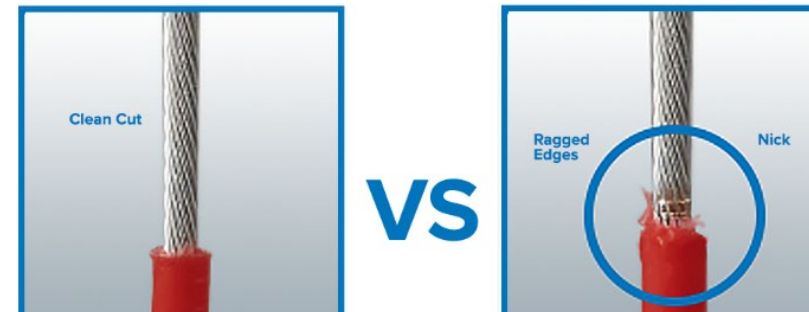
# Industry Vs. Military Standards Know the Difference!

- Example 2: Insulation Damage

- IPC – Defect if uneven or ragged pieces of insulation (frays, tails, and tags) are greater than 50% of the wire diameter or 1 mm (0.039 in), whichever is more.
- 1-1A-14 - The insulation shall not have gouges, ragged edges, be loose or frayed; not to exceed 1/32" (0.031). The end of the insulation shall be cut as squarely and cleanly as required to meet any soldering or crimping requirements. 1-1A-14 WP 009 00 Pg 10 Para 7d2



IPC/WHMA-A-620 Section 3.5

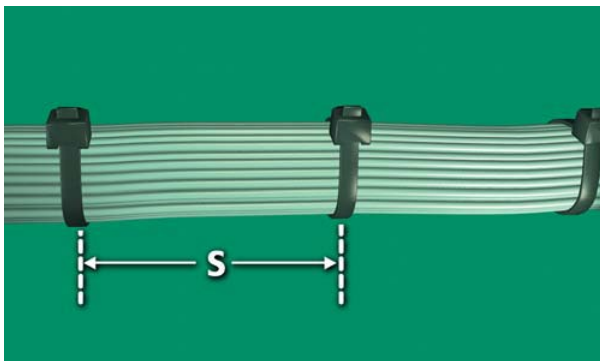




# Industry Vs. Military Standards Know the Difference!

- Example 3: Spacing of Ties

- IPC- Spacing of restraining devices from the rearmost connector accessory or between each other is 3 diameters of the wire bundle or 10 cm [4 in] whichever is less.
- 1-1A-14 -Install lacing ties as secondary wire support every 3" to 6" along the entire wire bundle. The spacing of spot ties used should be as indicated in Table 17. 1-1A-14 WP 010 00 Pg 37 Para 60e.



IPC/WHMA-A-620 Section 14.1.3

| Wire Bundle Diameter | Spot Tie Spacing |               |
|----------------------|------------------|---------------|
|                      | Max              | Not Less Than |
| up to ½"             | 4"               | 3"            |
| ½" to 1"             | 5"               | 3"            |
| 1" & larger          | 6"               | 3"            |

1-1A-14 WP 010 00 Pg 39 Table 17.



# Industry Vs. Military Standards Know the Difference!

- Example 4: Insulation Gap between Contact and Insulation
  - IPC - Insulation is greater than 1 but less than 2 wire diameters from the end of the contact barrel.
  - 1-1A-14 – 20AWG Insulation Gap 1/64" MAX
    - 20 AWG AS22759 is 0.0495" Diameter
    - 1/64 is 0.016
    - 1.9X Wire Diameter is 0.09405



IPC/WHMA-A-620 section 5.3.1

|      |         |
|------|---------|
| 1/64 | .015625 |
| 1/32 | .03125  |
| 3/64 | .046875 |
| 1/16 | .0625   |
| 5/64 | .078125 |
| 3/32 | .09375  |

1-1A-14 WP 013 00 Pg 5 Fig 2

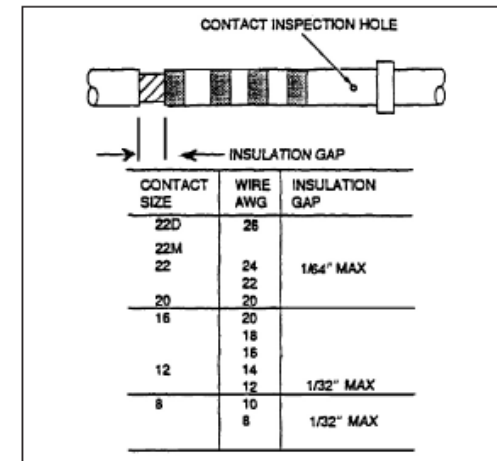


Figure 2. Insulation Gap



# Industry Vs. Military Standards Know the Difference!

- Summary
  - Know the Standards
  - Know your requirements
  - Know the differences
  - Communicate with your customer!
  - Questions?

