Workmanship Standards Personnel Training and Certification Explained

Jeannette Plante
NASA Workmanship Standards Program Manager
Personnel training and certification is the most recurrent compliance audit finding and the basis of most questions to the Workmanship Standards Program.

The forthcoming adoption of J-STD-001xS will bring new rules for personnel training and certification.

NASA-STD-8739.x will carry training and certification requirements that are explained herein.
NASA Workmanship Standards

» NASA-STD-8739.1 Polymeric Applications

» NASA-STD-8739.2 Surface Mount Technology

» NASA-STD-8739.3 Soldered Electrical Connections

» NASA-STD-8739.4 Crimp, Cable and Harnesses

» NASA-STD-8739.5 Fiber Optic Terminations

» ANSI/ESD S20.20 Electrostatic Discharge Safety

» IPC J-STD-001DS.1 Space Applications Electronic Hardware Addendum to J-STD-001D Requirements for Soldered Electrical and Electronic Assemblies
Workmanship Personnel Certification Requirements

*Found in NASA-STD-8739 series*

*In coordination for use of J-STD-001xS and ANSI/ESD S20.20*

Personnel: operators, inspectors, instructors

Retraining every two years
Meet vision requirements (except ESD)
Continuous competency
No more than a six month absence from performing related duties (except ESD)
Employer certifies (except IPC® Instructor)

*This is a Very shorthand-representation of the current and future rules.*

*Training ≠ Certification*
What is the Value of Workmanship Certification?

1. Provides organizational level oversight that certification conditions are being met continuously.
2. Provides a POC who can “vouch” for the personnel’s competency when they are assigned to the NASA job.
4. Prevents non-compliant personnel from being assigned to work on a NASA job.
5. Enables employer to apply additional certification requirements such as retraining and mentoring.
## Does Your Organization Certify Workmanship Personnel Properly?

<table>
<thead>
<tr>
<th>If your organization…</th>
<th>…then you may…</th>
</tr>
</thead>
<tbody>
<tr>
<td>…keeps track of operator, inspector, and Level B instructor certification compliance…</td>
<td>…certify correctly.</td>
</tr>
<tr>
<td>…depends on your operators, inspectors, and Level B instructors keep track of their own training schedule and completion…</td>
<td>…<em>NOT</em> certify correctly.</td>
</tr>
<tr>
<td>…gets feedback on performance from manufacturing and project teams on personnel competency…</td>
<td>…certify correctly.</td>
</tr>
<tr>
<td>…verifies certification compliance prior to assigning personnel to NASA jobs…</td>
<td>…certify correctly.</td>
</tr>
<tr>
<td>…uses J-STD-001 when the contract requires NASA-STD-8739.2 …</td>
<td>…<em>NOT</em> certify correctly.</td>
</tr>
<tr>
<td>…uses the training completion certificate or card as evidence of Workmanship certification…</td>
<td>…<em>NOT</em> certify correctly.</td>
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</table>
Who Trains?

**NASA Level A Training Center**
- W-NMTTC (JPL)
- E-NMTTC (GSFC)

**NASA Level B Training Center**
- W-NMTTC (JSC)
- E-NMTTC (MSFC)

- *Training is intended for NASA suppliers.*
- *All students allowed, foreign nationals require special approvals.*

- **Operator**
- **Inspector**
- **Operator/Inspector**

- **Operator**
- **Inspector**
- **Operator/Inspector**

- *Center personnel (JSC or MSFC)*
- *DCMA*
- *Center prime contractor personnel*
- *Center sub-contractor personnel*
Who Trains? continued

**Level B Instructor**
Suppliers (NASA or non-NASA)

- Operator
- Inspector
- Operator/Inspector

- Supplier personnel
- Subcontractor personnel

**ESD Instructor**
Suppliers (NASA or non-NASA)

- Operator
- Bench Monitor
- ESD Level B Instructor

- Personnel within the instructor’s organization
- Train to the local ESD Control plan
- “Other” per local control plan

**ESD Level B Instructor**
Suppliers (NASA or non-NASA)

- Operator
- Bench Monitor
- “Other” per local control plan

- Personnel within the instructor’s organization
- Train to the local ESD Control plan
Who Trains? …one more

Certified Master IPC® Trainers (MIT) Industry

- Certification and curriculum is controlled by the IPC.
- No limit on type of students

Certified IPC® Trainers (CIT)

- Operator
- Inspector
- Operator/Inspector

Certified IPC® Specialist (CIS)

- Operator Inspector
- Operator/Inspector

IPC® J-STD-001xS Course

Supplier-custom J-STD-001xS Course

Certified IPC® Trainers (CIT) Industry

- Operator
- Inspector
- Operator/Inspector

IPC® J-STD-001xS Course

Supplier-custom J-STD-001xS Course

Certified IPC® Specialist (CIS)

- Operator Inspector
- Operator/Inspector
IPC® Certification at CIS level = Training Completion
IPC® Certification at CIS level ≠ NASA Certification

NASA Certification:
Training: NASA-STD-8739, ESD, IPC® Certification (CIS)
Vision Screening *
Continuous Competency
Continuous Activity *

* Not required for ESD

Supplier’s certification process shall be documented.

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IPC® Certification at MIT & CIT level = NASA Certification
Additional Caveats to Certification Rules

- **Level A Instructors**
  Certified by NASA Workmanship Program Manager
  Must participate in review of final drafts of NASA Workmanship standard updates.

- **Level B Instructors at NASA Level B Training Center**
  Audit by a civil servant Level B instructor may be used as a substitute for retraining.
  Must participate in review of final drafts of NASA Workmanship standard updates.

- **ESD**
  Visual screening not required
  Continuous activity not required

- **ESD Instructors**
  Training and retraining per local rules, Maximum retraining cycle is 2 years
  Use of Level B instructors per local rules.

- **IPC MIT and CIT**
  NASA certification not required.
  IPC certification is sufficient.
Does ANSI/ESD S20.20 Training Count Toward Operator Certification for ESD?

No.
ANSI/ESD S20.20 requires development and use of a local control plan.
ESD training must be to the local control plan.

Tight on resources for developing control plan and training program?
Download NASA-HDBK-8639.21 for control plan template*. E-NMTTC is developing a training program which will teach to the recommendations in NASA-HDBK-8739.21.

* Google shows three ways to find the document
# Portability of Certification and Training

<table>
<thead>
<tr>
<th>Type</th>
<th>Portability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA Certification</td>
<td>Not Portable</td>
</tr>
<tr>
<td>NASA-STD-8739 Training from Level A or NASA Level B Training Center</td>
<td>Portable</td>
</tr>
<tr>
<td>NASA-STD-8739 Training from a “local” source (Level B instructor)</td>
<td>Portable via traceability to Level B Instructor and use of “complete” curriculum. Employer may wish to retrain due to lack of direct knowledge of content and quality of prior training.</td>
</tr>
<tr>
<td>Limited NASA-STD-8739 Training</td>
<td>May not be portable</td>
</tr>
<tr>
<td>ESD Training</td>
<td>Not Portable</td>
</tr>
<tr>
<td>J-STD-001xS Training</td>
<td>Portable</td>
</tr>
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Certification and Training Records

Certification:
Maintained by employer for five years
Available for verification audit on the worksite

Training:
Maintained by the employer and the training center for five years
Rules for Registering for Training

Vision screening is a prerequisite:

• Far Vision. Snellen Chart 20/50.
• Near Vision. Jaeger 1 at 355.0 mm (14 inches), reduced Snellen 20/20, or equivalent.
• Color Vision. Ability to distinguish red, green, blue, and yellow colors as prescribed in Dvorine Charts, Ishihara Plates, or AO-HRR Tests. A practical test using color coded wires or electrical parts is acceptable for color vision testing.

These are long established by NASA Workmanship standards. Far vision is being questioned.

Required every two years by a certified specialist, technician, instructor

Corrected vision allowed (glass or contact lenses)
Rules for Registering for Training

NASA-STD-8739.1
NASA-STD-8739.2
NASA-STD-8739.3
NASA-STD-8739.4
NASA-STD-8739.5
IPC J-STD-001xS

An initial class is required. Typically lasts one week.

If the prior training was completed within 27 months, then a shortened retraining class is permitted.

Some soldering experience is assumed. Soldering is not taught, requirements are taught.

NMTTC will recognize prior training from another NMTTC or a NASA Level B Training Center. All others must take initial training from NMTTC before they are eligible for NMTTC retraining.

ESD

Duration is between ½ day to three four days depending on level

Classes are generally the same every two years with no difference between training and retraining.
Training Materials Provided to NASA Level B Trainers and IPC CITs

• Lecture slide shows
• Procurement information for materials needed for practical exercises and exam
• Quizzes and Exams
• Tools list
• Standards and Student Workbooks

Computer-based training content allowed with conditions. Computer-based content does not replace practical exercises and exams.
Calibration of Training Center Equipment

• Not all training equipment requires regular calibration

• Training center equipment shall be maintained and checked in a manner that ensures that students are able to obtain normal results using the recommended techniques, and are not prevented from successful course completion due to underperforming classroom equipment or supplies.

• Expired calibration stickers shall not be left on equipment that does not require calibration.
• Calibrated equipment shall carry current calibration stickers.
• Expired calibration stickers being used as teaching aids shall be identified as such to ISO auditors.
Local Training Center Rules

Flexibility is provided to NASA Training Centers for establishing local management policies.

- Last-minute registration
- Single-student classes
- No-shows
- Lateness or absences
- Non-payment (where fees apply)
- Badge-ing and security issues
DCMA Training

Initial training taken from
- NASA Level A instructor
- NASA Level B instructor*
- DCMA Level B instructor

Retraining taken from
- NASA Level A instructor
- NASA Level B instructor*
- DCMA Level B instructor
- CD-Based course developed by DCMA and reviewed and approved by NASA

* At a NASA Level B Training Center

DCMA and NASA have an agreement regarding recertification of personnel away from inspecting for greater than six months due to deployment to Iraq and Afghanistan.
Additional Courses Offered by NASA Training Centers

Additional courses may be offered at NASA Training Centers to meet local needs or Agency needs.

E-NMTTC will offer a training course designed for ESD Control plans which adheres closely to NASA-HDBK-8739.21

NASA Workmanship Standards policy does not apply to these additional courses or to non-certification courses.
Operators & Instructors as Inspectors

In small organizations there is a need to enable instructors and operators to also act as inspectors.

- NASA Level B Instructor (also operator/inspector)
- Operator/Inspector
- Operator
- Inspector

Students must either take additional training and testing to be an NASA Standards operator/inspector or become a Level B Instructor.
Allowed Curriculum Variations

NASA-STD-8739 Series:

• **Addition of local rules which exceed baseline**
  
  *If delivered by a Level A or NASA Level B trainer, these cannot impact student’s ability to pass class*

• **Reduction of full baseline by excluding specific technologies (e.g. types of splices, connectors, or hand-soldered joints)**
  
  *Topics covered/not covered must be recorded on training card and record. May affect student’s ability to take shortened retraining.*

• **Different exams and grading criteria for operators vs. inspectors**
  
  *Students must pre-identify which they will take or if they plan to take both.*
Allowed Curriculum Variations

IPC J-STD-001xS:

• **Addition of local rules which exceed baseline**

*If providing an IPC training certification, IPC standard tests must be used with no additions.*

• **Reduction of full baseline by excluding specific technologies**

*Students to take Modular IPC J-STD-001xS course can opt out of topic areas – see later slides.*

• **Different exams and grading criteria for operators vs. inspectors**

*Students must pre-identify. Operators may also act as inspectors. “Inspectors-only” cannot act as operators.*
Allowed Curriculum Variations

IPC J-STD-001xS:
• IPC Modular or IPC Non-Modular Class is acceptable
  *Explained in later slide*

• Use of local training program is acceptable.
  *Must make available to NASA Project for review and approval.*
  *Must not use copyrighted IPC material (text, images) without permission.*
  *Trainer Must be IPC MIT or IPC CIT*

• Challenge Testing Allowed for CIS (not for CIT)
  *Must complete all practical exams with passing grade.*

• IPC J-STD-001xS & NASA-STD-8739:
  *Shortened retraining class may be used following initial full-length class.*
  *After 24 months + 3 months grace period*
VCS Work on Polymeric Applications

NASA-STD-8739.1 Polymeric Applications

Conformal coating, staking, bonding, encapsulation
Hands-training at NMTTC’s and NASA Level B Training Centers

J-STD-001xS, Chapter 10

Conformal coating, encapsulation
No hands-on training

Workmanship policy will continue to require NASA-STD-8739.1 and will not use J-STD-001xS, Chapter 10

Path forward:
• requirements gap analysis (in process)
• gap risk rating
• close requirements gaps
• create hands-on IPC training
Traditional Course

“Modular”

2 ½ to 5 ½ day class depending on which modules are taken, operators take different modules than inspectors, operator modules 2-4 are technology-specific, DS material is in Module 6.

All quality levels and all subject matter are taught (Class 1, 2 and 3) in whole day classes.

All practical exercises and tests are to Quality Level 3 (military).

½ day class covers “Space” requirements and Pb-free info.

Challenge testing is offered as alternative to attending course (not applicable to Space Module).

“Space-only” Course

“Non-Modular”

4 day class. Class is not Modular (must take all four days)

Only Space Quality Level is taught. Includes Chapter 10 material.

Practical exercises use same hardware as Modular class. Different rating scale for operators and inspectors.

Trainees: Take Traditional Course + Space Module, then can teach Modular or Non-Modular Course
Modular Course

The minimum requirement for operators taking the IPC Modular course for J-STD-001xS is M1, M6 and any one of the other four modules.

Inspectors take M1, M5, M6

Instructors must take all modules.
• No absences greater than 10% of the course time
• Written exam grade: $\geq 80\%$
• Written and practical exam scores shall not be averaged.

### J-STD-001\times S Modular Course Completion Requirements

<table>
<thead>
<tr>
<th>Student</th>
<th>Passing Score for Module</th>
<th>Module Taken</th>
</tr>
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<tbody>
<tr>
<td>Operator</td>
<td>80%</td>
<td>M1, [M2, M3, M4], M6</td>
</tr>
<tr>
<td>Inspector</td>
<td>80%</td>
<td>M1, M5, M6</td>
</tr>
<tr>
<td>Operator/Inspector</td>
<td>80%</td>
<td>M1, [M2, M3, M4], M5, M6</td>
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Summary
The matrix of combinations of types of training and types of students is large and difficult to describe succinctly. NASA-STD-8739.x will codify applicable policy and can be used as a reference.

NASA requires operators and inspectors to be certified by their employer to ensure that oversight is being performed.

Certification > Training