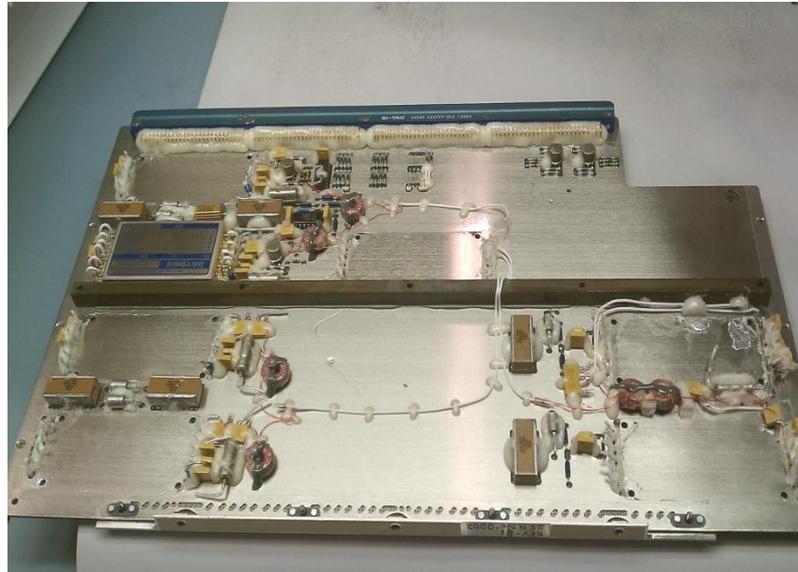


Workmanship Standards Personnel Training and Certification Explained



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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

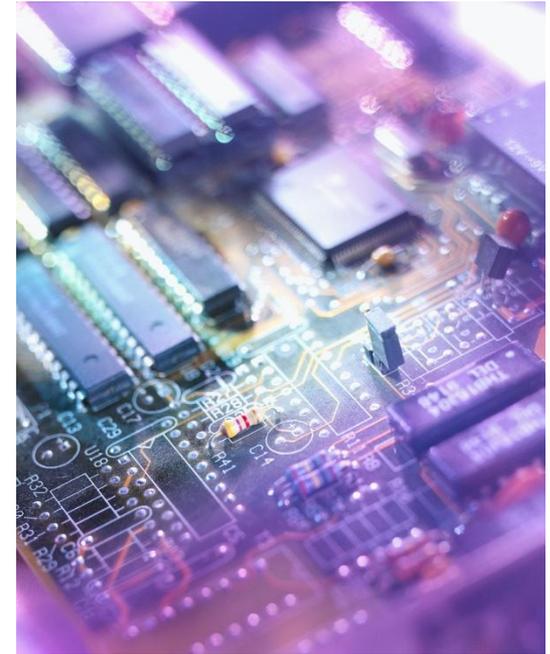
»NASA-STD-8739.3 Soldered Electrical Connections

»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.
3. Provides a means for removal of non-compliant personnel from a 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?

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



Who Trains?

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

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

NASA Level B
Instructor

Level B
Instructor

Operator

Inspector

Operator/Inspector

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

- *Center personnel (JSC or MSFC)*
- *DCMA*
- *Center prime contractor personnel*
- *Center sub-contractor personnel*

Operator

Inspector

Operator/Inspector



Who Trains? continued

Level B Instructor

Suppliers (NASA or non-NASA)

- *Supplier personnel*
- *Subcontractor personnel*

Operator

Inspector

Operator/Inspector

ESD Instructor

Suppliers (NASA or non-NASA)

- *Personnel within the instructor's organization*
- *Train to the local ESD Control plan*

Operator

ESD Level B
Instructor

“Other” per local control plan

Bench Monitor

ESD Level B Instructor

Suppliers (NASA or non-NASA)

- *Personnel within the instructor's organization*
- *Train to the local ESD Control plan*

Operator

“Other” per local
control plan

Bench Monitor



Who Trains? ...one more

Certified Master IPC[®] Trainers
(MIT)
Industry

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

IPC[®] J-STD-001xS Course

Supplier-custom J-STD-001xS Course

Certified IPC[®]
Trainers (CIT)

Certified IPC[®]
Specialist (CIS)
Operator
Inspector
Operator/Inspector

Operator

Inspector

Operator/Inspector

Certified IPC[®] Trainers (CIT)
Industry

- *Center personnel (JSC or MSFC)*
- *DCMA*
- *Center prime contractor personnel*
- *Center sub-contractor personnel*

IPC[®] J-STD-001xS Course

Supplier-custom J-STD-001xS Course

Certified IPC[®]
Specialist (CIS)
Operator
Inspector
Operator/Inspector

Operator

Inspector

Operator/Inspector



IPC[®] Certification at CIS level = Training Completion

IPC[®] Certification at CIS level \neq 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.

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

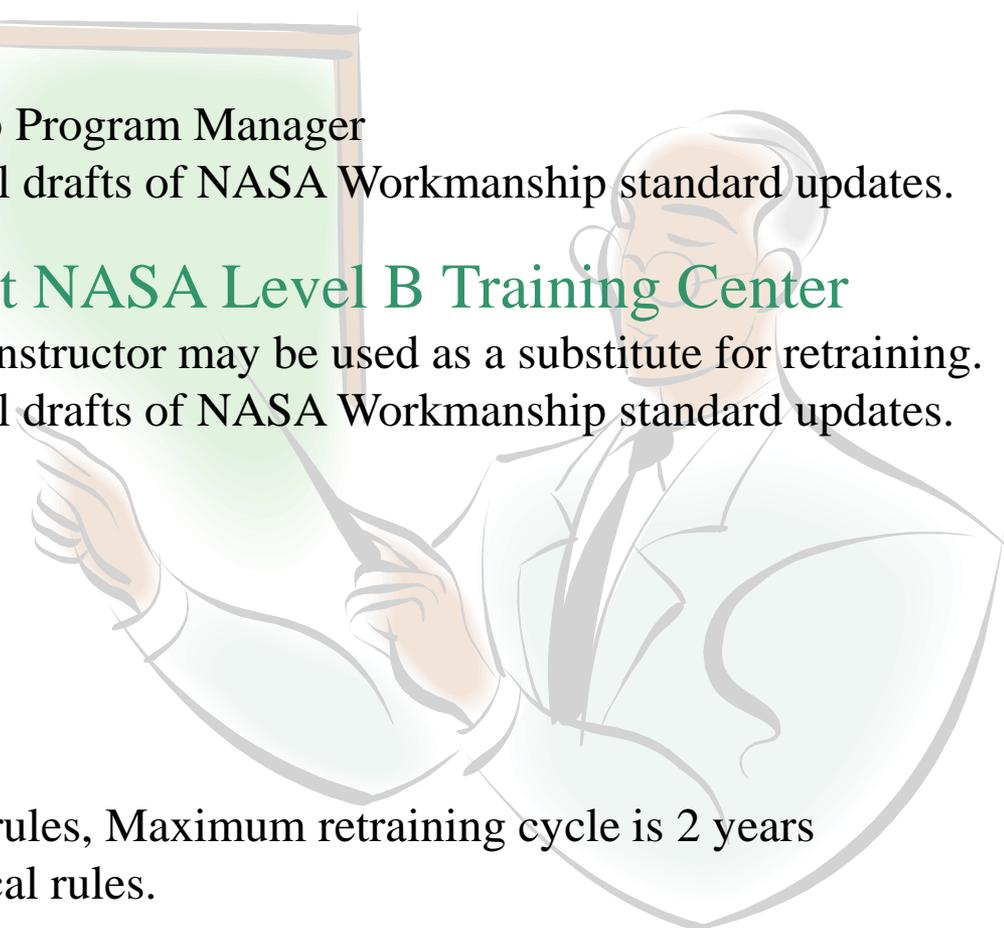
Training and retraining per local rules, Maximum retraining cycle is 2 years

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

Type	Portability
NASA Certification	Not Portable
NASA-STD-8739 Training from Level A or NASA Level B Training Center	Portable
NASA-STD-8739 Training from a “local” source (Level B instructor)	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.
Limited NASA-STD-8739 Training	May not be portable
ESD Training	Not Portable
J-STD-001xS Training	Portable



Office of Safety and Mission Assurance



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

ESD

Duration is between 1/2 day to three four days depending on level

Classes are generally the same every two years with no difference between training and retraining.

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.



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.

CALIBRATED	
By: _____	Date: _____
Due: _____	



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

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.

* At a NASA Level B Training Center



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 adhere 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.



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



J-STD-Training Model

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.

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



TOPIC	MODULE 1	MODULE 2	MODULE 3	MODULE 4	MODULE 5	MODULE 6 -
Certification programs	X					X
General soldering and assembly topics	X					X
Tin whiskers	X					X
Solder alloys, including lead-free	X					X
Flux	X					X
Environmental factors	X					X
Wire and terminal assembly/soldering	x Summary	X			X	X
Through-hole mounting and terminations	x Summary		X		X	X
Surface mounting of components	x Summary			X	X	X
Inspection skills (Product Assurance)	x Summary			X	X	
Coating and encapsulation	Refers to 8739.1		X	X	X	X
PCBs				X	X	X
Inspection pictures Set I		X				
Inspection pictures Set II					X	
Inspection pictures Set III	X					
Rework and Repair			X			X
Cleaning Process Requirements	X					X

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.



NASA-STD-8739 & J-STD-001xS Non-Modular Course Completion Requirements

- No absences greater than 10% of the course time
- Written exam grade: $\geq 80\%$
- Written and practical exam scores shall not be averaged.

Student	Passing Score for Assembly	Passing Score for Inspection
Operator	85%	80%
Inspector	80%	85%
Operator/Inspector	85%	85%

J-STD-001xS Modular Course Completion Requirements

Student	Passing Score for Module	Module Taken
Operator	80%	M1, [M2, M3, M4], M6
Inspector	80%	M1, M5, M6
Operator/Inspector	80%	M1, [M2, M3, M4], M5, M6



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

