

LPR 8739C

Effective Date: May 6, 2025
Expiration Date: May 31, 2030

Langley Research Center

Workmanship Standards Personnel Certification Program

National Aeronautics and Space Administration

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CHANGE HISTORY LOG

Status	Document Revision	Approval Date	Description	Approval
Baseline	A	August 9, 2011	Initial Release	Stephen G. Jurczyk Deputy Director
Revision	B	May 21, 2020	Revision	David Young Deputy Director
Revision	C	TBD	Revision	David Young Deputy Director

PREFACE

P.1 PURPOSE

a. This document sets forth certification requirements for performing work covered by the NASA Workmanship Standards at Langley Research Center (LaRC), as well as the requirements for recertification and maintenance of the workmanship certifications. Workmanship is the control of design features, materials, and assembly processes to achieve the desired performance and reliability for subassembly interconnections—specifically those in printed wiring assemblies and cable harnesses—and the use of inspection techniques and defect criteria to assure interconnect quality. Workmanship standards promote design and fabrication practices that facilitate repeatable, high-quality outcomes and that have a strong history of success in space missions. Obtaining and maintaining workmanship certification is an important part of a quality system.

b. The requirements in this directive are mandatory for personnel working on projects involving flight hardware and mission critical ground support equipment for spaceflight projects that include atmospheric science instruments, satellites and missions, International Space Station payloads and experiments, and planetary science payloads and missions. These requirements may also be required on risk-reduction flights, flight experiments, flights of opportunity that are sub-orbital, sounding rockets, un-crewed aerospace vehicles, drop models, and major Unmanned Aerial Vehicle (UAV) operations, as specified in their respective Product Assurance Plans.

P.2 APPLICABILITY

a. This LPR is applicable to all LaRC employees and contractors to the extent specified in their contracts.

b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall.” The terms: "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.

c. In this directive, all document citations are assumed to be the latest version, unless otherwise noted.

P.3 AUTHORITY

a. National Aeronautics and Space Act, 51 U.S.C. § 20113 (a).

P.4 APPLICABLE DOCUMENTS AND FORMS

a. LPR 8739.21, Langley Research Center (LaRC) Procedures and Guidelines for Electrostatic Discharge (ESD) Control of ESD-Sensitive (ESDS) Devices Program.

b. LMS-CP-4316, Off-Site/On-Site Training Process.

c. LF 359, Workmanship Standards Certification Record.

d. NASA-STD-8739.1, Workmanship Standard for Polymeric Application on Electronic Assemblies.

e. NASA-STD-8739.4, Workmanship Standard for Crimping, Interconnecting Cables, Harnesses, and Wiring.

f. NASA-STD-8739.5, Workmanship Standard for Fiber Optic Terminations, Cable Assemblies, and Installation.

g. NASA-STD-8739.6, Implementation Requirements for NASA Workmanship Standards.

h. IPC J-STD-001 with Space Addendum, Requirements for Soldered Electrical and Electronic Assemblies.

i. IPC/WHMA-A-620C With Space Addendum, Requirements and Acceptance for Cable and Wire Harness Assemblies.

P.5 MEASUREMENT/VERIFICATION

NONE

P.6 CANCELLATION

LPR 8739B, dated May 21, 2020

Allen Kilgore May 6, 2025
Deputy Director Date

Distribution:
Approved for public release via the Langley Management System; distribution is unlimited.

CHAPTER 1: INTRODUCTION

1.1 PURPOSE

This document establishes responsibilities for training and certifying Langley Research Center (LaRC) personnel performing work as instructors, inspectors, and operators covered by the NASA workmanship standards, including those for Polymeric Application on Electronic Assemblies; Crimping, Interconnecting Cables, Harnesses, and Wiring; Fiber Optic Terminations; Requirements and Acceptance for Cable and Wire Harness Assemblies (IPC/WHMA-A-620), and the IPC J-Standard for Soldered Electrical and Electronic Assemblies as adopted by NASA Headquarters (HQ).

1.2 SCOPE

1.2.1 This document is applicable to LaRC personnel working on projects involving flight hardware, mission critical ground support equipment, and elements thereof, as stipulated in their project Product Assurance Plans (PAP).

1.2.2 These workmanship standards' requirements shall be used for spaceflight projects that include atmospheric science instruments, satellites and missions, International Space Station payloads and experiments, and planetary science payloads and missions. These requirements may also be required on risk-reduction flights, flight experiments, flights of opportunity that are sub-orbital, sounding rockets, un-crewed aerospace vehicles, drop models, and major Unmanned Aerial Vehicle (UAV) operations.

1.2.3 NASA-STD-8739.6 sets forth requirements for Level A instructors, Level B instructors, inspectors, and operators performing work under the NASA workmanship standards. Level A instructors are responsible for training Level B instructors, who in turn train personnel to be certified under the workmanship standards at LaRC to perform workmanship operations and inspections.

CHAPTER 2: VISION, TRAINING, & CERTIFICATION

2.1 GENERAL

2.1.1 Personnel performing duties that involve workmanship standard disciplines (e.g., polymerics; fiber optics; crimping, wiring, cables, and harnesses; and soldering) shall be certified under the applicable standard as either instructors (i.e., Level A or Level B), operators, or inspectors.

2.1.2 Level A instructors are proficient in the knowledge of workmanship standards allowing personnel to facilitate training courses to Level B personnel in the relevant workmanship standards. Level A instructors are trained and certified to train Level B instructors, operators, and inspectors.

2.1.3 NASA LaRC Level B instructors are personnel trained by a Level A instructor. Level B instructors have proficient knowledge in workmanship standards and facilitate training courses to his or her internal team (e.g., NASA Center) comprised of operators and inspectors in the relevant workmanship standards. NASA LaRC Level B instructors are trained and certified to train operators and inspectors.

2.1.4 Inspectors are trained and certified to inspect for conformance to the requirements of the discipline standard.

2.1.5 Operators are trained and certified to perform discipline tasks in conformance with the requirements of the applicable standard.

2.1.6 Certified operators shall be authorized to perform work on flight and flight-associated hardware.

2.1.7 Certified inspectors shall be authorized to approve flight and flight-associated hardware.

2.1.8 Operators, inspectors, and instructors shall be qualified to fulfill all requirements of the applicable workmanship standard for their assigned tasks.

2.1.9 Certification shall consist of appropriate training, medical protocols, and supervisor’s signature per NASA Langley Form (LF) 359, “Workmanship Standards Certification Record.” Proficiency and understanding of the requirements shall be a requisite for both certification and recertification.

2.2 VISION REQUIREMENTS

2.2.1 Vision testing shall be a prerequisite for initial training and retraining. Vision testing shall not be required for Electrostatic Discharge (ESD) training or ESD certification unless required by the local ESD Control Program.

2.2.2 Vision screening shall be performed within 23 months of the training or retraining start date, as a prerequisite for NASA workmanship standards training.

2.2.3 Vision tests shall be administered a minimum of once every two years by a qualified examiner using standard instruments and techniques.

2.2.4 Vision testing shall verify the following:

a. Near Vision – Ability to demonstrate near vision capability through Jaeger 1 at 14

inches (355.0 mm), reduced Snellen 20/20, or equivalent approved testing methods.

b. Color Vision – Ability to distinguish red, green, blue, and yellow colors as prescribed in Dvorine Charts, Ishihara Plates, American Optical Hardy-Rand-Rittler (AO-HRR) Tests, or equivalent approved testing methods. A practical test, using color coded wires or electrical parts, is acceptable for color vision testing.

2.2.5 Vision requirements may be met with corrected vision (e.g., eyeglasses or contact lenses).

2.2.6 Documentation indicating that minimum visual requirements have been met shall be made available to training centers, supervisors, and/or instructors when students register for workmanship training.

2.3 ELECTROSTATIC DISCHARGE (ESD)

2.3.1 ESD Certification is a prerequisite for all NASA workmanship standards.

2.3.2 ESD Certification shall be maintained on the employee's LF 359.

Note: When adding or updating entries on the LF 359, ensure all valid workmanship certification dates are transcribed to the newest document.

2.4 TRAINING

2.4.1 Training of Level B instructors is available at the East Coast NASA Manufacturing Technology Transfer Center (NMTTC) associated with Goddard Space Flight Center (GSFC) or the West Coast NMTTC associated with the Jet Propulsion Laboratory (JPL).

2.4.2 Training for LaRC personnel as operators and inspectors shall be from a certified NASA Level B Instructor, unless the LaRC Mission Assurance Branch Head approves training from another source.

2.4.3 Training shall be initiated and verified complete by the supervisor for personnel selected to perform duties requiring specific workmanship standards by:

a. Signing up personnel for training by adding them to the SATERN curriculum following the procedures laid out in Table 2-A.

b. Providing signed supervisor statement on personnel-completed NASA LF 359s.

2.4.4 Training shall be conducted by the appropriate personnel according to the hierarchy described in the certification level information (see Section 2.5).

2.4.4.1 Trainees shall obtain an electronic copy of their certification cards to show proof of certification.

Table 2-A. Workmanship Standard Certification Process

Discipline	Supervisor	Initial Certification	Documentation Required to Process Certification	Expiration
Crimping, Interconnecting Cables, Harnesses and Wiring (CCH) Training Requirements	Sign up employee by adding the needed curriculum to the employee's SATERN training plan: 1) SATERN ADMIN 2) Learner needs management 3) Add curriculum 4) Find employee in system 5) Click curriculum ID & select "next"	Attend NASA LaRC Level B Instructor's Class (scheduled as needed)	Instructor emails SMAO Admin a list of names of who took class and whether they were instructor/operator/ inspector	**CCH** (expires in 2 years)
		Fill out LF 359 found in the Langley Management System (LMS)	Employee to complete LF 359 and have it signed by supervisor before sending it to SMAO. SMAO Admin will place in SATERN upon receipt.	
		Obtain Supervisor Signature of Approval on LF 359		
		Send completed and signed form to Safety and Mission Assurance Office (SMAO) at mail stop MS 305		
Soldering/J-STD Training Requirements	Sign up employee by adding the needed curriculum to the employee's SATERN training plan: 1) SATERN ADMIN 2) Learner needs Management 3) Add curriculum	Attend IPC J-STD-001 Certified IPC Trainer (CIT) Class (scheduled as needed)	Instructor emails SMAO Admin a list of names of who took class and whether they were instructor/operator/ inspector	**JSTD** (expires in 2 years)

Discipline	Supervisor	Initial Certification	Documentation Required to Process Certification	Expiration
Soldering/J-STD Training Requirements, continued…	4) Find employee in system 5) Click curriculum ID & select "next"	Upon completion of course, fill out LF 359 found in the Langley Management System (LMS)	Employee to complete LF 359 and have it signed by supervisor before sending it to SMAO. SMAO Admin will place in SATERN upon receipt.	**JSTD** (expires in 2 years)
		Obtain Supervisor Signature of Approval on LF 359		
		Send completed and signed form to Safety and Mission Assurance Office (SMAO) at mail stop MS 305		
Electrostatic Discharge (ESD) Training Requirements	Sign up employee by adding the needed curriculum to the employee's SATERN training plan: 1) SATERN ADMIN 2) Learner needs management 3) Add curriculum 4) Find employee in system 5) Click curriculum ID & select "next"	Sign up for ESD Curriculum in SATERN: ESD CONTROL TRAINING PREREQUISITE (COURSE LARC-ESD-CNTRL-TRNG2)	Employee to complete LF 359 and have it signed by supervisor before sending it to SMAO. SMAO Admin will place in SATERN upon receipt.	**ESD Basic Card** (expires in 2 years)
		Upon completion of course, fill out LF 359 found in the Langley Management System (LMS)		
		Obtain Supervisor Signature of Approval on LF 359	LF 359 sent to Mission Assurance Branch (MAB) Workmanship Standard Work Lead for record keeping	
		Send completed and signed form to Safety and Mission Assurance Office (SMAO) at mail stop MS 305	LF 359	

Discipline	Supervisor	Initial Certification	Documentation Required to Process Certification	Expiration
Polymeric Training Requirements	Sign up employee by adding the needed curriculum to the employee's SATERN training plan: 1) SATERN ADMIN 2) Learner needs management 3) Add curriculum 4) Find employee in system 5) Click curriculum ID & select "next"	Attend NASA LaRC Level B Instructor's Class (scheduled as needed)	Instructor emails SMAO Admin a list of names of who took class and whether they were instructor/operator/ inspector	**Polymeric Card** (expires in 2 years)
		SATERN Curriculum: POLYMERIC APPLICATIONS ON ELECTRONIC ASSEMBLIES FOR OPERATORS	Employee to complete LF 359 and have it signed by supervisor before sending it to SMAO. SMAO Admin will place in SATERN upon receipt.	
		Upon completion of course (POLYMERIC APPLICATIONS ON ELECTRONIC ASSEMBLIES FOR OPERATORS – INITIAL CERTIFICATION (COURSE LARC-PAEAO)), fill out LF 359 found in the Langley Management System (LMS)		
		Obtain Supervisor Signature of Approval on LF 359		
		Send completed and signed form to Safety and Mission Assurance Office (SMAO) at mail stop MS 305		

Note: Once enrolled in a curriculum, SATERN provides reminders of recertification requirements.

2.5 CERTIFICATION PROCESS

2.5.1 Certification is the act of verifying and documenting the completion of required training, and if required, On-the-Job Training (OJT), with demonstrated proficiency.

2.5.2 Supervisors shall certify their personnel per Section 2.4.3 of this LPR.

2.5.3 Level A and B instructors shall be certified as noted in the Certification Level (see Section 2.6).

2.5.4 Completion of LF 359 by personnel and signed by their supervisor, shall provide the necessary documentation of qualification to perform the relevant workmanship duties.

2.5.5 Individual supervisors may establish On-The-Job (OJT) or other training requirements in addition to the workmanship training. This training shall be maintained by the supervisor.

2.5.5.1 Individual supervisors shall document successful completion of these additional requirements in the individual's certification record.

2.5.6 Personnel who perform operator or inspector tasks for any of the electrical process skills shall minimally meet the certification/recertification training requirements of Table 2-B.

Note: See LPR 8739.21 for Electrostatic Discharge Control workmanship requirements.

Table 2-B. Workmanship Standards Training Requirements (Hours)

Discipline	Applicable NASA Standard	INITIAL CERT	RECERT	INITIAL CERT	RECERT
		Operators and Inspectors		***Level B Instructors***	
Polymeric Application	8739.1	32	16	40	16
Crimping, Cables, Harnesses, & Wiring	8739.4	36	16	56	16
Fiber Optic Terminations	8739.5	32	16	56	16
Hand Solder	J-STD-001xS	Per IPC	Per IPC	Per IPC	Per IPC

2.5.7 Candidate civil service and contractor personnel who meet the workmanship training and vision requirements shall be certified by their supervisors.

2.5.8 Evidence of workmanship certification status shall be maintained by the trained personnel in the form of a completed LF 359 and presented to Quality Assurance personnel when requested.

2.5.9 Personnel Supervisors shall:

a. Sign supervisor statement on personnel-completed LF 359s.

b. Enroll employees into the SATERN training curriculum for each discipline as required for their duties.

c. Maintain a documented record of the workers' LF 359s.

d. Maintain other forms of documentation (e.g., OJT) as evidence of additional training as long as they have been properly signed by the supervisor.

e. Ensure workmanship operators and inspectors are familiar with the necessary requirements of each Workmanship Standard Training module, and other pertinent requirements of the workmanship standards in order to properly perform their duties. These duties typically require a broad understanding of the workmanship standards such as polymeric application and soldering.

f. Reassign employees if they fail to meet certification requirements.

2.6 CERTIFICATION LEVELS

2.6.1 Level A Instructors

2.6.1.1 Level A NASA instructors are certified by the NASA Training and Certification Board.

2.6.2 Level B Instructors

2.6.2.1 NASA LaRC Level B instructors are an integral part of the quality assurance function and shall be NASA civil servants (CS) selected by the Mission Assurance Branch (MAB) Head.

2.6.2.2 NASA LaRC Level B instructors shall train both CS and contractors.

2.6.2.3 Certification of NASA LaRC Level B instructors shall be provided by the LaRC MAB Head (i.e., supervisor) based on successful completion of training given by a Level A NASA instructor. The MAB Head provides signed supervisor statement on personnel (i.e., Level B instructor) completed LF 359.

2.6.2.4 Upon successful course completion, a training certificate shall be issued to the NASA LaRC Level B instructors.

2.6.3 Inspectors and Operators

2.6.3.1 Certification of **inspectors** shall be provided by the LaRC MAB Head based on successful completion of training given by a Level A instructor or NASA LaRC Level B instructor.

2.6.3.2 Certification of **operators** shall be provided by the respective personnel supervisor based on successful completion of training given by a Level A instructor or by a NASA LaRC Level B instructor.

2.6.3.3 Certification of supplier personnel shall be the responsibility of the supplier manager.

2.6.3.4 When operators are certified to perform limited operations or processes, it shall be stated on the certification card.

2.7 MAINTENANCE OF CERTIFICATION STATUS

2.7.1 Maintenance of certification by periodic retraining of instructors, operators, and inspectors shall be performed per the NASA-STD-8739.6, Chapter 4 “Implementation”.

2.7.1.1 Recertification of NASA LaRC Level B instructors shall be achieved after the successful completion of retraining provided by a Level A NASA instructor.

2.7.1.2 Recertification of operators and inspectors shall be achieved after successful completion of retraining provided by a Level A NASA instructor or a NASA LaRC Level B instructor.

2.7.1.3 Recertification shall be required when:

a. Proficiency in the assigned NASA Standards workmanship requirements is not met, including:

(1) Instructors – knowledge of assigned NASA Standard lacking.

(2) Operators – unsatisfactory quality of articles fabricated.

(3) Inspectors – unsatisfactory quality of inspections performed.

(4) Quality/quantitative data demonstrates a need for recertification.

b. New soldering or inspection techniques have been approved.

c. Work period interruption of greater than six months has occurred.

d. Two years has elapsed since last certification.

2.7.1.4 Certification shall be revoked when:

a. Personnel fail recertification.

b. Employment is terminated.

c. Certification shall be revoked, and recertification required when work performance levels are deemed unsatisfactory and/or work period interruption of greater than six months has occurred.

Note: The Level B instructor may extend the personnel’s certification for a period not to exceed 12 months.

CHAPTER 3: RECORDS

3.1 MAINTENANCE OF RECORDS

3.1.1 The following records shall be maintained for a period of five years by the personnel supervisor, and then destroyed when the personnel duties have been changed or the personnel are reassigned by the supervisor:

a. Personnel-documented training on LF 359.

b. List of any OJT or other training required in addition to the requirements identified in Section 2.4.

c. Record of equivalent work experience, if used to justify OJT.

CHAPTER 4: TRAINING RESOURCES

4.1 LEVEL B INSTRUCTOR TRAINING

4.1.1 The NASA certifying body for Level A training resides with Jet Propulsion Laboratory (JPL) and Goddard Space Flight Center (GSFC) at their training centers.

4.1.2 Training of Level B instructors is available at the East Coast NASA Manufacturing Technology Transfer Center (NMTTC) associated with Goddard Space Flight Center (GSFC) or the West Coast NMTTC associated with the Jet Propulsion Laboratory (JPL).

a. Goddard Space Flight Center (GSFC)

NASA's Manufacturing Technology Transfer Center (MTTC) (Eastern Region)

Code 300.1

Greenbelt, MD 20771

(410) 964-7616

b. Jet Propulsion Laboratory (JPL)

NASA's Manufacturing Technology Transfer Center (MTTC) (Western Region)

MS83-204

4800 Oak Grove Drive

Pasadena, CA 91109

(818) 354-6730 Email: MTTC_help@jpl.nasa.gov

4.1.3 Suppliers shall not train operator or civil servant inspector personnel for certification or recertification for the standards listed in P.4 without expressed written permission from the LaRC MAB Head.

APPENDIX A. DEFINITIONS

Certification: Act of verifying and documenting the completion of required training, and if required, On-the-Job Training (OJT) with demonstrated specified proficiency.

On-the-Job Training (OJT): Ability to demonstrate the performance of the discipline task that requires documentation/qualification. Documentation includes previous work history and period of performance.

Personnel Supervisor: The organizational line manager who provides supervisory functions and responsibilities for employees.

Recertification: The process of reconfirming the certification of an individual by training and/or proficiency test at the end of a predetermined period or when lack of proficiency dictates.

Vision Screening: A brief evaluation (such as with a Snellen – or “big E” – chart) that can be performed by a primary care doctor as part of a regular physical. A vision screening cannot diagnose exactly what is wrong with your eyes; instead, it can indicate that you should make an appointment with an ophthalmologist or optometrist for a more comprehensive dilated eye examination.

APPENDIX B. ACRONYMS

CS	Civil Servants
ESD	Electrostatic Discharge
GSFC	Goddard Space Flight Center
HQ	Headquarters
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
LF	Langley Form
LMS	Langley Management System
MAB	Mission Assurance Branch
NASA	National Aeronautics and Space Administration
NMTTC	NASA Manufacturing Technology Transfer Center
OJT	On-the-Job Training
PAP	Product Assurance Plan
SMAO	Safety and Mission Assurance Office
STD	Standard
UAV	Unmanned Aerial Vehicle