

MWI 3410.3

REVISION A

EFFECTIVE DATE: August 16, 1999

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MARSHALL WORK INSTRUCTION

QS01

PERSONNEL CERTIFICATION FOR ELECTRICAL PROCESSES

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		5/14/99	Document converted from MSFC-P18.1-C03 to a Directive. Previous history retained in system as part of canceled or superseded ISO Document files.
Revision	A	8/16/99	Changed scope to limit personnel certification to work on flight or critical flight associated hardware. Added requirement for disposition of records after retention period. Modified paragraph 6.1.2, to require that supervisors submit examiner credentials to the certifying officer and added examiner's credentials documentation to paragraph 9 as quality records. Modified paragraph 6.2.1 to require the examiner to document in an organizational issuance the process for evaluating and approving schools/training courses.

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1. PURPOSE

This instruction establishes the minimum requirements for the certification and/or qualification of MSFC personnel who fabricate or inspect flight or flight-associated hardware using electrical process skills (EPS) per the applicable documents. These requirements also apply when other program/industry documents are used that require personnel certification. See note in paragraph 7 for electrical process skills not addressed herein. This instruction responds to the requirements of ISO documents MWI 3410.1, "Personnel Certification Program," and MPG 3410.1, "Training."

2. APPLICABILITY

This procedure applies to all civil service MSFC personnel who fabricate, modify, or inspect flight or flight-associated hardware using the requirements of the applicable documents. Personnel developing technology and performing research do not require certification.

3. APPLICABLE DOCUMENTS

- a. MPD 1280.1, "Marshall Management Manual"
- b. MPG 3410.1, "Training"
- c. MSFC-STD-2903, "MSFC Tailoring Guide for NASA-STD-8739.3, Soldered Electrical Connections"
- d. MSFC-STD-2904, "MSFC Tailoring Guide for NAS 5300.4(3M), Workmanship Standard for Surface Mount Technology"
- e. MSFC-STD-2905, "MSFC Tailoring Guide for NASA-STD-8739.4, Crimping, Interconnecting Cables, Harness, and Wiring"
- f. MSFC-STD-2906, "MSFC Tailoring Guide for NAS 5300.4(3J-1), Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies"
- g. MSFC-STD-2907, "Workmanship Standard for Printed Wiring Boards"
- h. MSFC-RQMT-2918, "Requirements for Electrostatic Discharge Control"
- i. MWI 3410.1, "Personnel Certification Program"

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4. REFERENCES

None

5. DEFINITIONS

Refer to MPG 3410.1 and MWI 3410.1 for definitions.

6. INSTRUCTIONS

This instruction details training, experience, and examination requirements for the following methods/skills: soldering, cabling, crimping, conformal coating, staking, electrostatic discharge (ESD) control, wire wrap, and printed wiring board (PWB) inspection.

6.1 EPS Categories.

6.1.1 Personnel performing electrical process skills are certified as either operators or inspectors to the applicable MSFC document above. Operators are authorized to perform work on flight and flight-associated hardware, and inspectors are authorized to accept flight and flight-associated hardware.

6.1.2 Personnel evaluating EPS for certification are classified as examiners. Examiners should complete the same training requirements as operators/inspectors or have equivalent experience. Examiners do not need to be certified; however, they must be recognized as experts in their field. Examiners are recommended by their supervisors for approval by the certifying officer. Beginning in August 1999, supervisors must submit to the certifying officer documented credentials of personnel recommended as examiners.

6.2 Training.

6.2.1 Training Organization. Training must be obtained from an examiner-approved school. Outside agencies may be used for training subject to review and approval by the examiner. The examiner shall document the school/training course approval process in an organizational issuance.

6.2.2 Lesson Plans. Lesson plans will be developed for each training course required. The plans will include topics to be addressed, practical test specifics, and examination examples.

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Training contractor lesson plans will be reviewed and approved by the examiner.

6.2.3 Instructor Qualifications. Instructors must be recognized experts in their field. Instructors may be tested to requirements as determined by the certifying officer or examiner.

6.3 Training Requirements for Initial Certification.

6.3.1 Personnel who perform operator or inspector tasks for any of the electrical processes must meet the initial certification/qualification requirements of Table 1. Documented previous training and experience may be accepted for certification at the discretion of the examiner and certifying officer. Certification is required for all EPS's except PWB inspection.

6.3.2 Examinations. Written and practical examinations will be administered and graded by the examiner or designated representative. Copies of the examination will be retained on file. If an outside agency administers the examination, a written statement from the agency will be retained in the certification file.

6.3.2.1 Vision Examination. Vision and color perception tests will be administered per the applicable process document by the MSFC medical center personnel prior to certification. The vision tests will be administered prior to certification/recertification and shall be documented on MSFC Form 4293.

6.3.2.2 Written Examination. For initial certification, each candidate must score at least 80 percent on a written exam typically consisting of 25 questions. PWB inspection qualification does not require written examination.

6.3.2.3 Practical Examination. The candidate must pass a practical exam which is representative of the work to be performed and fully demonstrates proficiency in the skill (excluding ESD and PWB inspection). For inspectors, the practical exam may include fabrication of samples and will include an inspection test. For operators, the practical exam may include an inspection test and will include fabrication of samples. Proficiency demonstration may also be accomplished by examiner audit of actual work performed provided the audit results are documented and included in the personnel certification file.

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**TABLE 1
EPS TRAINING REQUIREMENTS (hours)**

TASK	INITIAL CERT	RECERT³	REQUIREMENT
Soldering	40	16	MSFC-STD-2903
Surface Mount Tech ⁴	40	16	MSFC-STD-2904
Cabling	28	8	MSFC-STD-2905
Crimping	12	4	MSFC-STD-2905
Conformal coating/ staking	16	8	MSFC-STD-2906
ESD control	2	NOTE 2	MSFC-RQMT-2918
Wire wrap	12	12	NOTE 5
PWB inspection ¹	24	NOTE 2	MSFC-STD-2907

NOTE 1: This task requires qualification/training and does not require examination/certification/recertification.

NOTE 2: Retraining is required at the discretion of the examiner based on performance, new technology, etc.

NOTE 3: Training for recertification is required at the discretion of the examiner. Recertification may only consist of demonstration of proficiency in accordance with 6.5.1.

NOTE 4: For inspectors already trained in soldering, initial certification can be achieved by 16 hours of training and recertification can be achieved by 8 hours of training. Operator certification may require additional training on the exact machine used for production at the supervisor's or examiner's discretion.

NOTE 5: Certification is required in accordance with the applicable process specification.

6.3.2.4 Grading. Grading of written and practical exams will be as determined by the examiner. Typically, for practical exams, the total number of defects will be divided by the total opportunities for defects and subtracted from 100 to obtain the final score. For example, for soldering grading, the following scheme may be used: 1 point for each solder joint/board side with multiple defects counting only once for operators.

6.4 Certification.

6.4.1 Candidate civil service personnel who meet the above criteria will be certified by the MSFC Certifying Officer upon recommendation of the examiner. Certification cards will be issued for all categories except ESD and PWB inspection. Personnel who complete the ESD training class will be issued an ESD emblem to affix to their badge. Contractor personnel will be certified by the individual designated by their company.

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6.4.2 Qualification records and all documentation pertaining to certification will be maintained on file by the examiner. The records will include the following:

- a. Copy of certificate, including employee name, specification, type of certification, date certified, and signature of certifying officer.
- b. Records of training.
- c. Copy of vision examination.
- d. Results of examination or audit. The examination copy itself may be retained by the examiner at his/her discretion. Audit reports will be retained.

6.5 Recertification. Recertification is required every 3 years except for ESD. ESD recertification is required when requirement violations are observed. When necessary, the MSFC Certifying Officer may extend or limit the certification period based on recommendations of the examiner and the individual's supervisor. Extensions may not exceed 6 months.

6.5.1 Demonstration of proficiency is required for recertification. This may be achieved by fabrication/inspection of samples, completion of an examiner-approved refresher training course, or by an examiner audit of actual work. Recertification may also include a written examination.

6.5.2 Each recertification method requires documentation to substantiate compliance. The method chosen for recertification is the responsibility of the examiner.

6.5.3 Requalification for PWB inspection is required at the discretion of the examiner. The need for requalification will be based on performance.

6.6 Loss of Certification. Certification will be revoked under the following conditions:

- a. Evidence of deficient performance.
- b. Interruption of a work period for more than 6 months.
- c. New techniques have been developed which require different skills.

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- d. Employment has been terminated.
- e. Job function has changed and new function does not include EPS.

7. NOTES

Skills not addressed by Table 1 that require certification per the applicable electrical process specification will be identified by the supervisor or the examiner. The general requirements of this instruction apply to these skills, and the specific certification requirements will be determined by the supervisor and/or examiner and approved by the certifying officer.

8. SAFETY PRECAUTIONS AND WARNING NOTES

None

9. RECORDS

The following records will be maintained by the certifying officer or examiner for 10 years from the date of certification/recertification:

- a. Records of training.
- b. Certification card.
- c. Physical exam records including MSFC Form 4293, Eye Exam Certification.
- d. Audit records when applicable.
- e. Exam records when applicable.
- f. Examiner credential documentation (beginning in August 1999).

After 10 years, the records shall be maintained as historical records if the employee is still active in the skill; otherwise they shall be destroyed.

10. PERSONNEL TRAINING AND CERTIFICATION

None

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11. FLOW DIAGRAM

None

12. CANCELLATION

MWI 3410.3 dated May 14, 1999

Original Signed by

A. G. Stephenson
Director