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| Environmental Standard Operating Procedure | | | |
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Title: Non-Destructive Inspection

1.0 PURPOSE

The purpose of this Environmental Standard Operating Procedure (ESOP) is to provide environmental guidelines for conducting Non-Destructive Inspection (NDI) procedures.

2.0 APPLICATION

This guidance applies to those individuals who perform NDI processes on aircraft parts at Marine Corps Air Station (MCAS) Miramar.

3.0 REFERENCES

- 29 CFR 1910 (Code of Federal Regulations)
- 40 CFR 262
- 49 CFR
- 10 CFR parts 19-21
- 22 CCR (California Code of Regulations)
- MCO P5090.2A (USMC Environmental Compliance and Protection Manual)
- NAVAIR 01-1A-16 (Naval Air Force)
- NRC Form 3 (Notice to Employees)
- MCO 5104.3A (Radiation Safety Program)
- NAVMED 5055 (Radiation Health Protection Manual)
- S0420-AA-RAD-010 (RAD 10)
- Appropriate MSDS sheets

4.0 PROCEDURE

3.1 Discussion:

Non-destructive Inspection is the examination of an object with technology that does not affect its future usefulness. NDI includes many methods that detect internal or external imperfections. Methods of NDI include using a liquid penetrant, magnetic particles, ultrasonic sensor, and x-ray radiography. Materials handled, used and stored in the course of conducting NDI procedures must be

properly managed to help lessen impacts to human health and the environment.

Penetrant testing uses penetrating oil with a fluorescent additive that is applied to aircraft parts to make cracks visible under a black light so that they may be identified for repair. Penetrant testing uses an emulsifier to remove excess oil from the parts before inspection, followed by a developer to draw the Penetrant out of the cracks. For Penetrant Testing spray a small amount of penetrant into the cap of the can; dip a Q-tip in the cap to absorb penetrant and apply to engine parts; spray cleaner to a lint free rag and then wipe the part; apply aerosol developer to the part with a brush or by dunking the part in the dunk tank to draw the penetrant out of the cracks; and inspect with a black light.

Magnetic particle inspections are a method of locating and revealing discontinuities in magnetic materials, at or near the surface, and are too small to be detected with the naked eye. The magnetic particle method uses a ferromagnetic material that is distorted by a change in material continuity. Therefore, in the presence of discontinuities, the magnetic material will display a pattern. For Magnetic Particle Testing fluorescent magnetic particles are added to white mineral oil. The part is magnetized in either coil or stock heads while mineral oil with fluorescent magnetic particles is poured over the part; particles migrate toward crack(s) by magnetic field produced.

Ultrasonic inspection instruments utilize ultrasound to examine the internal integrity of materials. The sound waves bounce off internal defects. A probe is placed in contact with the part to be inspected with a gel-layer acting as a carrier of the acoustic signal. For Ultrasonic Inspection coat part to be inspected with a gel-layer; a probe is placed in contact with the part to be inspected; the gel-layer acting as a carrier of the acoustic signal. The size and position of internal flaws can be determined by the acoustic response.

X-ray radiography can detect defects under the surface of materials, like in welds. Materials are placed in the x-ray vault to identify changes in thickness and cracks in the material examined. For open facility shots, ropes are utilized to provide the 100mR barrier around the tube head. Processing x-ray photographic film generates spent x-ray processing solutions. Several types of hazardous and non-hazardous wastes are generated in the development process and include developer, fixer, and water rinsate.

Undiluted photographic developer may be corrosive and requires proper handling. The development processor is cleaned with a non-hazardous cleaner containing 1% Sodium hydroxide (NAOH). Silver is a heavy metal essential in x-ray image formation. Spent fixer contains high levels of silver, and is classified as hazardous waste (HW). Free silver ions are very toxic to aquatic organisms. Used developer and rinse water are considered non-hazardous wastes and are allowed down sink drains. The spent x-ray fixer shall be collected in approved containers for a known corrosive labeled as HW.

The x-ray facility is equipped with appropriate radiation barriers and containment. Units are equipped with approved dunk tanks and Hazard Materials (HazMat) storage facilities. Contact Marine Air Group-11/16 Individual Material Readiness (MAG-11/16 IMRL) or the manufacturer for change out or repair of equipment.

3.2 Operational Controls:

The following procedures apply:

1. Ensure that Material Safety Data Sheet (MSDS) for all materials involved in this process are readily available and current.
2. Ensure that training requirements are met and that training certifications for all personnel are maintained.
3. Ensure that Personal Protective Equipment (PPE) is used including: latex and heavy chemical gloves, aprons, face shields, cranials (head, ear and eye protective head gear), and steel toe boots.
4. Ensure that a fully stocked spill kit is nearby in a designated location.
5. Ensure that fire extinguishers are kept nearby in known locations.
6. Ensure eyewash is operating properly.
7. Ensure that only approved dunk tanks with attached drainage devices are used to divert drainage oil back into the tank.
8. Document daily tank inspections.
9. Use aerosol penetrant, cleaner, and developer for inspections performed outside of the NDI Lab Area e.g. Power Plants Building #8461.
10. Ensure that ropes are utilized while performing open facility shots in the hush house. The ropes delineate the 100 mR barrier around the X-Ray tube head.
11. Ensure that signs are posted with "Danger High Radiation" around the 100 mR barrier.
12. Ensure that a red light beacon is used next to the X-Ray tube head while in use.
13. Ensure that the doors on the hush house are locked when performing open facility shots. The walls and doors are considered the 2 mR barrier.
14. Ensure that signs are posted with "Caution Radiation Area" on the hush house doors.
15. Ensure all personnel wear Thermal-Luminescent Dosimeter (TLD) badges and pocket dosimeters for monitoring personal radiation exposure.
16. Perform vault surveys every two (2) years or after an earthquake.
17. Ensure that X-Ray utilization logs, dosimeter logs, radiation safety surveys, radiation safety site inspections, personnel health records, and radiation safety procedures are current and available for inspection.
18. Ensure that personnel Dosimeters and Radiacs (i.e., radiation survey meters) are used and maintained (i.e., calibrated at specified intervals) and that records of these activities are current and available for inspection.
19. Ensure containers of developer and fixer are fed into the film processor per manufacturers instructions.
20. Used developer and rinse water are considered non-hazardous wastes and are allowed down sink drains.

21. Place secondary containment pan under fixer collection container.
22. Collect spent fixer in approved containers.
23. Collect and store all hazardous waste (HW) in approved containers. Use only transfer containers equipped with lids. Check containers for deterioration and structural integrity.
24. Store all usable hazardous materials in the hazardous materials (HAZMAT) locker.
25. Properly label all containers completely and legibly with the following information: label with the words "Hazardous Waste" on outside of container, accumulation start date, and Environmental Protection Agency (EPA) HW number (e.g. D003).
26. Keep containers closed except when HW is being added or removed.
27. Ensure containers are not overfilled. Containers are considered full when 3 to 4 inches of head space remain to allow for thermal expansion.
26. Ensure containers that previously held HW are marked EMPTY.
29. Maintain a HW log, which includes container type, accumulation start date, accumulation end date, date container is taken to HW Satellite Accumulation Area, and HW Manifest number.
30. Contact the Hazardous Waste Minimization (HAZMIN) Center when drums and/or ASTs are full, for transfer to the HW Satellite Accumulation Area.
31. Dispose of used rags and discarded parts in red foreign object debris (FOD) buckets, and take buckets to "Air Frames" Building for disposal when full. They will exchange dirty rags for clean rags.
32. Clean up all spills immediately and report to the shop supervisor.
33. Ensure that spills are recorded in a spill log book detailing the spill date, time, product spilled, quantity, location, cleanup actions taken, and the name of person reporting the spill.
34. Ensure the penetrant line, magnetic particle, and ultrasonic utilization log books are maintained and available for inspection?
35. Ensure that the Oil and Hazardous Substance Spill (OHSS) Contingency Plan and the Spill Prevention Control and Countermeasures (SPCC) Plan are current and available for inspection.
36. If there are any specific situations or other concerns not addressed by this procedure, contact the Environmental Management Department (EMD).

3.3 Documentation and Record Keeping:

The following records must be maintained for NDI hazardous materials and equipment:

1. MSDSs for penetrating oil and solvent.

2. Training and certifications for all personnel records.
3. Site inspection reports.
4. Penetrant line log book.
5. Magnetic particle log book.
6. X-Ray log binder.
7. Spill log book.

3.4 Training:

All applicable personnel must be trained in this SOP and the following:

1. Hazard Communication (HazCom) Training.
2. General Environmental Awareness Training.
3. 40-hour Hazardous Waste Operations Emergency Response (HazWOPER) Training.
4. 8-hour HazWOPER Refresher Training.
5. First Responder Operations (FRO) Training.
6. Safety and Hazardous Materials Coordinator.
7. General shop safety.
8. Initial On the job training (OJT).
9. NDI School/Certification (includes 40-hour Radiation Safety Training/Certification).

3.5 Emergency Preparedness and Response Procedures:

Refer to Marine Corps Order (MCO) P5090.2A, Subject: (OHSS/SPCC) for MCAS Miramar.

3.6 Inspection and Corrective Action:

The Environmental Compliance Coordinator (ECC) shall designate personnel to perform inspections. The ECC shall ensure deficiencies noted during the inspections are corrected immediately. Actions taken to correct each deficiency shall be recorded on the inspection sheet.

Non-Destructive Inspection – Inspection Checklist

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| Date: | Time: |
| Installation: | Work Center: |
| Inspector's Name: | Signature: |

| Inspection Items | Yes | No | Comments |
|--|-----|----|----------|
| 1. Are MSDS for materials used current and available for inspection? <i>(29 CFR 1910)</i> | | | |
| 2. Are training requirements and certifications for all personnel maintained and available for inspection? <i>[MCO P5090.2A 9104.1 (k)(5)]</i> | | | |
| 3. Is PPE used, including: <ul style="list-style-type: none"> a. latex and heavy chemical gloves, b. aprons, c. face shields, d. cranials (head, ear and eye protective head gear), e. steel toe boots, f. lead vault and roped off area for x-ray containment, g. TLD badges and pocket dosimeters for personal monitoring radiation exposure? <i>(29 CFR 1910)</i> | | | |
| 4. Is a fully stocked spill kit kept nearby in designated location known to all shop personnel? <i>(29 CFR 1910)</i> | | | |
| 5. Are fire extinguishers kept nearby in known locations? <i>(29 CFR 1910, MCO P5090.2A)</i> | | | |
| 6. Is eyewash operating properly? <i>(29 CFR 1910)</i> | | | |
| 7. Are approved dunk tanks with attached drainage devices used for this practice? | | | |

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| <i>(NAVAIR 01-1A-16)</i> | | | |
| 8. Are dunk tanks inspected daily by the user? <i>(NAVAIR 01-1A-16)</i> | | | |
| 9. Are Penetrant Testing procedures performed outside of the NDI Lab Area? <i>(NAVAIR 01-1A-16)</i> | | | |
| 10. Are ropes utilized while performing open facility shots in the hush house? <i>[MCO 5104.3A, RAD 10]</i> | | | |
| 11. Are signs posted with “Danger High Radiation” around 100 mR barriers? <i>(29 CFR 1910)</i> | | | |
| 12. Are signs posted with “Caution Radiation Area” on the hush house doors? <i>(29 CFR 1910)</i> | | | |
| 13. Is red light beacon used next to the x-ray tube while in use? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 14. Are the doors on the hush house locked when performing facility shots? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 15. Do all personnel wear TLD badges and pocket dosimeters for monitoring personal radiation? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 16. Are surveys performed on the vault after earthquakes or on a biennial basis current and available for inspection? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 17. Are x-ray utilization logs, dosimeter logs, radiation safety surveys, radiation safety site inspections, personnel health records, and radiation safety procedures current and available for inspection? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 18. Are personnel Dosimeters and Radiacs (i.e., radiation survey meters) used, maintained (i.e., calibrated at specified intervals), and records of these activities current and available for inspection? <i>(MCO 5104.3A, NAVMED 5055, RAD 10)</i> | | | |
| 19. Are containers of developer and fixer fed into the film processor per manufacturer’s instructions? <i>(MCO P5090.2A)</i> | | | |
| 20. Is secondary containment used under fixer collection container? <i>(40 CFR 262)</i> | | | |
| 21. Is spent fixer collected in approved containers? <i>[40 CFR 262.34(c)(1)(i)]</i> | | | |

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| 22. Is all HW stored in appropriate, approved containers, are transfer containers equipped with lids, and are containers checked for deterioration? (40 CFR 262) | | | |
| 23. Are all usable hazardous materials stored in the HAZMAT locker? [40 CFR 262.34 (a)(3), (c)(1)(ii)] | | | |
| 24. Are all containers properly labeled with words “Hazardous Waste”, accumulation start date, and EPA HW number? [40 CFR 262.34 (a)(3), (c)(1)(ii)] | | | |
| 25. Are containers closed at all times except when HW is added or removed? (29 CFR 1910, 40 CFR) | | | |
| 26. Are containers filled to a level 3” to 4” below top? (29 CFR 1910) | | | |
| 27. Are containers that previously held HW marked EMPTY? (29 CFR 1910, 40 CFR) | | | |
| 28. Is a HW Log maintained with container type, accumulation start and end dates, date container taken to HW Satellite Accumulation Area, and HW Manifest number? (40 CFR Part 262) | | | |
| 29. Is the ECC contacted when containers are full for transfer? (MCO P5090.2A) | | | |
| 30. Are used rags properly disposed of in red FOD buckets for disposal? (MCO P5090.2A) | | | |
| 31. Are spills properly cleaned up and reported as soon as they are identified? (29 CFR 1910, 40 CFR) | | | |
| 32. Are spills recorded in a spill log book with the spill date and time, product spilled, quantity of product spilled, location of spill, cleanup action, and person reporting spill? (29 CFR 1910, 40 CFR) | | | |
| 33. Are the penetrant line, magnetic particle, and ultrasonic log books maintained and available for inspection? [MCO P5090.2A 9104.1(k)(5)] | | | |
| 34. Are the OHSS/SPCC plans current and available? (MCO P5090.2A) | | | |

ADDITIONAL COMMENTS:

CORRECTIVE ACTION TAKEN:

Environmental Compliance Coordinator

Name: _____

Signature: _____

Date: _____