

Industrial Radiography Operating Procedures



Radiography Procedure Checklist

1. Personnel Monitoring Equipment

- A. Badge - TLD or film
- B. Pocket dosimeter - Set to approximately zero
- C. Alarming ratemeter

2. Check Out Equipment

- A. Complete Utilization Log
- B. Survey Meter
 - 1) Battery Check
 - 2) Calibration Sticker - Not older than 6 months
 - 3) Check operation - Survey camera
 - 4) Note radiation level at reference point (outlet nipple)
- C. Inspect camera
 - 1) Lock operates properly
 - 2) Pig-tail connector not worn or bent
 - 3) Safety plug and lock box cap present
 - 4) Caution - Radioactive Material label
 - 5) Source tag - leak test if older than six months
 - 6) Name and address of licensee

Radiography Procedure Checklist (cont'd)

D. Source Tube and Collimator

- 1) No kinks or crimps
- 2) Disconnect coupling operates properly
- 3) Collimator attaches securely
- 4) Check Out Equipment

E. Controls

- 1) Connector matches with pig-tail and not worn or bent
- 2) Drive cable not bent or crimped and operates smoothly
- 3) Crank handle assembly not loose or worn, and not slipping

F. Supplies

- 1) Signs-Radiation Area; High Radiation Area; Radioactive Material
- 2) Rope or tape for barricades
- 3) Film, chemicals, pentrameters, lead numbers and letters

G. Documents

- 1) Operating and Emergency Procedures
- 2) NRC Rules and Regulations - Parts 19, 20 and 34
- 3) NRC Material License; or agreement state radioactive material license and reciprocity notice
- 4) NRC Form "Notice to Employees" (Recommended - not required)
- 5) Leak test record if source is older than six months (Recommended - not required)
- 6) Shipping papers for transportation

Radiography Procedure Checklist (cont'd)

- H. Forms (can be same form for all three)
 - 1) Daily dosimeter record forms
 - 2) Daily alarm rate meter check
 - 3) Daily equipment check
 - 4) Survey form for recording controlled area and postings
 - 5) Survey form for recording that source is secure in camera when placing camera into storage at end of day

3. Transportation

- A. Place camera into proper container for transportation
- B. Secure camera from moving during transport
- C. If transporting RADIOACTIVE YELLOW III labeled package, place four diamond RADIOACTIVE placards visible on front, rear and both sides
- D. Shipping papers accessible to driver and recognizable to emergency personnel entering driver's compartment
- E. Survey exterior of vehicle and cab. If at all possible transport camera such that radiation levels do not exceed 2 mR/hr on the exterior of the vehicle or in occupied positions in the vehicle.
- F. Survey meter accessible to you in cab during transit

Radiography Procedure Checklist (cont'd)

4. Daily at Radiography Site

- A. Check for badge and charge pocket dosimeter
- B. Inspect camera, source tube and controls (see above)
- C. Check survey meter (see above)
- D. Establish controlled area
 - 1) Barricade area
 - 2) Post area
- E. Survey camera - note reference reading for comparison at end
- F. Set up equipment
- G. Check for people in controlled area
- H. Make exposure
 - 1) Go to lowest possible radiation level during exposure
 - 2) Keep look out for people that may enter area
 - 3) Survey perimeter of controlled area, if possible
 - 4) Record first typical controlled area survey early in day

Radiography Procedure Checklist (cont'd)

I. Terminate exposure

- 1) Approach camera with survey meter in hand
- 2) Survey camera and source tube - compare to initial reading
- 3) Lock camera
- 4) Record survey when placing camera into storage at end of day

5. Daily Records

- A. Daily equipment checks
- B. Daily alarm ratemeter check (recommended)
- C. Record dosimeter reading at end of day
- D. Record camera survey when storing camera at end of day
- E. Record radiation levels and postings around controlled area early in day

Radiography Procedure Checklist (cont'd)


6. Check In Equipment

- A. Complete utilization log
- B. Inform RSO of any camera, source tube, control or survey meter maintenance required

7. Emergency

- A. Do not attempt to return source except by normal operation of controls
- B. Secure area at 2 mR/hr and notify:
 - 1. Radiation Safety Officer
(24 Hour Telephone Numbers)
or
 - 2. (Optional) - Consultant and/or Radiography Service Companies
(24 Hour Telephone Numbers)
or
 - 3. Radiation Control Agency
(24 Hour Telephone Numbers)

Radiography Operating Procedures

	NDE RADIATION SAFETY MANUAL	Chapt. 0516-6
	CHAPTER 6	Rev. 4
		Page 1 of 23

OPERATING PROCEDURES

<u>CONTENTS</u>

6.0	PURPOSE & SCOPE
6.1	RADIATION SAFETY & RADIOGRAPHIC PERSONNEL
6.2	RADIOGRAPHIC EQUIPMENT
6.3	PERSONNEL MONITORING (PM) DEVICES
6.4	SURVEY METERS
6.5	RECORDS
6.6	DAILY EQUIPMENT INSPECTION
6.7	SECURITY OF RADIOGRAPHIC EQUIPMENT
6.8	TRANSPORTATION OF RADIOACTIVE MATERIAL
6.9	RADIOGRAPHIC OPERATIONS – GENERAL
6.9	RADIOGRAPHIC OPERATIONS – GAMMA
6.10	RADIOGRAPHIC OPERATIONS – X-RAY

RSM CHAPTER 6 – OPERATING PROCEDURES	TABLE OF CONTENTS
--------------------------------------	-------------------

- Must be specific to the equipment in use & the application
- Mfr. op. manual is not sufficient
- Must be strictly followed

Radiography Procedure Checklist

1. Personnel Monitoring Equipment



- Personnel monitoring badge (OSLD/TLD/film)
- 0-200 mR range pocket dosimeter (zeroed) or electronic dosimeter
- Alarm ratemeter



- Perform dosimetry checks before doing anything else

Radiography Procedure Checklist

The Well Dressed Radiographer

- PM badge
- Pocket dosimeter
- Alarm ratemeter
- Survey meter



Radiography Procedure Checklist

2. Check Out Equipment

- Complete utilization log
- Survey meter
- Inspect camera



RC Form 255-U (Rev. 09/06)

**Texas Department of State Health Services
UTILIZATION LOG**

Licensee/Registrant Name: _____ License Registration No. _____ Storage Location (address): _____

* Exposure Device ("Camera") / Transport Container / or Control Console Serial No. _____

DATE OUT OF STORAGE	SOURCE SERIAL NO.	USE LOCATION	DATE(S) OF USE	SIGNED OUT TO	DATE RETURNED TO STORAGE	RETURNED BY
				(PRINT NAME) SIGNATURE		(PRINT NAME) SIGNATURE



Radiography Procedure Checklist

Removing Camera from Storage

- Check source activity w/ decay chart, & last reference survey recorded on utilization log
- Estimate what current reference survey reading should be, taking into account source decay



Radiography Procedure Checklist

Initial Camera Survey

- **Reference survey:** measure highest contact reading at exit port (marked by dot sticker on camera)
- Use last reference survey reading for comparison to verify operation of meter & shielded position of source
- One meter is required; 2 meters preferred; 3 is best
- **The survey meter is a radiographer's best friend**



Radiography Procedure Checklist

2. Check Out Equipment

- Camera & shipping container
- Controls
- Guide tube & collimator
- Warning signs
- Jigs, related gear



Radiography Procedure Checklist

Daily Equipment Inspection: Camera

- Verify that shipping plug is installed in outlet port, that plug screw & nut turn freely, & that threads are undamaged
- Perform No-Go tests
- Perform misconnect test
- Verify that overall condition of the camera is OK

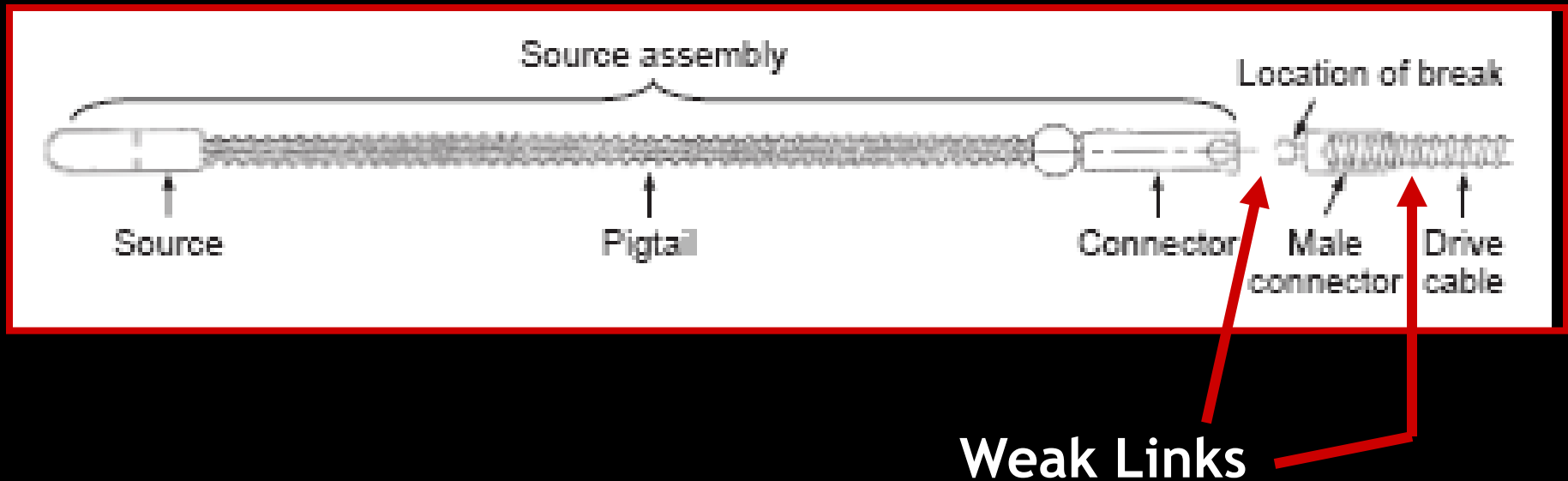


Radiography Procedure Checklist

Daily Equipment Inspection

No-Go Gauge:

Testing the drive cable-source assembly connections



Radiography Procedure Checklist

Daily Equipment Inspection

Drive Cable Connectors



Radiography Procedure Checklist

Daily Equipment Inspection

Drive Cable

- No-Go gauge tests (not required daily checks, but should be performed when using a camera that was last used by a different crew)
- Without excessive force, use No-Go gauge to check for wear on connectors
- All positions are no-go; connectors must not pass through gauge
- Do not use any components that fail the No-Go gauge tests; connectors that fail must be replaced

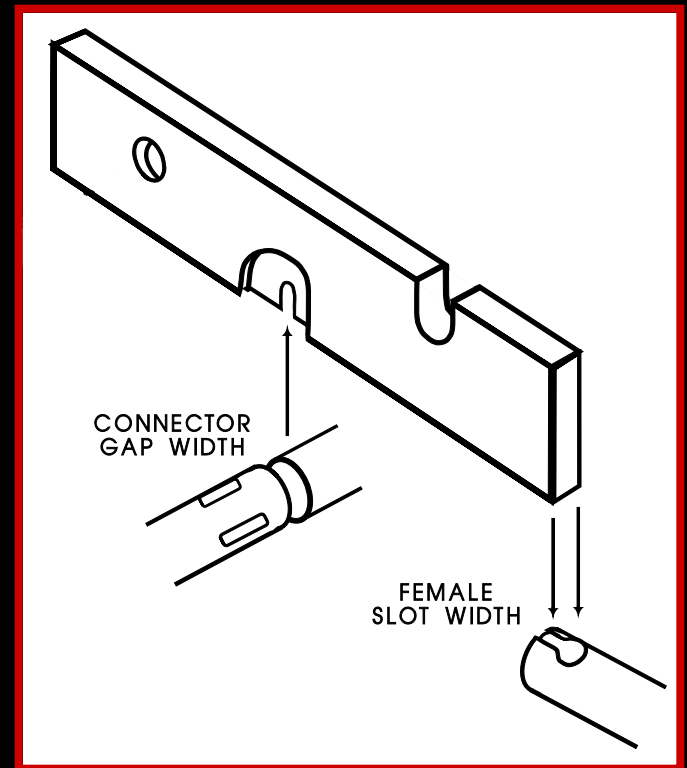


Radiography Procedure Checklist

Daily Equipment Inspection

No-Go Gauge Tests

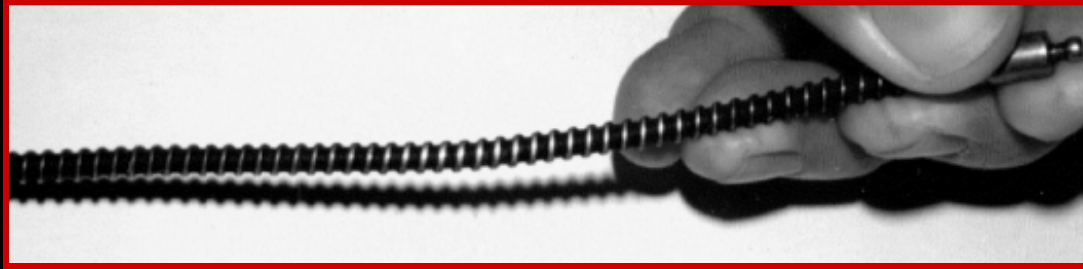
- Male-female connection: assemble male & female parts & verify that larger notch in side of gauge won't go into notch gap in center of gauge
- Female slot width: verify that gauge will not go into female slot



Radiography Procedure Checklist

Daily Equipment Inspection

U-Bend Test: Checking for Damaged Drive Cables



Radiography Procedure Checklist

Daily Equipment Inspection

Guide Tube

Check for:

- Dents
- Burns
- Cuts
- Crimps
- Deformed threads



If damaged, tag
& remove from service

Radiography Procedure Checklist

2. Check Out Other Equipment









- Film & cassettes
- Lead letter box
- Penetrameters
- Shot calculator
- OSHA safety gear



Radiography Procedure Checklist

2. Check Out Equipment

- Documents
- Forms

 DAILY SURVEY REPORT 	
DATE: _____	CLIENT: _____
LOCATION: _____	
RADIOGRAPHER: _____	BADGE NO.: _____
DOSIMETER SN: _____	PO READINGS: START: _____ END: _____ TOTAL: _____ mR
RAD./RAD. ASST.: _____	BADGE NO.: _____
DOSIMETER SN: _____	PO READINGS: START: _____ END: _____ TOTAL: _____ mR
RAD./RAD. ASST.: _____	BADGE NO.: _____
DOSIMETER SN: _____	PO READINGS: START: _____ END: _____ TOTAL: _____ mR
CAMERA MODEL: _____	CAMERA SN: _____
SOURCE MODEL: _____	SOURCE SN: _____
X-RAY MACHINE SN: _____	
SOURCE ACTIVITY: _____ Ci	
SURVEY METER MODEL: _____	SURVEY METER MODEL: _____
SURVEY METER SN: _____	SURVEY METER SN: _____
SM CAL. DUE DATE: _____	SM CAL. DUE DATE: _____
INITIAL REFERENCE SURVEY: _____ mR/hr	FINAL REFERENCE SURVEY: _____ mR/hr
AREA SURVEYS <div style="display: flex; justify-content: space-around;"> <div>  mR/hr @ ft.  mR/hr @ ft.  mR/hr @ ft. </div> <div>  SOURCE  mR/hr @ ft.  mR/hr @ ft. </div> </div>	
ACCESS CONTROLS <input type="checkbox"/> SIGNS <input type="checkbox"/> BARRICADE ROPE/TAPE <input type="checkbox"/> DIRECT SURVEILLANCE <input type="checkbox"/> ALARM OPERATIONAL <input type="checkbox"/> OTHER: _____	
VEHICLE SURVEYS DRIVER COMPARTMENT: _____ mR/hr VEHICLE EXTERIOR: _____ mR/hr	
<input type="checkbox"/> RADIOGRAPHIC & SAFETY EQUIPMENT INSPECTED PER OPERATING PROCEDURES (RSM-6)	
RADIOGRAPHER'S SIGNATURE _____	

DAILY EQUIPMENT CHECKLIST		
Inspect radiographic equipment immediately after removal from storage & before use. If satisfactory, check box by item. Report any equipment problems to the RSO ASAP.		
Survey Meters		
Serial No.: _____ <input type="checkbox"/> Calibration Check <input type="checkbox"/> Visual Check <input type="checkbox"/> Battery Check <input type="checkbox"/> Source Check	Serial No.: _____ <input type="checkbox"/> Calibration Check <input type="checkbox"/> Visual Check <input type="checkbox"/> Battery Check <input type="checkbox"/> Source Check	Serial No.: _____ <input type="checkbox"/> Calibration Check <input type="checkbox"/> Visual Check <input type="checkbox"/> Battery Check <input type="checkbox"/> Source Check
Alarm Rate Meter <input type="checkbox"/> Calibration Check <input type="checkbox"/> Visual Check <input type="checkbox"/> Battery Check <input type="checkbox"/> Function Check		
Radiography Camera & Associated Equipment		
Camera <input type="checkbox"/> All labeling visible and legible: • Trefoll radiation symbol and CAUTION (or DANGER) RADIOACTIVE MATERIAL warning • Camera manufacturer name, model and serial no. • Source ID tag (lists manufacturer, model/serial no., isotope & date/activity when loaded) • NDE name, address and phone number <input type="checkbox"/> Selector ring & lock plunger operate easily <input type="checkbox"/> Source outlet shipping plug screw & nut turn freely & threads undamaged <input type="checkbox"/> Overall condition of camera acceptable		
Outer Drive Cable & Drive Control Unit (Crank) <input type="checkbox"/> Cable free of cuts, breaks & broken fittings <input type="checkbox"/> ~1 ft. of outer drive cable next to male connector free of excessive/uneven wear, fraying, unraveling, nicks, kinks, bends; no loss of flexibility (abnormal stiffness, dirt/grit) <input type="checkbox"/> Male connector ball: with Model 550 No-Go gauge, ball connector will not go into gauge hole & ball connector shank will not go into small gauge notch <input type="checkbox"/> Crank unit: no signs of damage/loose hardware; control: freedom of drive cable movement <input type="checkbox"/> Connections are tight & free of breaks/bends		
Source Connector & Guide Tube <input type="checkbox"/> Source connector: spring-loaded safety latch opens smoothly & snaps back into position when opened & released; Model 550 No-Go gauge will not go into drive cable connector slot; connect drive cable to source connector & check gap with gauge; gauge will not go in gap between male & female connection <input type="checkbox"/> Guide tube free of crimps, deformed threads, obstructions or cuts in sheath		
Required • PPE badge, ratemeter, dosimeter(s) • Survey meter(s) • RT Field Manual • Daily Survey Report & Bill of Lading/ISO • Radiation warning signs • Barricade tape/wire & stands • Goggles, mask, &/or other airborne tape	Safety Equipment List • Tape measure • First aid kit • Small tools (nails, pliers, wrench, hammer, etc.) • Electrical extension cords, drop-light, light stands/damps • Lubricating grease & cleaning agents • Flashlight(s), emergency flashers • Hard hat • Ear plugs • Safety glasses/goggles • Steel toe boots • Safety harness	Recommended • First aid kit • Small tools (nails, pliers, wrench, hammer, etc.) • Electrical extension cords, drop-light, light stands/damps • Lubricating grease & cleaning agents • Flashlight(s), emergency flashers • Hard hat • Ear plugs • Safety glasses/goggles • Steel toe boots • Safety harness

Radiography Procedure Checklist

3. Transportation

- Place camera in shipping container (if necessary)
- Inspect container condition & labels



Radiography Procedure Checklist

4. Field Site

- Verify dosimetry for all personnel
- Inspect equipment
- Perform post transport survey
- Establish controlled area (post, & if needed, barricade)
- Set up equipment
- Verify area is clear of unauthorized personnel
- Make exposure
- Verify 5 mR/hr – 2 mR/hr perimeter (document)



Radiography Procedure Checklist

Posting & Access Control: Restricted Area

- Posting of 2 mR/hr perimeter isn't required, but access must be restricted, so direct surveillance, rope/tape barricades & posted warning signs are used to control access
- The 2 mR/hr, rather than 5 mR/hr isodose line is typically posted with "Caution - Radiation Area" signs
- Use of "Danger" in place of "Caution" is not allowed, but OK to use "Danger" barricade tape



Radiography Procedure Checklist

Posting & Access Control: Radiation Areas

- Unless already posting the 2 mR/hr perimeter, areas with radiation levels > 5 mR/hr must be posted with "Caution - Radiation Area" warning signs
- Area where radiation levels are > 100 mR/hr are posted with "Caution (or Danger) - High Radiation Area" warning signs
- Adding "Keep Out" & "Radiography in Progress" to signs is recommended to enhance area control



KEEP OUT

RADIOGRAPHY IN PROGRESS

Radiography Procedure Checklist

Posting & Access Control

- Sufficient number of signs must be used to ensure visibility in all directions
- Elevations above & below the level where the setup is located must be evaluated/monitored
- During 1st exposure, perimeter must be surveyed & if needed, adjustments made to ensure boundaries are properly established & controlled
- High radiation area perimeter should not be surveyed, but must be kept under constant surveillance during exposures

Radiography Procedure Checklist

5. Daily Records

- Daily equipment checks
- Daily alarm ratemeter check (recommended)
- Start, end & total dosimeter readings
- Initial reference survey reading on camera upon removal from storage (recommended)
- Camera survey upon return to storage (ref. survey)
- Radiation levels & postings around controlled area

Radiography Procedure Checklist

6. Equipment Return

- Complete utilization log
- Inform RSO of any problems encountered with equipment; tag & remove from service any equipment needing repair
- Verify batteries are off on meters & alarm ratemeters
- Properly store all equipment (clean if necessary)

Radiography Procedure Checklist

Security of Radiographic Equipment

- At field sites, store cameras in transport container & locked inside darkroom
- Other storage arrangements may be used as long as they meet all security & posting requirements
- Unless secured, maintain direct surveillance of camera at all times



Radiography Operating Procedures

Questions?

