

MANUAL OF
RADIOGRAPHIC OPERATING AND EMERGENCY PROCEDURES

at

Pelton Casteel, Inc.
148 W. Dewey Place
Milwaukee, Wisconsin 53207

or

1000 West Pelton Drive
Oak Creek, WI 53154

Prepared by E. J. Lenar
April 1975

Revised:
December, 1978
February 16, 1984
October 26, 1986

I N D E X

<u>Title</u>	<u>Pages</u>
I. <u>Operating Procedure for Remote Control Radiographic Device, Tech/Ops Model 402</u>	1-3
A. Procedure to Make an Exposure	1-2
B. Securing Device When No Additional Exposures are Required	2
C. Special Instructions for Replacing Source Using Tech/Ops Model 416 Source Changer	2-3
D. Special Instructions for Replacing Source Using Tech/Ops Model 771 Cobalt Source Changer.....	3a, 3b, 3c
E. Procedure for Disengaging or Engaging Tech/Ops Model 505 Source Assembly Connector	3c
II. <u>Use of Radiation Survey Meters</u>	3c, 4
A. When Surveys Will be Conducted	3c
B. Instructions for Operation of Survey Meters	4
III. <u>Control of Access to Radiation Areas</u>	5
IV. <u>Personnel Monitoring</u>	5-6
A. Dosimeters	5-6
B. Film Badges	6
V. <u>Minimizing Exposure of Persons in Event of Accident</u>	6-7
A. In Event of Accident or Damage to Source	6
B. In Event of Sealed Source Damage or Source Cannot Be Returned to Safe Position	6
C. In Event of Plant Emergency	6-7
D. In Event of Entrapment Inside Exposure Room	7
VI. <u>Procedure for Notifying Proper Persons</u>	7
VII. <u>Maintenance of Records</u>	7-8
VIII. <u>Maintenance and Inspection</u>	8-12
A. Daily Inspection	8
IV. <u>Quality Assurance Program</u>	12-19
A. Purpose of Quality Assurance Program	12
B. Quality Assurance Program	12-18
C. Organization	19

I. OPERATING PROCEDURE FOR REMOTE CONTROL RADIOGRAPHIC DEVICE, TECH/OPS
MODEL 402

A. Procedure to make an exposure.

1. Check remote control positioner lights for "safe" position of source.
2. Check and set Survey Meter for correct setting.
3. Check that gamma sentry alarm red light is off and green light is on.
4. Open entry door to exposure room with key. Audible alarm will sound if source is exposed. Verify gamma sentry alarm is green.
5. Make survey of device for highest possible reading and record.
6. Check source tube and entire exposure room for radiation levels.
7. Do not move device unless source is locked in safe position.
8. Castings can now be set up for exposure.
9. Place source tube in place in desired position and secure for singular or panoramic exposure.
10. Straighten tube and cables to insure free movement of source and cables.
11. Close and lock door with key to prevent unauthorized persons from entering "High Radiation Area".
12. Remove key and keep on your person.
13. Remove Survey Meter to storage area (dark room).
14. Unlock remote control and turn handle and observe that "safe" light is out and "open" light goes off where "on" light goes on.
15. Gamma sentry light will go to "red" indicating alarm system is activated.
16. Set time for desired exposure and check all warning signals for proper operation.
17. Remain on site and observe area.
18. After exposure return source to head. Check source positioner that "safe" light is on.
19. Check gamma sentry alarm that green light indicates exposure room is safe.
20. Reset survey meter and proceed to open exposure room door.
21. With key, unlock door, survey meter in hand, survey area and entire tube for any radiation levels.
22. Check head of device to insure source is in "safe" position and lock device.

(I. OPERATING PROCEDURES ... cont'd.)

23. Remove film from exposure room and secure room.
 24. Close and lock door until ready for another exposure.
- B. Securing device when no additional exposures are required.
1. Lock remote control and verify that safe light is "on" on control box.
 2. With survey meter, monitor top of shield cabinet to determine source is in safe position. Radiation level should not exceed 38 mr/hr.
 3. Unthread flexible source tube from face of head.
 4. Replace plug in source hole and lock lever with padlock.
 5. Close exposure room door and lock.
- C. Special instructions for replacing source using Tech/Ops Model 416 Cobalt Source Changer.
1. The Model 416 source changer will be assumed to contain the new source to be installed in Model 402 exposure device.
 2. Monitor radiation levels at source changer before starting source exchange. With new source stored in position "B", radiation level at top center of bridge should not exceed 50 mr/hr. At center of front vertical sides radiation level should not exceed 40 mr/hr. Radiation level at source connector should not exceed 5 mr/hr. If levels higher than these are indicated, do not proceed, notify supervisor and instructions will be obtained from Tech Ops before proceeding.
 3. Unlock padlocks, cut tamper proof wire seal, remove 4 screws securing cover and lift off cover. (Figure 1 & 2).
 4. Remove source switch assembly from flexible source tubes.
 5. Remove cap with hold down rod marked "A" and attach snout end of flexible source tube to male threaded bushing on source changer. (Figure 2 & 3)
 6. Leave exposure room and close door.
 7. Crank out old source into source changer. Determine with survey meter that old source is completely within the source changer.
 8. Cut tamper proof seal and remove holding safety clips. (Figure 4)
 9. Spread apart source guide tubes. The source cable connector is now exposed. (Figure 5)
 10. Grasp the source cable between thumb and forefinger of left hand and push down on female connector with blade of small screw driver. Source cable and connector will separate. Do not withdraw source cable. (Figure 5)
 11. Remove snout cable from threaded bushing. (Figure 5)

(I. OPERATING PROCEDURES ... cont'd.)

12. Close source guide tubes until spring locks guide tubes together. (Figure 3)
13. Replace safety clips. (Figure 2)
14. Replace cap with hold down rod. (Figure 2)
15. Secure tamper proof seal through safety clip bolt and cap. (Figure 2)
16. Remove bolt securing safety clips at side "B" as with side "A".
17. Spread apart source guide tubes as with side "A".
18. Remove cap with hold down rod marked "B" and attach snout end of flexible tube to male bushing on source changer. Insert control cable into source cable connector and make certain the connection is complete as in Figure 4.
19. Close source guide tubes until spring locks guide tube together. (Figure 3)
20. Replace safety clips. (Figure 2)
21. Leave exposure room and close door.
22. Crank new source into Model 402. Control box will indicate that new source is in safe position.
23. Open exposure room door and determine with survey meter that new source is in safe position.
24. Remove snout cable from source changer as in Figure 5.
25. Replace switch assembly to open end for flexible guide tube.
26. Replace cap with hold down marked "B" as in Figure 2.
27. Indicate on attached tag the strength of old source now in the source changer.
28. Replace cover, 4 hold down screws, replace tamper proof wire seal and padlock. (Figure 1)
29. Return used source to Tech/Ops for disposal as soon as practicable after transfer is accomplished per Chapter IX, Quality Assurance Program.

D. Special instructions for replacing source using Tech/Ops Model 771 Cobalt Source Changer.

1. Upon receipt of a source changer, survey the source changer on all sides to assure that the source is in its proper storage position. Radiation levels should be less than 200 milliroentgens per hour at the surface of the container and less than 10 milliroentgens per hour at one meter from surface.

If either of these radiation levels are exceeded, place the source changer in a restricted area and notify the Radiation Safety Officer. The Radiation Safety Officer should notify the U.S. Nuclear Regulatory Commission, the final delivering carrier and Tech/Ops, Inc.

Visually inspect the source changer for signs of damage, and assure that the seal wire has not been tampered with. Complete the Notification of Receipt form and mail to Tech/Ops, Inc.

2. Locate the source changer and radiographic exposure device in a restricted area. Arrange them so that one length of guide tube will fit between them without any sharp bends or kinks in the tube. The bend radius of the source guide tube during source changing operations should be greater than 24 inches.
3. Remove the storage plug from the exposure device and attach the source guide tube. Remove the cover plates from the source changer, by breaking the seal wire and removing the bolts. Attach the other end of the tube to the empty chamber of the source changer. Assure that the selector ring of the source changer is in the unlocked position.
4. Attach the control unit to the exposure device. Set the radiographic exposure device as for an exposure according to the procedure for the particular exposure device.
5. Assure no unauthorized personnel are in the restricted area.
6. At the exposure device controls, crank the source rapidly from the exposure device to the source changer. Observe the survey meter readings during this procedure. The radiation intensity should greatly increase as the source is first exposed, decrease slightly as the source is being cranked towards the source changer and then drop to background when the source is in the source changer.
7. Approach the exposure device observing the survey meter; survey the exposure device on all sides, survey the guide tube and survey the source changer on all sides to assure the source has been properly transferred and stored.

(1. OPERATING PROCEDURES ... cont'd.)

8. Rotate the selector ring of the source changer to the lock position and depress the plunger lock. Disconnect the source guide tube from the source changer and disconnect the drive cable from the source assembly.
9. If a new replacement source is to be installed in the exposure device, couple the drive cable to the new source assembly and connect the source guide tube to the fitting on the source changer. Unlock the key operated lock and rotate the selector ring to the unlock position.
10. Assure no unauthorized personnel are in the restricted area.
11. As the exposure device controls crank the new source into the exposure device. Observe the survey meter during this procedure. The radiation intensity should increase as the source exits the source changer, increase steadily as the source travels toward the exposure device and then drop to background level when the source is stored in the exposure device.
12. Approach the exposure device, observing the survey meter, survey the exposure device on all sides, survey the length of the guide tube and survey the source changer on all sides to assure the source has been properly transferred and stored. Radiation levels should be less than 200 mR/hr at the surface and less than 10 mR/hr at one meter from the surface of the exposure device.
13. Secure the source in the exposure device. Assure that the source is properly secured in the source changer by placing the connector selector ring in the lock position, depressing the lock plunger and removing the key.
14. Disconnect the control unit and the source guide tube from the exposure device and disconnect the source guide tube from the source changer.
15. Reassemble flexible guide tubes and verify that switch assembly is properly secured to the flexible guide tube.
16. Remove the identification plate from the exposure device and attach it with seal wire to the source changer connector assembly.
17. Affix the identification plate of the new source to the exposure device.
18. Secure the source holddown cap over the source assembly. Bolt down the source changer cover plates of the lock assemblies and seal wire.
19. Survey all exterior surfaces of the package to assure that the radiation level does not exceed 200 mR/hr at the surface.
20. Measure the radiation level at one meter from all exterior surfaces to assure that the radiation level is less than 10mR/hr. The maximum radiation level measured is one meter

(I. OPERATING PROCEDURES ...cont'd.)

from any exterior surface is the Transport Index.
(Example: with a maximum radiation level of 2.2 mR/hr,
the transport index [T.I.] is 2.2).

21. Prepare the 771 source changer for return to Tech/Ops for disposition of the old source.

E. Procedure for disengaging or engaging Tech/Ops Model 505 Source Assembly Connector.

1. Place survey meter in close proximity, where visible, before starting disconnect and connect procedure.
2. Do not move source connector assembly more than one-half inch (1/2") from its stored position when disconnecting or connecting drive cable to source.
3. To disengage connector
 - a. Using fingernail, move the connector pin forward (pressure on pin is downward toward stored position of source.) This moves the connector sleeve away from the keyway in the female connector.
 - b. Slide the drive cable connector out of the female connector and release the pin.
4. To engage the connector
 - a. Using a fingernail, move connector pin forward (pressure on pin is downward stored position of source). This moves the connector sleeve away from the keyway in the female connector.
 - b. Slide the drive cable connector into the female connector and release the pin. Assure that the connector sleeve has returned to the original position closing the keyway.
 - c. Test the connection by pulling between the drive cable and the source. Do not bend or twist the assembly.

II. USE OF RADIATION SURVEY METERS

- A. Physical surveys using a survey meter will be conducted under the following conditions.
1. Prior to entering restricted area at any time.
 2. Immediately before opening exposure room door.
 3. Survey meter must be in "on" position at all times that radiographers is in exposure room.
 4. Survey or perimeter of restricted area while source is in exposed position.

(I. OPERATING PROCEDURES ... cont'd.)

5. To make periodic surveys when required during inspection, maintenance, physical inventory or any other required survey.
6. Last survey of the day when last exposure has been made and equipment is secured.

B. Instructions for operation of survey equipment.

1. Gamma Survey Meters - (2) Victoreen - Model #592B Series (1).

- a. The Gamma Dose Meters, Model #592B, is a portable ion chamber survey instruments for the measurement of X and Gamma radiation over the range of 1 to 1000 mr/hr at energies between 50 Kev. and 1.3 Mev. Three linear ranges with full scale sensitivities of 1000, 100 and 10 mr/hr are provided.

2. There are two external controls on the case: A five-position range switch to the left of the carrying handle and a zero adjustment control to the right of the handle. The five positions of the range switch are:

- a. Off
- b. Zero
- c. X100
- d. X10
- e. X1

In the "off" position all batteries are disconnected.

3. Operating steps.

- a. Turn the range switch to "Zero" position.
- b. Adjust the "Zero" control (righthand control) so that the meter reads exactly zero.
- c. Turn the range switch to the X100-X10-X1 range = as required, and the instrument will measure gamma radiation in mr/hr.
- d. This procedure is to be used each time a measurement is to be taken.
- e. Survey meter to be calibrated quarterly using Calibration Unit, Model 571 following the calibration procedure.
- f. Do not enter exposure area at any time. If survey meter is inoperable, notify supervisor-Radiation officers.

III. CONTROL OF ACCESS TO RADIATION AREAS

- A. Exposure room has only one manually key unlocked, self-locking entry.
- B. Door is posted with approved Radiation sign.
- C. Audible alarm sounds on opening of entry door when source is exposed.
- D. Warning blinking red lights (print Oak Creek Gamma Ray #4 appendix) are turned on by gamma sentry which activates at 2 mr/hr. Radiation.
- E. No one is allowed on roof without approval of radiographer.
- F. Radiographic room is locked at all times except when set-up is being made.
- G. Radiograph building is locked when not attended by radiographer.
- H. Radiographer has facility keys in possession at all times.
- I. Plant safety rules state that employees must observe radiation hazard signs.
- J. Radiograph building is surrounded by chain link fence, which is locked when facility is not in operation. Radiations signs posted on fence. (Print #P1).

IV. PERSONNEL MONITORING

A. Dosimeters

- 1. Radiographer will wear a Landsverk Model or Victoreen L50 dosimeter, 0-200 mr/hr, and Landsverk Model L51 dosimeter, 0-5000 mr/hr or 500 mr/hr, at all times during working hours.
- 2. Dosimeters will be read frequently during the day and end of shift with reading recorded daily.
- 3. Dosimeters will be charged daily at the beginning of the shift.
 - a. Insert the dosimeter into the socket of the charger until there is contact.
 - b. Turn the potentiometer clockwise.
 - c. Press the dosimeter down and adjust to "zero".
 - d. Remove the dosimeter.
 - e. Turn the charger to "zero" counterclockwise.
- 4. Return a dosimeter that will not charge properly to Landsverk or Victoreen Electrometer Co., 641 Sonora Ave., Glendale, California for repair.
- 5. If a dosimeter appears to be operating improperly, notify Radiation Safety officer immediately.

(IV. PERSONNEL MONITORING cont'd.)

6. If a dosimeter becomes discharged beyond its range the following actions will be taken.
 - a. Halt all radiographic exposures.
 - b. Notify laboratory supervisor.
 - c. Film badge will be immediately returned to R.S. Landauer & Co. for processing to determine if exposure has occurred.
 - d. If over-exposure has resulted laboratory supervisor will institute procedures listed under Emergency Procedure (page 4-5) in Administrative Controls Manual.

B. Film Badges

1. Film badge will be worn in left shirt pocket area at all times by radiographer during working hours.
2. Film badges will be changed monthly.
3. A control badge kept in laboratory is for checking purposes only and must not be worn by radiographer.

V. MINIMIZING EXPOSURE OF PERSONS IN EVENT OF AN ACCIDENT

A. In event of accident or damage to device:

1. Return source to safe if possible, and lock.
2. Make a physical survey.
3. Close exposure room door.
4. Notify Radiation Safety Officer.

B. In event of accident or damage to sealed source or if source cannot be returned to safe position:

1. Under no circumstance will radiographer enter exposure room and expose himself to hazardous conditions. Trained outside help will deal with the problem.
2. Notify immediately the persons listed under "Emergency Notifications" in IV, A Section, page 4.
3. Facility must remain secured until no hazard exists.

C. In event of a plant emergency near area of radiographic device:

1. Return source to shielded position.
2. Perform survey to insure source is in safe position.
3. Remove source tube, replace plug position lever and padlock.
4. Retrieve control box assembly over the wall and place in cabinet. Close and lock cabinet door.

- S. Notify Radiation Safety Officer.
- D. In the event of entrapment inside exposure room:
 1. Exit immediately over west wall using rope ladder
 2. Notify Radiation Safety Officer.

VI.

PROCEDURE FOR NOTIFYING PROPER PERSONS IN THE EVENT OF AN ACCIDENT

A. Emergency notifications

1. The following persons must be notified immediately in the event of any accident to radiographic exposure device, facility or suspected exposure of employees to radiation:
 - a. Eugene J. Lenar, Vice President, Research & Technology
Home Phone: 425-5948
 - b. Aldro Kosharek, Plant Engineer
Home Phone: 545-3137
 - c. John Sirna, Radiographer
Home Phone: 543-5214
 - d. Technical Operations, Inc.
Northwest Industrial Park
Burlington, MA 01803
Phone: 671-272-2000

VII.

MAINTENANCE OF RECORDS

A. The following records will be maintained and kept by the radiographer:

1. Pelton Casteel Radiographic Department Daily Utilization and Inventory Logs. This form is completed daily and includes data on radiation at the head of the source safe at start of day and when source is secured, radiographic daily dosimeter reading, source used, maximum radiation recorded at walls of exposure room, monthly film badge reading, date of survey meter calibration, and leak test reports.
2. Radiographic Facility Radiation Survey Monthly Log of shop and roof barrier radiation level readings.
3. Radioactive Sources - Cobalt 60. On this form are recorded the dates of and results of leak tests of Cobalt 60 sources.
4. Survey Instrument Calibration Report. This form is completed quarterly for each meter checked. Recorded are date, instrument serial number, strength calibrating source, distances and m/r readings for X1, X10 and X100 scales.
5. Daily Inspection Form. Log of checks called out in daily inspection requirements on exposure device and collimator.
6. Quarterly Inspection and Maintenance Check List. This form calls out the check points for inspection and maintenance of the projector, collimator and source changer. Added in the remarks will be notation of calibration unit after survey meter
7. Radiation Source Inventory of Crucible sources. This form calls out a quarterly check of radiation levels of stored sources. (Supplementary sheet, ammendment 17).

calibration.

VIII. MAINTENANCE AND INSPECTION

A. Daily inspection - to be completed prior to first exposure of the day on Model 402 Tech/Ops gamma projector and Model 527 Tech/Ops Collimator.

1. Visually inspect all components such as shield, cabinet, source cables and signal cables to verify that equipment is in order.
2. On control assembly note operation of source indicator lights: stored, open and on.
3. Control assembly should operate smoothly without binding when source is moved from stored to open position and back again.
4. Pad lock and locking device must effectively lock the source in the shield position.
5. Source tube connectors must be tight and either source switch assembly or Model 527 collimator in place to prevent source from leaving the end of the source tube.
6. Verify the large yellow sign identifying the Model 402 unit is in place on the door and small identity sign for source capsule model #A-424-2 serial 1441 is in place on the door immediately below the yellow sign.
7. Operation of gamma alarm, green light should be on when source is stored.
8. Red warning lights should flash when source is in open position.
9. Visually examine Model 527 collimator and verify that shield is properly in place.
10. Survey radiation on top of cabinet with source stored. Radiation level not to exceed 38 mr/hr.
11. Observe operation of equipment throughout the day and note anything that seems different.
12. Complete the daily inspection and maintenance check list.
13. Any irregularities must be corrected prior to beginning daily exposures.

B. Quarterly inspection and maintenance.

1. The following tools, equipment and materials are required to perform quarterly inspection and maintenance on Tech/Ops Model 402 projector.

Source change Tech/Ops Model 416.
7/16, 9/16 & 11/16 open end wrenches.
4" x 3/16", 6" x 5/16" screwdrivers.
Cleaning pan 12-18" in diameter.
Syringe.
Dummy source assembly.

(VIII. MAINTENANCE & INSPECTION, cont'd.)

Tech/Ops 550 Connector NO-GO gage.
2 Oz Texaco "unitemp" grease or equivalent.
2 quarts solvent (perchloroethylene) or equivalent.
3/16" Allen wrench.
1" bristle cleaning brush.
1" wire brush.
8" pliers.
.005" feeler gage.

2. Control

- a. Following instructions of 416 source changer remove source from Model 402 shield and store in source changer. Before securing source changer check the female hole of source cable connector using the #4 position of the 550 connector NO-GO gage. The stem of the gage must not go into the hole. If the gage goes, the source must be returned to Technical Operations for replacement of the connector end.
- b. Disconnect signal cable at control mechanism and at shield. Examine electrical cable for deterioration and fraying for its length and at connectors at both ends. Cracked or damaged connectors must be replaced. Crushed, cut, frayed or any other visible damage requires replacement of the signal cable.
- c. Disconnect cable housing from shield and eject the cable by cranking in the expose direction. When cable is free of crank pull the remaining length of the cable from the cable housing. Coil the cable in 18" pan and immerse and wash with solvent. Brush cable with bristle or wire brush if necessary to remove accumulations of dirt, grease or rust. Use hand brushes only. Wipe the cable dry.
- d. Examine the cable for kinks, fraying, broken wires, wearing and rust. Light rust may be brushed away by hand wire brushing. Heavy rust that may have penetrated into the cable will require cable replacement. A cable with frayed or broken wires must be replaced. Minor bends in the cable may be straightened by hand only.
- e. Examine the connector carefully for straightness and looseness to the cables. Use the Tech/Ops 550 connector gage and gage male ball shank length using position #1. Using position #2, gage male ball shank diameter. Using position #3, gage male ball diameter. The gage may not go for any position. Repair of the connector or failure to gage correctly will require a replacement cable.
- f. Lubricate the cable with Texaco "Unitemp" grease.
- g. Remove control cable housings by undoing with 11/16" wrench. Examine carefully for internal damage by flexing the cable. Cut, flattened, burned or cable housing that will not flex uniformly must be replaced. Tape superficial damage to protective covering with tape.

Clean housing by syringing a few ounces of solvent into bore and blow out with low pressure air of about 20 psi.

Do not soak in solvent.

Check end fittings for secure attachment. Loose fitting attachment will require cable replacement.

- h. Clean source guide tubes by syringing in an ounce or so of solvent. Blow out the tubes with low pressure air. Check the tubes for internal damage by flexing the tubes. Check fittings for secure attachment. Examine and test threads for ease of operation. The dummy source should pass freely through a tube held vertically. Cut, flattened, burned or tubing that will not pass the dummy source must be replaced. Examine the signal cable for cuts, bare wire and damaged connectors. Damage that minor taping will not repair will require a new signal cable.

- i. Remove crank unit from reel housing. Remove crank and separate gear wheel from housing. Wash parts thoroughly in solvent. Check the inside of housing for evidence of galling and wear. A deeply scored line (.202 inches or more in depth) where the cable contacts the inner wall of the housing indicates the need for replacement.

Check clearance between wheel hubs and bushings. More than .005" wear indicates need for replacement.

Examine teeth of wheel for damage. A single bent tooth may be filed to fit. Two or more bent teeth will require replacement of the wheel.

Lubricate the bushings with Texaco "Unitemp" grease and reassemble the crank unit to the reel housing.

- j. Check exterior of shield and cabinet assembly for loose or missing hardware. Replace or repair as necessary. Examine source exit fitting, nut should rotate freely without excessive looseness. Look into exit port and check concentricity of source tube with nuts. Misalignment if found, indicates a shifting of the shield within the housing. The need for this type of repair will be referred to Technical Operations.
- k. Reassemble the system, connect control cables and source guide tubes to shield and control assembly. Reinstall cable through shield exit port. Connect dummy source. Connect electrical signal cable at shield control assembly, shield and along length of source tube. Operate the machine several times and verify the source position indicator lights activate correctly.
- l. Batteries can normally be expected to last one year. If there is any erratic light behavior of source position indicator lights replace batteries with fresh dated batteries.
- m. Following instructions of the 415 source changer manual return the live source to the shield and make a gamma ray survey. Radiation must not exceed 98 mr/hr on top of shield cabinet.

- n. Complete quarterly inspection and maintenance check list.
3. Model 527 Collimator, Tech/Ops
- a. Examine overall condition and appearance of Model 527 collimator for any damage or missing pieces.
 - b. Check to see that two holding screws hold lead shield collimator securely against body of the head.
 - c. With collimator lead shield removed grasp source switch assembly end and move it back and forth. It should move freely and easily with no binding. With source switch assembly end pulled out the open indicator light on control assembly should light. When released the source switch assembly end should retract and the stored indicator light on control assembly should lite. If switch binds or does not operate, remove and replace with new assembly.
 - d. Examine condition of threads that accept source tube connector. They should be clean and free of nicks so that the connector screws on easily.
 - e. Examine signal wire and connector for damaged insulation and frayed wires.
 - f. Examine head locking clamps for ease of operation.
 - g. Wipe unit clean with cloth wetted with perchlorethylene.
 - h. Complete quarterly inspection and maintenance check sheet.
4. Tech/Ops Model 416 Source Changer

The following inspection and maintenance will be conducted prior to quarterly inspection and maintenance on the Model 402 gamma projector to be certain that the source changer is in proper condition to accept the live source. The following procedures are conducted at positions "A" and "B":

- a. Visually examine external surfaces of source changer for any physical damage.
- b. Unlock pad lock and remove cover security chain. Remove four cover security screws and lift off cover.
- c. Check that safety clip plates are properly in position about plate guides. Remove clip plate bolts, bolt should remain secured to one clip plate and the nut to the other. Clips should remain chained to the bridge support. Repair or replace bolts, nuts or chains as necessary.
- d. Unscrew cap. Threads on cap and threaded bushing should permit free turning of cap. Spring loaded hold down rod should compress against source connector end to prevent free up and down movement of the source. Verify with dummy source.
- e. Dummy source must drop freely into the tube and bottom

(VIII. MAINTENANCE & INSPECTION cont'd.)

at the tube divider.

- f. Source guide tubes must hinge freely and spring lock must position in place when guides are vertical.
 - g. Remove dummy source, replace safety clip, cap, cover and security chain and pad lock.
 - h. With live source stored in source changer at position "B", radiation level at top center of bridge should not exceed 50 mr/hr. At center of front vertical sides radiation level should not exceed 40 mr/hr. Radiation level at source connector should not exceed 5 mr/hr. Higher levels of radiation than indicated will require examination by Tech/Ops personnel for correction.
 - i. Complete quarterly inspection and maintenance check list.
5. Tech/Ops 571 Calibration Kit.
- a. The quarterly calibration of survey meters will constitute maintenance and inspection of the calibration unit.

IX. PELTON CASTEEL QUALITY ASSURANCE, PERTAINING TO TRANSPORTATION PACKAGING FOR TRANSPORTATION OF BY-PRODUCT MATERIAL

A. Purpose of Quality Assurance Program:

- 1. Pelton Casteel, Inc. establishes this Quality Assurance Program to assure that all requirements for control procedures and package design, as required by 10CFR71 and approved by the Nuclear Regulatory Commission, shall be implemented.
- 2. The program shall assure that specific control procedures will be formulated and followed whenever a shipping package containing by-product material is received by, or is shipped from Pelton Casteel, Inc.

B. Quality Assurance Program:

- 1. All by-product material received by, or sent out from Pelton Casteel, Inc. shall be shipped in an N. R. C. approved shipping package.
- 2. Only shipping packages owned and supplied by certified suppliers shall be used for transportation of by-product material by Pelton Casteel, Inc. Radiographic facility.
- 3. All shipments transferred as in (1) above shall be tagged, identified and marked in accordance with 10CFR71 requirements.
- 4. Prior to receipt, or shipment by Pelton Casteel, Inc., of a shipping package supplied by a certified supplier a certification from the supplier will be furnished to Pelton Casteel, Inc. stating that all regulations pertaining to design, and engineering, identification, labeling, and all other items required have been approved by the N. R. C. and that said package is capable of transporting the specified by-product material safely and in accordance with N.R.C.

criteria. The supplier certification and copies of all shipping instructions shall be filed at the Pelton Casteel, Inc. Radiographic Facility and shall be readily retrievable.

5. Transfer at Pelton Casteel, Inc. of by-product material into or out of the shipping package shall be done by a certified radiographer in accordance with suppliers recommended procedure, and instructions as stated in the operating manual of the Pelton Casteel, Inc. By-Product License.
6. Shipping precautions and procedures:
 - a. Incoming or outgoing shipments containing product material shall be monitored with a calibrated survey meter to ascertain that radiation level is acceptable. The survey results shall be entered in the log book of the Radiographic Facility.
 - b. Visual inspection shall be made to package to ascertain if any physical damage of package is evident. Results of findings shall be recorded in log book of Radiographic Facility.
 - c. Visual inspection shall be made to package to ascertain that all labels, markings and identification are present as required by N. R. C. regulation. Entry of findings shall be entered in log book of Radiographic Facility.
 - d. All records required shall be readily retrievable.
 - e. Any shipping container arriving at the Pelton Casteel, Inc. facility which shall be found not to meet all N. R. C. criteria for shipping packages shall be placed undisturbed in safe storage in the Radiographic Facility and the N. R. C. immediately notified. The package will remain undisturbed until specific instructions are received from the N. R. C. as to proper action to be taken. The facility Radiographer will maintain security of package until N. R. C. instructions are forthcoming.
 - f. No transfer of by-product material to or from a shipping package, or receipt, or shipment of a shipping package shall be made to or from the Pelton Radiographic Facility except under the direct supervision of a qualified Radiographer and with full knowledge of the Radiation Safety Officer and the Administrator.
 - g. All transfers of by-product material shall be in accordance with step by step standard procedures as stated in the Pelton Casteel, Inc. Radiographic operating manual which is part of the Pelton Casteel, Inc. By-Product License.

7. Shipping instructions for return of 771 Source Changer.

- a. Measure the radiation level at one meter from all exterior surfaces to assure that the radiation level is less than 10 mR/hr. The maximum radiation level measured one meter from any exterior surface is the Transport Index (Example: with a maximum radiation level of 2.2 mR/hr., the transport index [T.I.] is 2.2).
- b. Select the proper shipping labels according to the radiation levels at the surface and at one meter from the surface, as shown in the following table. Properly complete two shipping labels listing the radionuclide, the activity (expressed in curies) and the transport index. (see page 18.)
- c. Remove all the old shipping labels from the shipping container. Apply the properly completed shipping labels to two opposite sides of the container. Assure bolts are tightened and seal wires are fastened.
- d. Properly complete the shipping papers indicating:
 - (1) Proper shipping name (Radiographic material, special form n.o.s. UN2974).
 - (2) Name of radionuclide (Cobalt-60).
 - (3) Activity of source (in curies).
 - (4) Category of label applied to container (Radioactive Yellow II or Radioactive Yellow III).
 - (5) Transport Index
 - (6) Type B identification number
Model 771 USA/9107/B(U) Type B(U)
 - (7) Shipper's certification stating:

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transport according to the applicable regulations of the Department of Transportation."

NOTE: (a) For air shipments, the following shipper's certification may be used:

"I hereby certify that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked and labeled and are in proper condition for carriage by air according to applicable national governmental regulations."

- (b) For air shipments, the package must be labeled with a "Cargo Aircraft Only" label and the shipping papers must state:

"This shipment is within the limitations prescribed for cargo-only aircraft."

- e. Due to the depleted uranium used as shielding in the source changer, a notice must also be enclosed in or on the package included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the following statement:

"This package conforms to the conditions and limitations specified in 49 CFR 173.424 for excepted radioactive material, articles manufactured from depleted uranium, UN 2909."

- f. For shipment of an empty source changer, assure that there is no source in the container. If the radiation level is below 0.5 mR/hr at the surface, and there is no measurable radiation level at one meter from the container, no label is required. Mark the outside of the package with the proper shipping name (Radioactive material, articles manufactured from depleted uranium UN 2909). Mark the outside of the package:

"Exempt from specification packaging, shipping paper and certification, marking and labeling and exempt from the requirements of Part 175 per 49 CFR 173.421-1 and 49 CFR 173.424."

Additionally, a notice must be enclosed in or on the package included with the packing list or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the statement:

"This package conforms to the conditions and limitations specified in 49 CFR 173.424 for excepted radioactive materials, articles manufactured from depleted uranium, UN 2909."

- g. Return the container to Tech/Ops, Inc. according to proper procedures for transporting radioactive material as established in Title 49 Code of Federal Regulations part 172-178.
- h. Fill out notification of return form and mail to Tech/Ops, Inc.

8. General Information

The Model 770 and 771 are used as source changers and Type B(U) transport packages for Tech/Ops, Inc. radioactive sources. The user should become thoroughly familiar with the instruction manual before attempting operation of the equipment.

In order to use this equipment to perform source changes within the United States, the user must be specifically licensed to do so. Application for a license should be filed with:

Material Licensing Branch
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

or with the appropriate Agreement state office.

Prior to the initial use of this source changer a transport package in the United States, the user must register with:

Transportation Certification Branch
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

The user must have in his possession a copy of the USNRC Certificate of Compliance No. 9148 issued for the Model 770 or No. 9107 issued for Model 771.

Prior to the first export shipment of the source changer from the United States, the user must also register with:

Office of Hazardous Materials Regulation
Materials Transportation Bureau
U.S. Department of Transportation
Washington, DC 20590

The user must have in his possession a copy of IAEA Certificate of Competent Authority Number USA/9148/B(U) issued for Model 770 or Number USA/9107/B(U) issued for Model 771.

An envelope accompanies each shipment and contains:

1. Source decay chart and leak test certification. Keep for user's records.
2. Source identification plate for attachment to user's exposure device.
3. Return shipping labels
4. Tamper-proof seals
5. Instruction manual

Notification of Receipt:

A notification of receipt is enclosed in this container. It should be completed and sent back immediately to Tech/Ops upon receipt of the source changer.

Notification of Return:

A notification of return is enclosed in this container. It should be completed with the following information:

- the date of return shipment
- contents of shipment
- method of shipment.




This form should be sent by mail to Tech/Ops when the container is being returned even if the container is being returned empty.

9. Technical Data: 771 Source Changer

The source changers Model 770 and 771 are portable shielded containers designed for transferring encapsulated radioisotope sources into radiographic exposure devices. The changers are designed to safely contain the radiographic sources during shipment and to permit field exchange of old for new sources without exposing the operator to unsafe radiation levels if proper procedures are followed. The source changers have depleted uranium from shielding.

Size:	24 in. (610mm) wide; 23 in. (548mm) long; 20 in (508 mm) high
Shipping weight:	704 lbs. (320 kg.)
Capacity:	Cobalt-60: 110 curies as special form
Shielding:	Depleted Uranium (U-238) 213 lbs. (97 kg)
Transport Status:	Type B Package: USA/9107/B(U)
Sources Approved for Use with Model 771:	Can be used with all the source assemblies as in the 770 with the following additional assemblies: A424-2, A424-11, A424-12, A424-14, A424-18

10. Labels

Category of Label	Maximum Radiation Level	
	at Surface	at One Meter
Radioactive White I 	0.5 mRem/hr	None
Radioactive Yellow II 	50 mRem/hr	1.0 mRem/hr
Radioactive Yellow III 	200 mRem/hr	10 mRem/hr

C. Organization:

1. The Radiation Safety Officer as established in the Pelton Casteel, Inc. By-Product License shall be directly responsible to see that all requirements of the Program are met.
 - a. He shall be notified whenever a shipping package is received by, or sent out from Pelton Casteel, Inc.
 - b. He shall ascertain that said shipments are in compliance with requirements of 10CFR71 and the Pelton Quality Assurance Program for Transportation Packaging.
 - c. He shall enter statement in the Pelton Radiographic Facility log book that compliance has been met.
2. The Radiographer as established in the Pelton Casteel, Inc. By-Product License shall ascertain that all by-product shipments into or from, the Pelton Casteel, Inc. Radiographic Facility meet all requirements of 10CFR71 and the Pelton Radiographic operations manual. (Part of Pelton By-Product License.)
 - a. He shall enter his findings in the Pelton Radiographic Facility log book.
 - b. No change may be made in this program without approval of the Radiation Safety Officer and Administrator, and unless final approval is made by the Nuclear Regulatory Commission.
3. We will not build or possess shipping containers or packages of Pelton design or manufacture but will transport license amounts of by-product material for disposal or replacement in containers or packages owned and licensed by approved suppliers of by-product materials.