

*For A  
Jim Nicolosi,  
RI  
Tom T Reussen  
IE HQ  
4927463*

JUL 20 1981

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*P. 1 of 5*

MEMORANDUM FOR: Dennis Allison, Technical Assistant to the Deputy Director, IE  
FROM: A. W. Grelle, Chief, Fuel Cycle and Material Safety Inspection, IE  
SUBJECT: ABNORMAL OCCURRENCE REPORT TO THE CONGRESS FOR SECOND QUARTER, CY 1981

Enclosed are draft writeups of two incidents for possible inclusion in the subject report.

We consider these incidents Appendix C items rather than AO's since they did not result in personnel overexposure (meeting AO criteria) or release of radioactive materials, although the public might perceive them as of public health and safety significance.

A. W. Grelle  
Chief  
Fuel Cycle and Material  
Safety Inspection, IE

Enclosures:

- 1. Beeton-Dickinson Irradiator Incident (5/14/81) Writeup
- 2. Herg From RI/I - Employee Exposure at Dresden

*outside scope of request  
Pages 4 + 5*

CONTACT: Tang Reussen x x 27463  
Jim Wigginton x 24967

*File -  
Beeton-Dickenson  
Docket file*

*(K)  
7/27/81*

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## APPENDIX C ITEM

### Becton-Dickinson Irradiator Incident

On May 15, 1981, Becton-Dickinson Company, North Canaan, Connecticut, reported the NRC that the source rack in their AECL irradiator (containing 1,400,000 Ci of Cobalt-60) had jammed in the up position at 5PM on May 14, and that they had experienced a fire inside the cell on the morning of May 15. The fire was later extinguished by the automatic sprinkler system. After attempts were made to manually free the source rack, the cell monitor still indicated a high radiation level although the panel lights indicated that the source was down. Pocket dosimeters later sent into the cell area on the monorail trolley also confirmed high radiation levels. During investigations by AECL, it was found that the source hoist was free from defects and that there were no apparent internal malfunctions. Video monitoring equipment indicated that the top center module was missing and that the lower center module was in position but most of the pencils were missing. Holes were drilled through the roof to locate and return the missing module and loose pencils. Radiation levels then fell back to normal. No personnel exposure or release of radioactive material has resulted from the incident.

The sequence of events was as follows:

A tote on the inner pass of the lower conveyor, lacking the structural support of its cover, apparently bent into the path of the source rack. The edge of this tote interfered with the bottom center of the source module. As the source rack descended the two center modules were prevented from going down. The top bar of the source rack made contact with the damaged tote, preventing the rack from lowering completely. At this point there was no support for the upper module and it is assumed the module leaned to one side until the top was touching the tote box. While raising the source rack in an attempt to free it, the upper module was also raised and eventually slipped off the rack and jammed on the upper conveyor support. It is also assumed that this action was sufficient to disrupt the pencils causing them to dislodge from the module.

The following actions have been or will be taken by the licensee:

1. All damage was repaired and certified by AECL.
2. The six pencils bent as a result of this incident were removed from operation and stored at the bottom of the pool and will be returned to AECL at the next source replenishment.
3. All of the pencils were installed in the racks and a new loading diagram was made.
4. New aluminum totes were instituted using thicker material. All four sides are closed and the top is open. Reinforcing bands were welded at the top, bottom, and middle sections of all totes.
5. Aluminum sheets of approximately 1/8" thickness were installed to form a shroud separating the source from the product conveyors. This will

prevent product totes from interfering with the source rack as well as prevent any pencils from jamming between the product and the conveyors.

6. Licensee will investigate moving the automatic sprinkler heads to provide better coverage of the source rack and product totes. If feasible an additional manual sprinkler will be installed over the source rack. The nozzles will be positioned so they all spray the source and product totes on either side of the source rack. These actions will be implemented after compliance with national fire protection and safety codes has been determined. In conjunction with this system two radiation monitor probes will be mounted on the resin beds of the water deionizer system.

On May 22, 1981, an Immediate Action Letter was issued to the licensee requiring that the licensee, prior to resuming routine operation of the irradiator, perform radiation and contamination surveys, and submit a written report of the incident evaluation. Special inspection was conducted on May 15, 16, 17, 18, 19 and June 2, 1981. One item of noncompliance regarding emergency procedure (i.e., immediate notification of the NRC of a stuck source) was identified. The inspection report is currently in preparation by Region I.

27 OCT 1981

Docket No. 030-06891

Becton, Dickinson and Company  
ATTN: Andrew P. Rowjohn  
Plant Manager  
Route 7 and Grace Way  
North Canaan, Connecticut 06018



Gentlemen:

Subject: Inspection Number 81-01

This refers to the special safety inspection conducted by Messrs. Nicolosi and Costello of this office on May 15-19 and June 2, 1981 of activities authorized by NRC License No. 06-13514-01 and to the discussions of our findings held by Mr. J. Nicolosi with yourself and Mr. Crook of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the Office of Inspection and Enforcement Inspection Report which is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, measurements made by the inspector, and observations by the inspector.

Based on the results of this inspection, it appears that one of your activities was not conducted in full compliance with NRC requirements, as set forth in the Notice of Violation, enclosed herewith as Appendix A. This item of noncompliance has been categorized into the levels described in the Federal Register Notice (45 FR 66754) dated October 7, 1980. You are required to respond to this letter and in preparing your response, you should follow the instructions in Appendix A.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosures will be placed in the NRC's Public Document Room. If this report contains any information that you (or your contractors) believe to be exempt from disclosure under 10 CFR 9.5(a)(4), it is necessary that you (a) notify this office by telephone within ten (10) days from the date of this letter of your intention to file a request for withholding; and (b) submit within 25 days from the date of this letter a written application to this office to withhold such information. Consistent with section

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RI:DETI  
Nicolosi/gwc  
9/23/81  
PAC  
RI:DETI  
Costello  
10/16/81  
KI:DETI  
Kinneman  
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2.790(b)(1), any such application must be accompanied by an affidavit executed by the owner of the information which identifies the document or part sought to be withheld, and which contains a full statement of the reasons on the basis which it is claimed that the information should be withheld from public disclosure. This section further requires the statement to address with specificity the considerations listed in 10 CFR 2.790(b)(4). The information sought to be withheld shall be incorporated as far as possible into a separate part of the affidavit. If we do not hear from you in this regard within the specified periods noted above, the report will be placed in the Public Document Room. The telephone notification of your intent to request withholding, or any request for an extension of the 10 day period which you believe necessary, should be made to the Supervisor, Files, Mail and Records, USNRC Region I, at (215) 337-5223.

In previous discussions between this office and your staff, your staff has indicated that changes were planned to the sprinkler system within your cobalt-60 irradiator room. Please discuss the status of these changes in your reply to this letter.

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

~~Original Signed By:~~

John D. Kinneman, Chief, Materials  
Radiological Protection Section,  
Technical Inspection Branch

Enclosures:

1. Appendix A, Notice of Violation
2. Combined Office of Inspection and Enforcement Inspection  
Report Numbers 030-06891/81-01 and 030-06871/81-01

cc w/encls:

Public Document Room (PDR)  
Nuclear Safety Information Center (NSIC)  
State of Connecticut

bcc w/encls:

Region I Docket Room (with concurrences)  
Chief, Operational Support Section (w/o encls)

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APPENDIX A

NOTICE OF VIOLATION

Becton, Dickinson and Company  
North Canaan, Connecticut 06018

Docket No. 30-06891  
License No. 06-13514-01

As a result of the inspection conducted on May 15-19; June 2, 1981, and in accordance with the Interim Enforcement Policy, 45 FR 66754 (October 7, 1980), the following violation was identified:

Condition 16 of NRC License No. 06-13514-01 requires that licensed material be possessed and used in accordance with statements, representations and procedures in your application dated October 19, 1979. This application contains emergency procedures to be followed in a radiation incident.

Your emergency procedures require you to immediately notify Atomic Energy of Canada Limited once it is determined that the source rack is jammed. These procedures also require you to shut off the exhaust fan in the irradiator room once you have determined that you are experiencing a fire.

Contrary to these requirements on May 14, 1981, you failed to immediately notify Atomic Energy of Canada Limited once you determined that your source rack was jammed. You continued attempts to free the source rack with the overhead crane hoist before notifying Atomic Energy of Canada Limited. You also failed to shut off the exhaust fan in your irradiation facility once you determined that you were experiencing a fire in that room on May 15, 1981.

This is a Severity Level V violation (Supplement VII).

Pursuant to the provisions of 10 CFR 2.201, Becton, Dickinson and Company is hereby required to submit to this office within thirty (30) days of the date of this Notice, a written statement or explanation in reply, including: (1) the corrective steps which have been taken and the results achieved; (2) corrective steps which will be taken to avoid further violations; and (3) the date when full compliance will be achieved. Under the authority of Section 182 of the Atomic Energy Act of 1954, as amended, this response shall be submitted under oath or affirmation. Where good cause is shown, consideration will be given to extending your response time.

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The responses directed by this Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Dated \_\_\_\_\_  
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\_\_\_\_\_  
Signed By:  
John D. Kinneman, Chief  
Materials Radiological Protection  
Section

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report Nos. 030-06891/81-01  
030-06871/81-01

Docket Nos. 030-06891  
030-06871

License Nos. 06-13514-01      Priority IV      Category E  
54-00300-09      Priority IV      Category E

Licensee: Becton, Dickinson Company      Atomic Energy of Canada Limited  
Route 7 and Graceway      Commercial Products Division  
North Canaan, CT 06018      P.O. Box 6300  
      Station J  
      Ottawa, Canada K2A 3W3

Facility Name: Becton, Dickinson and Company

Inspection at: North Canaan, Connecticut

Inspection conducted: May 15-19, 1981  
June 2, 1981

Inspectors:

James F. Nicolosi  
James F. Nicolosi, Radiation Specialist

10/22/81  
date signed

Francis M. Costello  
Francis M. Costello, Radiation Specialist

October 22, 1981  
dated signed

Approved by:

John D. Kinneman  
John D. Kinneman, Chief, Materials  
Radiological Protection Section

10/22-81  
date signed

Inspection Summary:

Inspection on May 15-19, 1981 and June 2, 1981 (Combined Report Nos. 030-06891/81-01 and 030-06871/81-01)

Areas Inspected: Special, announced inspection of circumstances surrounding the occurrence of a jammed source rack and subsequent fire including a review of report of incident, operations, radiation protection procedures, contamination control, independent measurements, and facility modifications.

Results: Of the 9 areas inspected, one apparent violation was identified - (failure to follow emergency procedures, paragraph 4).



## DETAILS

### 1. Persons Contacted

#### Becton, Dickinson and Company (BDC)

C. Jordan, Corporate Safety Officer  
\*\*A. Rowjohn, Plant Manager  
\*\*R. Crook, Sterilization Department Manager  
W. Case, Radiation Safety Officer  
R. Pernock, Licensed Operator  
R. Leonard, Plant Engineering Manager  
W. Groden, Corporate Safety Representative  
M. Hamlon, Employee  
F. Twing, Employee

#### Atomic Energy of Canada Limited (AECL)

F. Fraser, General Manager, Industrial Products  
R. McKinnon, Manager, Engineering  
S. Jaeger, Installation Supervisor  
R. Chu, Radiation Specialist  
\*G. Leeson, Service Representative

#### Other

P. Mulville, local contractor  
M. Mulville, local contractor  
D. Madeiros, local contractor  
J. Savanella, local contractor

\* by phone on May 22, 1981

\*\* denotes those present at exit interview

### 2. Description of Licensed Operations

Becton, Dickinson and Company (BDC), North Canaan, Connecticut owns and operates a cobalt-60 irradiation facility for the purpose of sterilization of medical products manufactured at that plant. The irradiation facility was designed and installed by Atomic Energy of Canada Limited (AECL). NRC License No. 54-00300-09 authorizes AECL to perform recovery and repairs operations at this type of facility. A copy of the manual for AECL Type J6500 Serial No. IR21 Irradiator is enclosed with this report (Enclosure 5). A description of the product transport mechanism (conveyor) is included in this manual.

### 3. Report of Incident

At 9:30 a.m., May 15, 1981, Region I received a telephone report from BDC that the source rack in their AECL irradiator had jammed in the up position at 5:07 p.m., May 14, 1981 and that a fire had started at 6:03 a.m., May 15, 1981. The rack contained 1,499,140 curies of cobalt-60 as of August 1, 1980. An inspector was sent to the site to observe the licensee's recovery operations. The inspector arrived at 6:40 p.m. on May 15, 1981.

### 4. Description of Incident

The inspector interviewed several BDC and AECL representatives during the inspection and the following sequence of events was described. Aluminium tote boxes are used to transport products on the conveyor into the irradiator room in a pattern around the source rack and back out of the irradiator room. Pneumatic cylinders push these totes from one portion of the conveyor to another as the totes move around the source rack. These totes consist of a box which is completely open on top and partially open on one side. An "L" shaped lid fits on top (See Enclosure 1). There is also a separate monorail system which permits movement of items in and out of the irradiator room.

On May 15, 1981, during routine product irradiation, apparently two of these boxes lost their lids while moving through the conveyor mechanism. Loss of the lids led to a loss of rigidity. As the boxes were subjected to the normal stress imposed by the pneumatic cylinders during the receive/discharge cycles, these totes apparently deformed. These two boxes were not adjacent to one another. One was located on the fourth level of the upper product conveyor and the second was located on the seventh level of the product conveyor. In the BDC irradiator the source pencils are not protected by a shroud (See Enclosure 4).

Apparently during an advancement cycle the second box either jammed against the exposed source rack or in some other way became positioned in such a fashion as to prevent free entry of the source rack back into the pool. Simultaneously this box applied force to boxes located on the eighth pass of the lower conveyor. This apparently caused the end box on the eighth pass to extend slightly into the path of the product carrier. This prevented further product movement. This failure activated the overdose timer to start. This timer is intended to lower the source after a preset time expired. The licensed operator seeing the activation of the overdose timer, and surmising a minor product jam, decided this would be an appropriate time to test the door interlock system, a required daily check. The interlock test activated the source hoist to lower the source rack back into the pool.

The licensed operator, after waiting an appropriate time period, failed to receive a "source down" indication on the control panel. This "source down" indication indicates the source rack has reached the end of its travel and is at the bottom of the pool. This was at 5:07 p.m. May 14, 1981. He immediately made telephone calls to the residences of both the Radiation Safety Officer and the Sterilization Department Manager. Contact with the department manager was made at 5:35 p.m. while the RSO returned his call at 5:45 p.m. They instructed the operator to make no attempts to resolve the problem until they arrived at the plant. The department manager arrived at 6:05 p.m.; the RSO arrived at 6:35 p.m. They reviewed the situation with the operator. The RSO made a survey which indicated that the source was in a full "up" position. They decided to go to the roof of the irradiation facility to check the source hoist and cable. The cable had lowered part way, but not completely. They were able to manually raise the source rack about one foot in the upward direction by pulling on the source cable. During this procedure no one was in the control room to monitor for a control panel indication of the "source up" light. They then lowered the source rack to the original level at which they encountered it. The RSO then proceeded to the control room to monitor the panel.

The department manager and shift operator proceeded to wrap the source hoist cable four to five times around a hook on a chain hoist pulley system located on a steel "I" beam directly above the source hoist mechanism. They raised the source rack, using the hoist approximately two to three feet until the RSO signaled that they had a "source up" indication on the control panel. At this point the RSO attempted to activate P1 and P15 pneumatic cylinders through a receive/discharge cycle in an attempt to clear the apparent jam. This proving unsuccessful, the radiation safety officer went to "manual" operation and tried to load/unload product in the pass mechanism. This also proved unsuccessful. At this point the source rack was again lowered. The control panel gave a "source down" indication. A test of the in-room radiation monitor indicated a radiation source was still present in the irradiator room.

At 7:45 p.m. AECL was notified of the incident. At 8:00 p.m. BDC's plant manager was notified. AECL representatives described several procedures that BDC should perform to verify the internal condition in the irradiator room. One of these was to send in radiation monitors attached to the product carrier, a manual mode operation. BDC representatives sent in two pocket dosimeters. Each indicated that a radiation source was still present in the room. AECL instructed BDC to secure the area and wait until they arrived onsite. BDC representatives had not tried to defeat the door interlock system during any of these procedures. BDC representatives locked up and secured the irradiator and posted the licensed third shift operator at the external end of the conveyor system. He was instructed to prevent unauthorized entry into the area and to monitor internal temperature of the irradiator room every half hour.

At 6:03 a.m., May 15, 1981, the fire alarm and sprinkler system were activated in the irradiator room. The temperature at this point was greater than 180° F (off scale) as indicated by the chart recorder. Sometime after 6:30 a.m. the local fire department arrived but were refused admittance to the facility. The radiation safety officer arrived at 7:30 a.m., entered the control room and encountered water overflow caused by the sprinkler system in the irradiator room. Surveys for contamination in the water and area were negative. The air exhaust system had remained operational throughout this time. At 8:00 a.m. BDC informed AECL that they had experienced a fire. AECL directed them to do the following: disconnect piping to the filter bed, shunt the water directly to the drain in the equipment room, shut off the sprinkler system, and shut off the exhaust system. BDC performed these operations between 8:30 and 9:00 a.m. A significant smoke build up occurred following these actions. They informed AECL of the smoke problem and were instructed to turn the sprinkler system back on, which they did at 9:18 a.m. Region I was notified by BDC of the incident at this time. The irradiator room temperature dropped from 180°F to 148°F, the normal range of temperature for this type of operation when the source is exposed. A Region I inspector was dispatched to the site and arrived at 6:40 p.m. May 15, 1981. A licensee event report from BDC was received by Region I on June 26, 1981. A copy of this report is enclosed with this report. (Enclosure 2)

The finding that the licensee continued to manipulate the source rack after determining that it was jammed and the fact the licensee failed to turn the exhaust off after identifying a fire represents noncompliance with Condition 16 (Emergency Procedures) of NRC License No. 06-13514-01.

#### 5. Recovery Operations

A four man team from AECL arrived onsite at 2:45 p.m., May 15, 1981. They interviewed the BDC personnel involved in the incident to assess the situation. After completing their initial evaluation, they proceeded to the irradiator area to begin recovery operations. When the inspector arrived he observed that AECL representatives had attached a television camera to the product carrier at the discharge port of the irradiator room. This product carrier is attached to a powered monorail system which carried the television camera into the irradiator room. This camera was wired into a television and video recorder system, permitting a limited view of existing conditions inside the irradiator room. With the television camera in position members of the AECL team manually hoisted the source rack for inspection. The source rack normally contains six modules of cobalt-60 pencils arranged in a plaque with three modules each in the upper and lower positions. (See Enclosure 4) The source rack was missing the middle modules in both the upper and lower positions. Further evaluation of the replay of the video recorder indicated that lower modules had not come out as a complete unit. Several cobalt-60 pencils were protruding out from the lower middle section of the source rack at various angles. From this information AECL

representatives surmised that at least one or more cobalt-60 pencils and/or one source module remained somewhere in the product pass mechanism. The irradiation room monitor still indicated the presence of radiation in the room. This prevented the maze door from being opened even though the control panel had indicated a "source down" position. The sprinkler system had been turned off while the television camera was in the irradiator room. During this period and subsequent periods of time when the system was turned off, there was a noticeable increase in smoke and fumes coming from the irradiator room.

At approximately 1:30 a.m., May 16, 1981 the BDC plant manager authorized AECL to drill a hole through the ceiling in the area of the source hoist. The ceiling thickness is 59 inches of poured concrete. A local contractor was hired to drill a hole 1.25 inches in diameter directly over the normal position of the source rack. After the hole was completed AECL representatives assessed the internal conditions of the irradiator room by angling mirrors over the hole. AECL measurements indicated an exposure rate of approximately 25 roentgens per hour at 12 inches above the hole. An attempt was made to use a nine foot long flexible fiber optics system, but the fiber optics were damaged by the intense radiation field in the irradiator room. Evaluation by AECL indicated that a source module (probably the upper center module) had been jammed in the upper level of the product pass mechanism. At approximately 2:00 a.m., May 17, 1981 AECL representatives were able to free the jammed module which fell back into the pool. This was accomplished by using a hook fashioned at the end of a long metal rod. Radiation measurements made by an AECL representative indicated a radiation level reduction factor of 40. The room monitor still did not function indicating that elevated radiation levels remained in the room indicating that one or more cobalt-60 pencils still remained out of the pool. There was a marked reduction in the smoke and fumes after the module fell back into the pool.

At approximately 10:00 a.m., May 17, 1981 another local contractor proceeded to drill a four inch diameter hole approximately six inches from the first hole. Evaluations and measurements by AECL indicated that the second hole had placed them further away from whatever sources remained out of the pool in the irradiator room. At 4:30 p.m. that same day another four inch diameter hole was drilled approximately six to eight inches to the opposite side of the first hole. (See Enclosure 4) This hole permitted the lowering of a television camera into the irradiator room. This revealed two cobalt-60 pencils wedged together in the lower section of the product pass mechanism. Using remote handling devices fashioned on site, AECL personnel were able to retrieve the first pencil at approximately 2:00 a.m. May 19, 1981 and the remaining pencil on May 19, 1981 at approximately 4:00 p.m. A radiation survey performed on the roof and around the facility by AECL indicate background levels of radiation existed in the irradiator room. The irradiator room monitor was now functional at this point. A monitor test procedure performed gave a positive response. A key inserted into the maze door lock

permitted the door to be unlocked. The AECL team entered the irradiator room after radiation surveys indicated background levels. No evidence of contamination was observed. After identifying the probable cause damage was assessed and clean up operations ensued.

The six AECL representatives who directed and participated in the recovery operations are authorized users list on NRC License No. 54-00300-09.

No items of noncompliance were identified.

#### 6. Radiation Protection Procedures

The inspector observed that all personnel in the irradiator area during recovery operations had been issued personnel monitoring. Survey instruments used by the licensee during the recovery were manufactured by Berthold. The models used were the LD200 calibrated March 10, 1981 and RATO/F calibrated January 28, 1981. Region I instrumentation used for verification purposes were a Victoreen Model 740D "Cutie Pie", a Ludlum Model 3 GM with an end window probe and an Eberline Teletector. The first two instruments were calibrated in March 1981 while the Teletector was last calibrated January 1981. AECL representatives were observed to be wearing film badges, pocket dosimeters and audible alarm monitors continuously through those parts of the recovery operation when the inspector was present. AECL issued film badges to the local contractors hired to bore the holes in the roof of the irradiator facility. The inspector observed AECL representatives instructing the local contractors in the protective procedures they were to observe while drilling the holes. AECL continuously monitored the bore holes during drilling procedures to identify any condition which would require modifying their planned actions. AECL's estimate of the expected radiation exposure rate at the surface of the first bore hole was in the range of 1100 Roentgens/hour. The inspector had independently estimated about 1300 Roentgen/hour which was in good agreement with the licensee's estimated value. The measured exposure rate after the first bore hole was completed was approximately 25 Roentgens/hour. This measurement was made at approximately 12 inches above the bore hole surface due to a lead fort which had been constructed by the licensee. This indicated that the hole was not directly over the jammed source rack modules. Measurements of radiation scatter at a radius of three feet in any direction ranged from 1 to 2 milliroentgens/hour. Measurements under the same parameter for the second hole indicated an exposure rate of 40 Roentgen/hr at 12 inches and radiation scatter of 2 to 5 milliroentgens/hr at three feet. Measurements for the third hole were estimated to be 140 Roentgens/hour at 12 inches and 5 to 15 milliroentgens of radiation scatter at three feet. The three foot measurement was appropriate as this represents the actual work zone occupied by AECL representatives during recovery operations. For most operations AECL representatives used remote handling devices in their manipulations to both assess internal conditions and retrieve sources. This prevented them from having to

place their hands in the direct beam. Several maneuvers required AECL members to place their hands in the direct beam. Individuals strapped pocket dosimeters to their wrists before entering the beam. At other times a dose rate estimate was made and a time limitation factor imposed for extremities in the beam. The inspector did not observe any time limitations being exceeded.

No items of noncompliance were identified.

7. Contamination Control

Shortly after the onset of the incident BDC monitored the filter system to identify any breach of integrity of the source pencils. This was done with a Berthold LD200 survey meter. No contamination was identified. These filter beds were routinely checked throughout the period of the recovery operation to insure source integrity. No levels of contamination were identified during these checks.

Water from the sprinkler system eventually caused the irradiator pool to overflow. The excess water caused minor flooding in the control room and equipment room. The equipment room has a floor drain which empties into a leaching bed on the licensee's property. The overflow that existed after the fire and during recovery operations was directed to this drain. It was periodically monitored for contamination. No evidence of contamination was identified. The licensee did not monitor for airborne contamination based on the results of surveying the filter beds and overflow from the irradiator pool.

No items of noncompliance were identified.

8. Independent Measurements

Verification surveys made by the inspector during recovery operations were in good agreement with those obtained by AECL. Differences noted were attributed to variability in instrument detection characteristics such as chamber size, time constant, etc. Water samples taken during and after the incident were returned to Region I laboratory for analysis. No cobalt-60 could be identified in the water samples. This was in agreement with samples analyzed by the licensees.

No items of noncompliance were identified.

9. Interviews with Personnel

Interviews with the persons denoted in paragraph I verified the events associated with this incident. These interviews also produced the following relevant information.

Licensee representatives stated that from 1975 when the aluminum tote boxes with lids had been introduced in the BDC irradiator facility there had been continuous problems with this system. The new boxes would function properly for approximately six months of service. After that period these boxes would exhibit signs of stress and wear which rendered them undesirable in terms of safe and efficient performance. Licensee representatives stated that while these boxes were a long standing problem they had never before interfered with source rack movements. Licensee representatives stated that these boxes were not the type which AECL normally specifies for this kind of operation. BDC's Corporate Research and Development Department had issued a directive to AECL requiring any box delivered to the facility must have a lid cover. This represents a design modification as the boxes usually supplied by AECL are a top loading five sided box without a lid. The lid requirement by BDC was to prevent a cobalt-60 source pencil from falling into an open box and being transported out of the irradiator room.

BDC instituted a quality assurance program for the aluminum tote boxes after a similar incident (October 24, 1981) at BDC's facility in Broken Bow, Nebraska. This consisted of a visual inspection by the product handlers, removal and repair of damaged totes by straightening bent sections and welding stress fissures and torn seams. This program was put into effect in January 1981. This check is documented in the periodic safety audits conducted by the licensee. The radiation safety officer stated that since its inception approximately 70% of all boxes had been removed either temporarily for repair or permanently for replacement. Interviews with the product handlers confirmed that they had been instructed to remove defective totes. The plant manager also stated that BDC had contracted with a local manufacturer to build a more durable aluminum tote box at the time of the incident.

The inspector reviewed a corporate informational notice dated October 27, 1981 which described a quality assurance program which was to be instituted at the company's Broken Bow facility. Also included in this report is a copy of a service bulletin from AECL dated December 15, 1980 (See Enclosure 3) describing the hazards associated with the use of defective totes. Personnel at BDC's Canaan facility were aware of IE Informational Notice No. 81-13.

No items of noncompliance were identified.

#### 10. Facility Modifications

On May 22, 1981, Region I issued Immediate Action Letter (IAL) File No. 81-24 documenting the licensee's agreement to take certain corrective action prior to resumption of licensed activities at BDC. These actions included (1) Sections of the conveyor system (metal rollers) were replaced as they had been warped due to the intense heat of the fire. (2) A fixed 1/8 inch aluminum shroud was installed around the source rack. (3) All pneumatic cylinders were removed for inspection. (4) New



microswitch wiring on the pneumatic cylinders was installed. (5) A new set of aluminium tote boxes was ordered. (6) A second pool monitor was installed which prevents the elevation of the source rack should the water volume fall below a certain level. (7) A automatic exhaust fan circuit cut-off was installed which is activated in case of an irradiator room fire. (8) The three holes drilled during recovery operation were adequately plugged and secured with shielding material prior to the resumption of normal operations. (9) A pneumatic valve cut-off was installed in series with the air supply to the solenoid valve and hoist cylinder which jointly control source rack elevation. This valve cut-off is activated by a chain barrier which must be manually unhooked before entering the maze. The device is intended to act as a backup system during service work. (10) An additional water sprinkler system was ordered which will be operable in a manual mode should fire suppression become necessary. The sprinkler system had been delivered, but not yet installed as of June 2, 1981. Other cosmetic changes were performed such as cleaning and painting. Before resumption of licensed activities, a complete radiation survey and facility inspection was performed by AECL. BDC notified Region I on May 26, 1981 that modifications had been made as per IAL No. 81-24. BDC restarted licensed activities on May 26, 1981. The inspector confirmed the performance of these modifications during the visit on June 2, 1981.

No items of noncompliance were identified.

#### 11. Exit Interview

The inspector met with the licensee representatives denoted in paragraph 1 at the conclusion of the inspection/investigation on June 2, 1981 and summarized the scope and findings of the inspection/investigation.

APR 1 1982

Docket No. 30-06891

License No. 06-13514-01

Becton-Dickinson  
ATTN: Andrew P. Rowjohn  
Plant Manager  
Route 7 and Grace Way  
North Canaan, Connecticut 06078

Gentlemen:

Subject: Inspection No. 30-06891/81-01

This refers to your letter dated February 26, 1982.

Thank you for providing the information documented in your letter. We will review this matter during a future inspection of your licensed program.

Your cooperation with us is appreciated.

Sincerely,

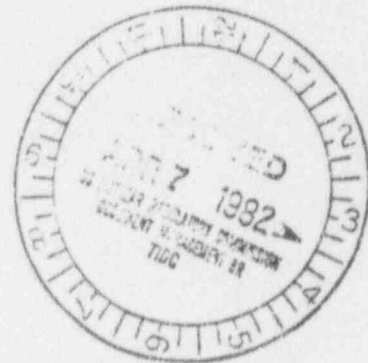
Original Signed By:

JOHN KINNEMAN

for Thomas T. Martin, Director  
Division of Engineering and Technical  
Programs

cc:  
Public Document Room (PDR)  
Nuclear Safety Information Center (NSIC)  
State of Connecticut

bcc:  
Region I docket Room (w/concurrences)



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BY NAME	Aicolosi:ny	Kinneman
DATE	3/25/82	3/30/82

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**B-D** BECTON-DICKINSON

Route 7 and Grace Way, North Canaan, Connecticut 06018 / (203) 824-5487 / Division of Becton, Dickinson and Company

February 26, 1982

United States Nuclear Regulatory Commission  
Region 1  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Docket #030-06891  
License #06-13514-01  
Inspection #81-01

Reference: Letter dated November 18, 1981 to NRC from  
Andrew P. Rowjohn of Becton-Dickinson & Co.

Gentlemen:

Paragraph four of the above referenced letter describes a manual fire suppression system for our Cobalt 60 system which was to be installed by March 1, 1982. We have just received the design of the system, a copy of which is enclosed, and are submitting it to Atomic Energy of Canada Limited and Factory Mutual Engineering for approval. If there are no major problems with the design, the revised installation date for this system is July 1, 1982.

Very truly yours,

BECTON, DICKINSON AND COMPANY

*Andrew P. Rowjohn*  
Andrew P. Rowjohn  
Plant Manager

APR:jt

Encl:

~~204080531 YB~~  
06-13514-01

PDR