3941

FEB 16 1970

Jack R. Roeder, Chief, Materials Inspection
and Enforcement Branch, Division of Compliance, HQ

WESTINGHOUSE ELECTRIC CORPORATION
BOX 2278
PITTSBURGH, PENNSYLVANIA
LICENSE NO. 37-09442-01
TYPE B EXPOSURE: 17.4 REM WHOLE BODY EXPOSURE AND 150 REM EXTREMITY EXPOSURE WHILE UTILIZING A 23.7 CURIE COBALT-60 SEALED SOURCE FOR CALIBRATING INSTRUMENTS

Transmitted herewith for appropriate enforcement action are the original and two copies of the Report of Compliance Investigation.

[redacted] the Experimental Operator who received the exposure has been assigned to duties not requiring the use of radioactive materials. The licensee has closed the Radiation Calibration Facility in which this incident occurred. It is building a new facility with improved controls, warning devices and interlocks as required by 10 CFR 20.203(c)(2), "Caution signs, labels and symbols". It is anticipated that before the new facility is put into operation, it will be inspected by this office for full compliance with the AEC regulations.

E16

We would like to direct your attention to an apparent misinterpretation by licensee personnel of license condition 13. Instead of the Isotopes Committee designating the supervisor of an activity as set forth in license condition 13, the Committee approves the activity, and permits the manager of the activity to designate the supervisor.

This office plans no further action herein and considers this matter closed.

Information in this record was deleted
in accordance with the Freedom of Information
Act, exemptions 6
FOIA- 2001-0377

Alvin F. Ryan
Investigation Specialist

E14

Enclosure:
Orig & 2 cys Rpt
w/Exhibits A thru H

OFFICE ▶	COMPLIANCE					
SURNAME ▶	[illegible]	E. Stello	[illegible]			
DATE ▶	[illegible]					

COMPLIANCE INVESTIGATION REPORT

DIVISION OF COMPLIANCE

Region I

Subject: **WESTINGHOUSE ELECTRIC CORPORATION**
Box 2278
Pittsburgh, Pennsylvania 15230
License Number 37-09442-01

Type of Case: **Type B exposure 17.4 Rem whole body exposure and 150 Rem extremity exposure while utilizing a 23.7 Ci Co-60 sealed source for calibrating instruments.**

Period of Investigation: **September 10, 11, 1969 and December 18, 1969**

Investigator: Original Signed by: A. F. Ryan
Alvin F. Ryan, Investigation Specialist — Date

Eugene Epstein, Radiation Specialist — Date

Reviewed By:
Paul R. Nelson, Senior Radiation Specialist — Date

Atomic Power Division, Forest Hills, Pennsylvania

Andrew T. Sabo, Manager, Industrial Hygiene and Safety

Person Accompanying Investigator

Joel Lubenau, Pennsylvania Department of Health

Exhibits

A - Source calibration curve dated February 19, 1967.

B - Copy of Licensee's evaluation of dose dated August 8, 1969.

C - Copy in part of Operating Procedures for [illegible] Radiation Calibration Facility.

D - Photograph of trailer housing Radiation Calibration Facility.

E - Photograph of Technical Operations source projector situated under trailer.

F - Photograph of controls for Technical Operations source projector.

G - Photograph of block holding electrical connections, the Co-60 source tip and showing distance between source tip and electrical connections.

H - Photograph of interior of trailer showing equipment used in calibration of instruments.

Items of Noncompliance

1. 10 CFR 20.201(b), "Surveys"

   a. - in that an adequate evaluation was not made of the radiation exposure to an employee's hand to ensure compliance with 10 CFR 20.403(b), "Notification of Incidents", and 20.405(a) and (b), "Reports of overexposure and excessive levels and concentrations". (See paragraphs 59-63 inclusive and 69.) (Resulted from the incident.)

   b. - in that an adequate survey was not performed to ensure that the radiation dose limits specified in 10 CFR 20.101(a), "Exposure of individuals to radiation in restricted areas", were not exceeded. (See paragraphs 2, 18, 32 and 38.) (Caused the incident.)

2. 10 CFR 20.203(c)(2), "Caution signs, labels and symbols"

   - in that the high radiation area of the Radiation Calibration Facility was not equipped with a control device which upon entry into the area, either causes the level of radiation to be reduced below that at which an individual might receive a dose of 100 mrem in one hour or energizes a conspicuous visible or audible alarm signal in such a manner that the individual entering and the licensee or a supervisor of the activity are made aware of the entry. (See paragraphs 18, 20, 21, 24, 25, 32, 39, 44 and 45 of the report details.) (Contributed to the incident.)

3. 10 CFR 20.403(b), "Notification of incidents"

   - in that the licensee did not, within 24 hours, notify the Director, Region I, Compliance Division, by telephone and telegraph of an incident involving licensed material which may have caused an exposure to the hands of an individual, to 75 Rems or more of radiation. (See paragraphs 1, 2, 48, 59, 60, 61, 62, 63 and 69 of the report details.) (Resulted from the incident.)

4. 10 CFR 20.405(a) and (b), "Reports of overexposures and excessive levels and concentrations"

- in that the overexposure of 150 Rem to the hand of an employee was not included in the 30-day report to the Director of Compliance and the employee was not notified of the nature and extent of his hand exposure. (See paragraphs 1, 2, 48, 59, 60, 61, 62, 63 and 69 of the report details.) (Resulted from the incident.)

5. License Condition 15

- [redacted] (See paragraphs 14, 27, 28, 43 and 71.) (Contributed to the incident.)

1. On August 8, 1969 Andrew Sabo, Manager, Industrial Hygiene and Safety, APD telephoned to CO:I to report that [redacted], an employee of Westinghouse Astronuclear Experimental Facility (WANEF) may have received a 17.4 R whole body exposure on July 7, 1969 while calibrating instruments with a sealed source of approximately 24 Ci Co-60. Sabo stated that the licensee had been notified of the possible exposure on August 1, 1969 by R. S. Landauer Company, the film badge processor. Sabo confirmed the telephone call by a telegram received at CO:I on August 11, 1969. On August 11, 1969 Charles E. Conn, Radiation Specialist, CO:I telephoned to Sabo who stated that the licensee on August 1, 1969 had determined that [redacted] on July 7, 1969 had worn a pocket dosimeter and that it had never read greater than 200 mr thus indicating that the exposure was to the film badge only. The film badge, according to Sabo, was not sent to Landauer for processing until July 18, 1969 and was not read at Landauer's until [illegible]

Exh 6

2. On August [illegible], 1969 CO:I received a written copy of a letter [illegible] 1969 from the [illegible] while calibrating instruments, [illegible] Calibration Facility (RCF) [illegible] letter indicated that [illegible] to use an available survey meter [illegible] that he had [illegible] the automatic warning device because of the low range of the instrument and that he was working alone contrary to the licensee's procedures which require that two employees work together in this operation. In this letter, licensee indicated that contrary to its earlier notification on August 8, 1969 [redacted] had received a valid dose of 17.4 R whole body.

Exh 6

Background Information

3. The license authorizes the use of a total of 100 curies of any byproduct material as sealed sources and a total of 100 curies of any byproduct material in any chemical or physical form. Use is authorized for research and development. The Westinghouse Astronuclear Experimental Facility at Waltz Mill, Pennsylvania was initially inspected on September 12, 1966 and again on May 21, 1968. On both occasions a form AEC-591 was issued stating that no item of noncompliance was found. The Radiation Calibration Facility was established on August 2, 1968 and had not been inspected prior to this incident.

Organization and Administration

4. The following information was obtained from Frederick Frantz, Manager, Westinghouse Astronuclear Experimental Facility (WANEF) and from Maurice Beebe, Manager, Industrial Hygiene and Safety Westinghouse Astronuclear Laboratory (WANL). The Radiation Calibration Facility (RCF) is operated by WANEF at Waltz Mill, Pennsylvania. WANEF is a tenant of the Advanced Reactor Division which is the principal occupant of the Waltz Mill site. WANEF, at Waltz Mill, Pennsylvania is under the direction of the Westinghouse Astronuclear Laboratory (WANL) which is located at Large, Pennsylvania.

5. Health Physics and Safety Services for WANEF are supplied by the Advanced Reactor Division through Roy G. Kitzer, Manager, Industrial Hygiene and Safety at Waltz Mill. Beebe, Manager of Industrial Hygiene and Safety at WANL may audit the adequacy of the Health Physics and Safety Services supplied by the Advanced Reactor Division. Beebe and Kitzer are responsible directly to their respective site managers. However, on matters involving the use of licensable radioactive materials they also are required to report to Andrew T. Sabo, Manager, Industrial Hygiene and Safety, Atomic Power Division, Forest Hills, Pennsylvania.

Facilities and Equipment

6. All information contained in these paragraphs is based on physical inspections made by the investigator or the inspector unless specified to the contrary. Exhibit "C" is a partial copy of the licensee's publication entitled "Westinghouse Astronuclear Experimental Facility Operating Procedures for WANEF Radiation Calibration Facility and Associated Equipment", containing a description of the facilities and equipment and showing plan views of the site of the incident.

7. The trailer, in which the incident occurred, is the principal component of the Radiation Calibration Facility; a photograph of the trailer is shown as Exhibit "D". The 23.7 curie cobalt-60 source is a Technical Operations Model A-424, used in a Technical Operations Model 325 radiographic exposure device. The source projector (shielded source container) is located beneath the trailer as shown in the photograph in Exhibit "E". The exposure device control, shown as Exhibit "F", is located at a point approximately 15 feet from the trailer. The inspector noted that there were lights in the exposure device control to indicate whether the source was in its shielded position or in its exposed position. He noted that these lights were functioning properly at the time of the investigation.

8. The exposure device cable enters the trailer through a hole in the floor and is secured at a point within the trailer that is 44 inches above the floor, as shown in the photograph which is Exhibit "F". Within the trailer there is equipment associated with the testing of the [redacted] which are covered by the [redacted] or the neutron generator (described in the licensee's licensing [redacted] see Exhibit "G"). The associated equipment is shown in a photograph as Exhibit "H".

9. Surrounding the trailer is an earthen bank that is approximately 12 feet high, 20 feet across the base and 6 to 8 feet across the top. A wire concentration prevents the escape of the unattenuated radiation from the enclosure. Surrounding the earthen bank at a distance of approximately 15 feet there is a 4 feet high fence that is posted with the radiation caution symbol and the words Caution, Radioactive Material and Caution, High Radiation Area. There is one gate to this fence. Woodsum stated that this gate is kept locked when the Radiation Calibration Facility area is unattended.

10. At a distance of approximately 150 feet from the trailer there is a building known as the Rocker House. Cables connect the experimental apparatus being tested in the trailer with remote read-out instrumentation within the Rocker House. Therefore, as stated by Woodsum, the experimental set-up would be made in the trailer, the technician would withdraw to the exposure device control, wind-out the source, leave the fenced enclosure, lock the gate, and await the completion of the required exposure period in the Rocker House.

11. At the time of the investigation there was a Victoreen "Vamp" detector located within the trailer. The unit was set to alarm at 100 mR/hr; if it did alarm it would also show a red light at the detector, and, through relay contact closure, a red light at the outer surface of the trailer, another at the entrance gate to the fenced area (a rotating beacon) and another within the Rocker House. It was also noted that this series of red lights could also be turned on by a manual switch within the trailer. The Vamp was referred to, by the licensee, as an "automatic radiation alarm system" but the inspector noted that the Vamp was not connected by interlock to either the gate of the RCF area or to the door of the trailer; and thus did not provide a means of making the individual entering the high radiation area, or a supervisor of the facility, aware of the entry.

Interviews

Frederick Frantz, Manager (WANEF)

12. Frantz was interviewed September 10, 1969 at WANEF, Waltz Mill, Pennsylvania. Frantz stated that WANEF is a tenant at Waltz Mill and that the Health Physics and Safety Services are supplied by Roy G. Kitzer, Manager, Industrial Hygiene and Safety, Advanced Reactor Division, the principal occupant at Waltz Mill.

13. Frantz stated that [redacted] employed as an experimental operator has worked at WANEF for the past 3 or 4 years. Frantz describe[redacted] as a technically capable, mature person who is moderately aggressive, anxious to complete as soon as possible any assignment given to him. Frantz stated that [redacted] works under the supervision of Hubert C. Woodsum, a supervisor in experimental physics.

14. According to Frantz, [redacted] had been working alone at the time of the occurrence. According to Frantz, [redacted] on July 7, 1969 was going to conduct a calibration check on the Bragg-Gray detector for the PAX run. This was verified by an entry for July 7, 1969 in the RCF log book. The entry made by [redacted] in the log indicated he had

worked 0.5 hours on that day. The preceding entry was dated June 17, 1969 and the subsequent entry was dated July 22, 1969.

15. Three entries subsequent to July 7, 1969 were recorded in the log as follows: July 22, 1969: calibration of 10 TLD's to Co-60 source at 25 cm. Quantity of 5 LiF and 5 of CaF_2 TLD's exposed for ten minutes (DNG) July 24, 1969: calibration check on Bragg-Gray detector type 0.5 aluminum 0.5 beryllium to Co-60 source. Two hours (DNG) July 25, 1969: calibration check on Bragg-Gray detector type 0.5 aluminum and 0.5 beryllium to Co-60 source two hours (DNG).

16. Frantz also presented two personnel dosimetry cards by DNG which had been brought in by Ray Kitner. These were for the second quarter April 14, 1969 to June 30, 1969 and the third quarter from July 1, [illegible] entries in the second quarter [illegible] mr to 135 mr.

17. [illegible] These card entries are usually made on Monday mornings to record the exposure for the preceding week. Kochin, according to Frantz and Kitner, rezeros the dosimeter when it reads about 100 mr. Frantz stated that [redacted] does not record the readings from the dosimeter nor does he rezero the instrument. The card entry on July 7, 1969 for the preceding week for [redacted] was 30 mr. Two card entries were made for the period of July 7 through July 11, 1969, one on July 10, of 120 and one on July 11, of 15 mr.

18. Frantz stated that on August 7, 1969, [redacted] submitted a verbal report of his action at the Radiation Calibration Facility on July 7, 1969. According to Frantz, [redacted] had stated that he probably had not worn his dosimeter and had not carried his survey meter into the radiation field within the trailer. In addition, he stated he had worked alone in violation of the Waltz Mill rules and procedures for the facility and had disconnected the automatic radiation alarm.

19. Frantz stated that the Radiation Calibration Facility housing the trailer in a fenced locked area has been shut down and would not be started up until a review of this activity is made by the Safety Committee. Frantz stated that the licensee may revise the procedures and construct a new facility. (A photograph of the outside of the trailer, taken on September 10, 1969 by A. F. Ryan, CO:I is attached hereto as Exhibit "D".)

20. Frantz described the automatic radiation alarm as a Victoreen Vamp with a range from 0-100 mr per hour. Frantz stated that the licensee had on order prior to the incident, a Nuclear Materials of Chicago instrument Gm-2T with a range from 0 to 100 R per hour. Frantz stated this instrument had been delivered after the incident involving [redacted]

21. Frantz stated that management knew of [redacted] practice of disconnecting the automatic alarm which was activated by normal radiation work in the area. Frantz stated that management did not object to the practice of disconnecting the alarm because of the two man rule and the required use of a survey meter. Frantz stated that the second man usually assigned to work with [redacted] is Ed Kochin.

22. According to Frantz, the Radiation Calibration Facility had not been in operation prior to August 1968. The investigator noted that the first entry in the log was dated August 2, 1968.

Hubert Woodsum, Supervisor, Experimental Physics, WANEF

23. Woodsum was interviewed September 10, 1969 in his office at WANEF, Waltz Mill, Pennsylvania. Woodsum stated that he had been employed at WANEF since April, 1968. Woodsum stated that he is [redacted] technical and administrative supervisor. Woodsum stated that there are written procedures in connection with the use of the RCF. According to Woodsum, [redacted] had to be tested on these procedures before he was assigned to work with the Co-60 source. Woodsum stated that [redacted] qualified to work in the RCF on the basis of the test.

24. Woodsum stated that the radiation alarm in the RCF trailer is set for 100 mr/hr. Woodsum stated that since he has been in WAMF the alarm is unplugged when the Co-60 source is being used. Woodsum stated that the procedures require that two men work together in the RCF. One man is required to monitor with a survey instrument.

25. According to Woodsum the operator, upon entering the restricted RCF area, is required to check out the radiation levels and the alarm system. Woodsum stated that the second man is required to monitor the area to insure that the source is not exposed. Woodsum stated that if the alarm system were activated, and the source is exposed, the red lights, one at the gate and one on the trailer, would be activated. These are deactivated by unplugging the monitor. According to Woodsum, when the monitor is unplugged and the switch is thrown the warning lights would be on, whether the source is exposed or not.

26. Woodsum stated that in February, [redacted] a high level monitor system. Woodsum stated that he worked on [redacted] He stated that he does not know whether Victoria passed the requirements of the Health Physics Section. Woodsum stated that shortly after [redacted] Woodsum he talked to K. Nychka about procurement of a high level monitor.

27. Woodsum stated that the source is used on an average of twice a week. Woodsum stated that he was on vacation between July 3, 1969 and July 20, 1969. He stated that when he is absent there is no alternate supervisor.

28. Woodsum stated that Burchell Jennings, who is an Advisory Engineer at Rocker House, is not, technically, a supervisor.

29. Woodsum stated that he first learned of the possible exposure to [redacted] on August 7, 1969. Woodsum stated that he attempted to determine whether the exposure received was valid. Woodsum stated he had been told by [redacted] that [redacted] had left his film badge on his lab coat in the RCF trailer. This badge had not been picked up for processing before his new badge was issued to him. Thus he had two film badges out at the same time. Woodsum stated that [redacted] brought in his old film badge but that he did not recall where he had found it. Woodsum stated that the old badge had been turned in on July 9, 1969 and that the new badge had been issued on July 3, 1969.

30. Woodsum questioned [redacted] about not having a second man with him as required by the two man rule. According to Woodsum, [redacted] said he understood the two man rule permitted one man at Rocker House and one at the RCF trailer. Woodsum stated that he does not know how long this misunderstanding of the rules by [redacted] persisted.

31. Woodsum exhibited a copy of the RCF Operating Procedures for WAMF identified as revision "A" 46-68 dated January 1969. On page 11 facility rule #4 states, "Personnel will not be within the RCF exclusion area when the high-level warning lights are ON except with a Health Physics technician or other Westinghouse personnel carrying a suitable portable radiation survey instrument as well as having the permission of the Facility Operator. The second person rule is not meant to apply to the operator-of-the-day when he is only checking out and calibrating the radiation warning system using a check source." In appendix two of the same document rule #3 states, "at least two people shall be present during the operation of the source exposure mechanism. One of these people will provide continuous radiation monitoring."

32. Woodsum stated that in his interview with [redacted] could not recall whether he had worn his dosimeter. According to Woodsum, [redacted] was required to wear both a film badge and dosimeter in this operation. [redacted] had informed Woodsum that he had a survey meter with him but he did not use it. Woodsum had [redacted] do a reenactment of his movements in an effort to stimulate his memory regarding his dosimeter. During this reenactment a tritium film badge was found on the bench about three feet from the source. Woodsum stated that [redacted] said he sometimes put his badge there. [redacted] according to Woodsum, had said he had X-rays of his stomach taken at a local hospital during this period. [redacted] also had worked on the reactor on July 7, 1969. Woodsum stated that the gate in the fence surrounding the RCF is locked but is not interlocked. He stated that the trailer door is not interlocked.

33. Woodsum stated that when the neutron generator is used they have the same problem with the Victoreen Vamp radiation alarm because of its low range.

[redacted] Experimental Operator, WANEF

34. [redacted] was interviewed September 10, 1969 in the office of F. Frantz, manager, WANEF. [redacted] had requested that Hubert Woodsum be present during his interview.

35. [redacted] stated that he is employed as an experimental operator at WANEF and has been so employed since January 1967. [redacted] stated he worked on the RCF since September 30, 1968. He stated that he passed the examination as [illegible] September 30, 1968. [redacted] [illegible] [redacted] [illegible]

36. [redacted] [illegible] [redacted] [illegible] Section [illegible] having left his [illegible] he checked [illegible] log and [illegible] July 7, 1969 was the probable date of the exposure. [redacted] stated that his film badge had not been picked up for processing when due. He stated he had worked on the neutron generator and may have left his film badge in the RCF trailer at that time. [redacted] stated that his difficulty in recalling precisely the date of the incident results from the fact that his film badge is often submitted late for processing. He stated that he will quite often leave his film badge and dosimeter on his work bench at Rocker House. He stated that sometimes he will leave his film badge and dosimeter on his lab coat at Rocker House. [redacted] stated that he wears his dosimeter in his shirt pocket and his film badge on his belt at his right side.

37. [redacted] stated that to the best of his recollection on July 7, 1969 he had taken a "Cutie Pie". He stated that he observed a reading on the instrument at the source control of 200 mr/hr. [redacted] stated he then began to return to Rocker House and then realized he had not made all of the electrical connections in the trailer on the experimental detector. He stated that he had not gone more than 8-10 feet from the controls when he returned to the trailer to make the connections. (A photograph showing the distance between the electrical connections and source tip taken on September 10, 1969 by A. F. Ryan, CO:I is attached hereto as Exhibit "G".) E/6

38. [redacted] stated that he did not recall whether he had taken the "Cutie Pie" from where he had left it at the source controls into the trailer. He stated that he realized that he did not know if the source was in or out. He stated that he could not rely on the lights of the projector controls to determine whether the source was in or out. [redacted] stated that he did not recall whether he wore his dosimeter at this time, but if he had been wearing it he would have checked it. E/6

39. [redacted] stated he had been working at the facility in the morning. He stated he had disconnected the alarm because in the past it had damaged the instrumentation. He stated that this had become a standard procedure when working at the facility. He stated that the alarm would be reactivated after a run had been made.

40. [redacted] stated that he had told a fellow employee, Jennings, of the possibility that he, [redacted] may have been exposed to the source. He stated that this exposure may have occurred on June 30, 1969 although he could not verify this inasmuch as his activity for that day had not been logged. He stated that to the best of his recollection this incident occurred in the week between June 30 and July 7, 1969. E/6

41. [redacted] stated he was sent to see Dr. Albert Spritzer the plant physician. According to [redacted], Spritzer took blood samples. He stated that on about July 21, 1969 he had a physical examination at the plant. He stated the blood samples were taken at about that time.

42. [redacted] stated that he had some X-rays taken by a Dr. Colvetta at Greensburgh, Pennsylvania on July 9, 1969. [redacted] stated he had been off ill on Tuesday, Wednesday and Thursday July 8, 9 and 10, 1969. [redacted] stated that when the X-rays were taken his clothing and personal belongings, including his film badge (if he had been wearing it) were left in an adjoining room. E/6

43. [redacted] stated that Jennings, who was at the Rocker House, had no means of monitoring the activity at the trailer. [redacted] stated that he misinterpreted the requirement for two men at the radiation calibration facility and thought that the presence of Jennings at Rocker House met the requirement that two men work together.

Ex 6

44. [redacted] stated he had been disconnecting the alarm for about two months prior to July 7, 1969. He stated that the previous instrument had a range of 0-50 mr/hr. [redacted] stated that when the automatic alarm was disconnected he would set the manual alarm system. [redacted] again stated that when the health physics technician was unavailable, he [redacted] considered the presence of Jennings at Rocker House as complying with the two man rule. [redacted] stated that he did not operate the radiation calibration facility at any time without informing someone at the site that he was at the facility.

45. [redacted] [illegible] he had [illegible] mr/hr [illegible] had been [illegible] installed. [illegible] that he did not [illegible] disconnecting the alarm. [illegible] who was present at the interview [illegible] this point that he was aware that the alarm was being disconnected. [redacted] concluded his interview with a statement that when he told Jennings he thought he had an exposure, Jennings said he would discuss the instrumentation with Mr. Frantz, Manager of the experimental facility.

Ex 6

Burchell Jennings, Advisory Engineer, WANEF

46. Jennings was interviewed in his office at Rocker House on September 10, 1969. Jennings stated that he was not at the site on July 7, 1969. He stated that he may have been there on June 30, 1969. Jennings stated that he recalled a discussion with [redacted] about the installation of radiation detection instruments. Jennings stated that he had designed the facility and had written the safety regulations. Jennings stated that he had included a high level - low level monitoring system to be installed which had a capacity up to 100 R/hr. Jennings stated that the local health physics people were responsible for the procurement of radiation safety equipment. According to Jennings, the safety committee had revised the safety regulations. Jennings stated that he did not realize that the instrumentation he had designated at the time he designed the facility had not been installed.

47. Jennings stated that [redacted] comments at that time were primarily directed to the capacity of the instrument, not to any personnel exposure. Jennings stated that if there had been an exposure to [redacted] it would have been picked up on his dosimeter. Jennings was not aware that [redacted] may not have been wearing his dosimeter. According to Jennings, [redacted] gave him the impression that he may have been exposed but Jennings did not pay too much attention to this comment. Jennings let management, through Frantz, know that he was unhappy that the instrumentation had not been procured. Jennings stated that when the facility was first opened they had started with a Geiger counter in a Victoreen count rate meter, model number 743. Jennings stated that the two man requirement is observed sometimes and sometimes not. He stated that procedures require that two men must enter the trailer if the source is to be used, but he does know of occasions when this rule was not followed.

Ex 6

Licensee's Calculations of Dose

48. Attached hereto as Exhibit "B" is a copy of the report of the investigation conducted by the licensee dated August 8, 1969. According to licensee's report, the time factor was 160 seconds and the calculated exposure on the basis of radiation levels and distance involved was 38.73 R. A prior walk through under the same circumstances was done in the same time but resulted in a calculated exposure of 27.64 R.

Results of Calculations made by CO:I Personnel

49. Set out below is the exposure evaluation as calculated by Eugene Epstein, Radiation Specialist, CO:I. In addition to the whole body dose which is not [illegible]

Exposure Evaluation

50. The source used, according to records of receipt, was a Technical Operations model A-424, 30 Ci, Co-60 sealed source used in a Technical Operations model 528 radiography exposure device. Source 30 Ci, September 27, 1967, had an activity of 30 x .7915 or 23.74 Ci on June 30, 1969. This source has a calculated dose rate at 16 inches distance of 176.5 Rem/hr, using the values given on page 139 of the USPHS Radiological Health Manual.

51. [redacted] Radiatory measurements made by the inspector, using Landauer film badges gave a dose rate at 16 inches distance of [redacted] Rem/hr, and only [redacted] and [redacted] gave a dose rate of 206.3 Rem/hr at 16 inches distance. The [redacted] had a calibration curve dated February 25, 1969 showing exposure rates of 165 Rem/hr at 16 inches and 105.4 Rem/hr at 20 inches distance from source tip.

52. The source capsule, according to manufacturer literature, was [redacted] of 1/4 of an inch diameter and 3/8 of an inch long. It was found that the source capsule was projecting into a vertical source exposure tip 3/4 of an inch in diameter and 2 inches long. The top of the source exposure tip was noted to be 46 inches high from the center of the floor of an 8 feet by 40 feet trailer.

53. [redacted] stated he had, inside the trailer, set the distance of detector to source to 10 cm. on the day in question and left the trailer to windout and expose the source. After doing this he stated he proceeded to the restricted area gate for a short distance when he remembered that he had forgotten to make the connections to the remote readout area. (A photograph of the interior of the trailer taken on September 10, 1969 by A. F. Ryan, CO:I is attached hereto as Exhibit "H".) He pointed out that these connections were made approximately 14 inches from the source. He stated after making the necessary connections and measuring alignment of the source with detector again he went to the windout control and discovered that the source had been fully exposed because he had to wind the wrong way and was actually returning the source to the storage container. It was therefore decided to make [redacted] reenact his movements to determine whole body and extremity exposure.

54. [redacted], on September 10, 1969 and again on September 11, 1969 described his actions inside and around the trailer during the time he stated the source was exposed. His actions were timed by the inspector using a stop watch. The distances of body and extremities from the end of the source exposure tip was measured and and the following was noted. Whole body exposure using dose rates as determined by using TLD CaF_2 EC and G dosimeters supplied and calibrated by HASL-NYOO.

Action	Time	Dose Rate	Whole Body Exposure Rem
1. Walking 22 ft. away from windout control	7 sec.	200 mr/hr	0
2. Walking 44 ft. to front door of trailer	13 sec.	10 R/hr	0.037
3. Opening door of trailer and entering 5 feet from source	5 sec.	11.8 R/hr	.014
4. Securing cables 2 feet from source	20 sec.	74.1 R/hr	.412
5. Taping cables to insulating block right side of body 12 inches from source	20 sec.	296 R/hr	1.642
6. Connecting cables to probe right side of body 6 inches from source exposure tip	38 sec.	1230 R/hr	13.000
7. Measuring and aligning source exposure tip exactly 10 cm distance from probe. Right side of body 6 inches from source	5 sec.	1230 R/hr	1.708
8. Working at connector board rear of whole body 28 inches from sour[illegible]	23 sec.	54.2 R/hr	0.3[illegible]

Action	Time	Dose Rate	Whole Body Exposure Rem
9. Leaving trailer and closing trailer door 5 feet from source	5 sec.	11.8 R/hr	0.014
10. Walking to exposure device	13 sec.	10 R/hr	0.037
Total time	149 sec.	Total Whole body exposure	17.212 Rem

55. The licensee [illegible] the incident [illegible] [redacted] [illegible] and estimated that his operations took 160 seconds on [illegible] that the whole body dose was [illegible] Rem during the first [illegible] and [illegible] Rem during the second [illegible] for an average of 33.12 Rem. R. Kitzer reported that he used the source calibration curve dated February 19, 1969 in his calculations. This curve is included as Exhibit "A". The licensee's evaluation is included as Exhibit "B".

56. The inspector's analysis of the licensee's evaluation showed that the estimated dose disparity (e.g. 17.2 Rem vs 33.2 Rem) resulted from the licensee's failure to differentiate between those activities performed by [redacted] when the source was exposed, and those which were performed before he had placed the source in the exposed condition. [redacted] informed the inspector that he adjusted the equipment to obtain the required source-to-detector distance prior to exposing the source. It is this operation which the licensee clocked at 50 seconds on his first test and at 30 seconds, on his second test. In fact, however, as stated by [redacted] he only spent 5 seconds in verifying the source-to-detector distance on his return to the RCF, while the source was exposed.

57. Kitzer confirmed the inspector's evaluation by admitting that he had assumed, without checking with [redacted] that [redacted] had made the adjustments of the source-to-detector distance while the source was exposed.

58. [redacted] stated he usually wore his film badge attached to his pants belt at the right side of his body. The inspector noted that the height of the film badge from the floor was 40 inches and that during all [redacted] operations, [redacted] film badge faced the source and was not shielded by his body.

59. Kitzer stated on September 11, 1969 that neither he, nor anyone had made any evaluation of the radiation exposure that [redacted] received to the fingers of the right hand during exposure of the Co-60 source.

60. The inspector noted that during the measurement operation, [redacted] right thumb was 1/4 of an inch from the surface of the source projection tip and 1/2 of an inch from the surface of the source capsule. It was noted that this operation could not be performed with the right thumb at a greater distance from the source. During the taping and connecting operation his right hand (dorsal portion) was at 14 inches distance from the source.

61. The exposure to the right hand and particularly the right thumb was also calculated as a result of TLD dosimetry by the inspector and is as follows:

5 sec. at 5/8" distance from the center of the source 166.5 R/hr at 16" =

$$166.5 \times \frac{(16)^2}{(1625)} \times \frac{5}{3600} \qquad 151.8 \text{ Rem}$$

20 sec. connecting wires both at 14 inches distance

$$166.5 \times \frac{16^2}{142} \times \frac{58}{3600} = 3.5 \text{ Rem}$$

Total 155.3 Rem

62. The inspector noted that [redacted] on September 10, 1969 had two small white-like formations on the thumb and first finger of the right hand. The inspector specifically then questioned [redacted] as follows: E+6

> Have you ever noticed these formations? [redacted] replied No. Have you ever had any redness, swelling or soreness in your hands? [redacted] replied No. Were your hands ever examined by a physician? [redacted] replied that the plant physician to date had only taken blood samples and had not examined his hands.

63. On September [illegible], 1969 the inspector requested [illegible] to inform Beebe of the over-exposure [illegible] calculated [illegible] of September [illegible], 1969 as a result [illegible] of his [illegible] examined by a physician. [illegible] 17, 1969 the inspector [illegible] a telephone call to Beebe [illegible] had not informed him [redacted] had overexposure and had not had [redacted] hands examined by a physician. Beebe thanked the inspector for the information and stated that [redacted] would be examined by Dr. A. Spritzer, Plant Physician. Beebe, on September 25, 1969 reported via telephone that Spritzer had examined [redacted] hands as a result of the call of September 17, 1969 and reported no evidence of radiation damage. E+6

64. The inspector, using EG and G thermoluminescent CaF_2 dosimeters calibrated by HASL-NYOO against Co-60 and Landauer film badges made an exposure for 40 seconds at various distances and in several positions in the trailer where the source is exposed. The results are as follows:

Distance from source	Position	Radiation reading for 40 sec. film badge	Radiation reading for 40 sec. TLD	Dose Rate R/hr film badge	Dose Rate R/hr TLD
16"	facing source	2000 mr	1850 mr	180 R/hr	166.5 R/hr
16"	perpendicular to source	1820 mr	1850 mr	163.8 R/hr	166.5 R/hr
27"	facing source and shielded with polyethylene 11" thick	330 mr	330 mr	29.7 R/hr	29.7 R/hr
55"	at point where [redacted] stated he sometimes hung his lab coat with film badge attached	130 mr	-	11.7 R/hr	

E+6

65. As noted above, the radiation level as measured at 16 inches from the source 180 R/hr by film badge and 166.5 R/hr by TLD agrees fairly closely with the theoretical output of the source. It is also noted that if [redacted] had left his film badge at the location 55 inches from the source during 30 minutes, the maximum exposure time, it would have been exposed to only 5.85 R. The film packet worn by [redacted] received a recorded exposure of 17.4 Rem. E+6

66. [redacted] was referred to Neil Wald, M.D., consultant to the licensee, for blood studies to determine chromosome break and abberation. Blood samples were taken, according to Beebe, on September 8 and 15, 1969. Beebe stated that the first blood sample showed evidence of radiation induced chromosome break and therefore a second sample was taken for tissue incubation and evaluation. Beebe stated results would be available during the week of September 20, 1969.

67. Mr. Charles Comar of this office communicated with Dr. Neil Wald on September 22, 1969. Wald reported that it would have been preferable to have had a base line blood sample prior to the incident. He also stated that the results while not conclusive, are consistent with a 17 Rem whole body exposure.

Discussion with Management

68. [redacted]

69. The items of noncompliance were enumerated and described by the representatives of CO:I. The licensee representative, through Beebe, conceded all of the items of noncompliance, qualifying only two. These were items number 1 and 4 relating to licensee's failure to evaluate the radiation hazard to determine the exposure to the hand of the employee and its failure to notify the employee that he had received a radiation exposure to his hand. Beebe stated that immediately after the film badge results were received, [redacted] did two reenactments of the incident on the basis of which the licensee calculated the dose he had received. Beebe stated that from observation of [redacted] reenactment the calculations of the dose to the hands did not indicate that he had received a hand exposure in that the distance [redacted] hands were from the source during these reenactments was 6 inches to 7 inches and the calculations did not indicate he had received a reportable dose. Beebe acknowledged that he had omitted mentioning the hand calculation in his 30 day report but that the possibility of a hand exposure had been considered. Beebe also acknowledged that no notification of the extremity exposure to this agency as required by 10 CFR 20.403(b) had been made by the licensee, nor had notification of the extremity exposure to the employee as required by 20.405(b) been made.

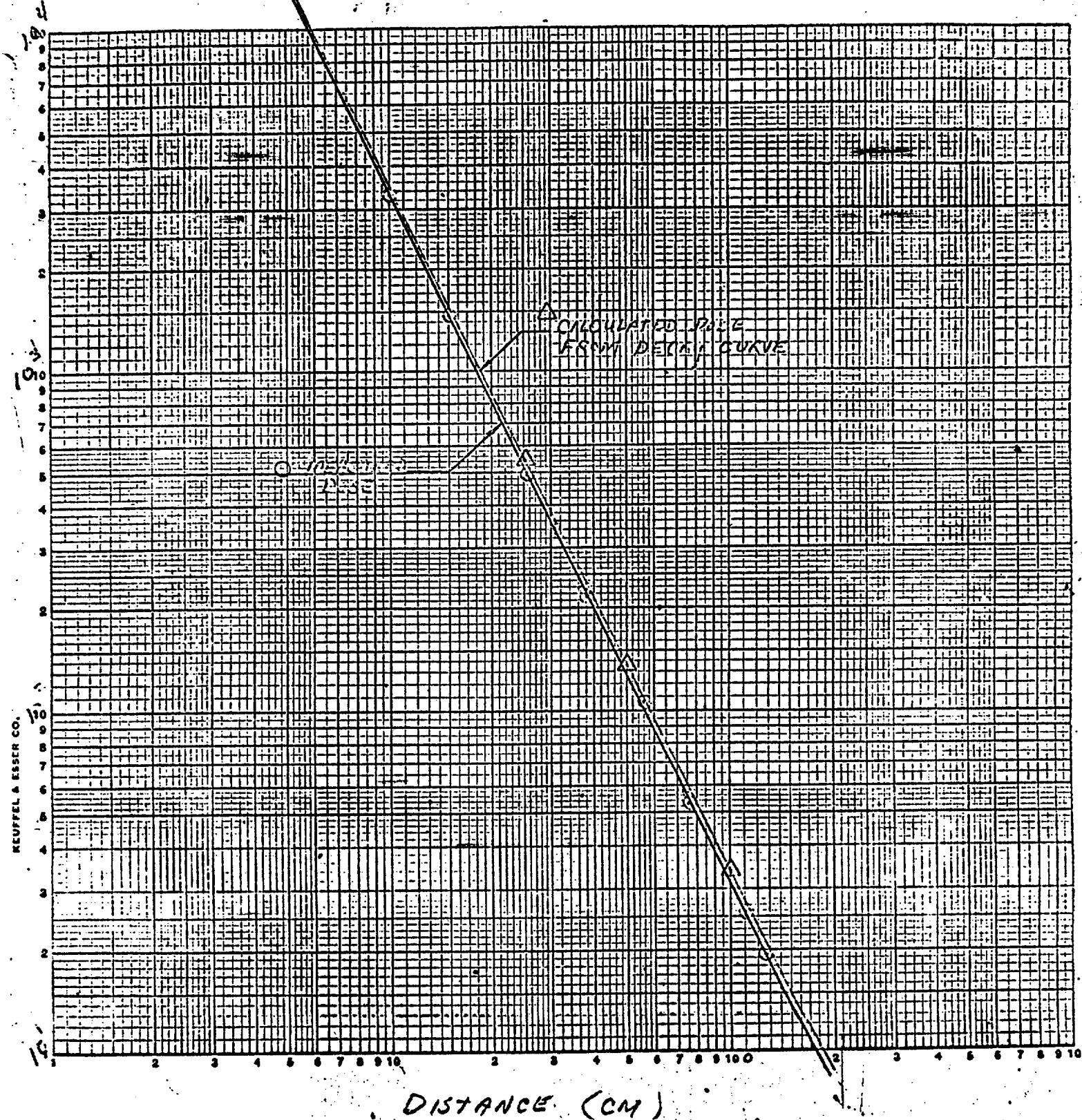
70. Dr. Spritzer stated that he considered the discrepancy between the reenactments as reported by Westinghouse personnel and the reenactment as observed by the Region I representatives was significant. He stated that [redacted] had been given a routine physical examination on August 1, 1969. At that time, [redacted] made no mention afterward of the possibility that he had received a radiation exposure during the preceding month. Spritzer stated he learned of the exposure on August 8, 1969 and when he questioned [redacted] concerning the exposure, [redacted] was vague about the details of what had occurred, uncertain of the date and was unable to give Spritzer any specific information concerning the incident. Spritzer stated that during the time when this incident occurred in July of 1969, [redacted] had taken mild tranquilizers.

71. Beebe stated that the Isotope Committee did not designate an individual specifically to supervise an activity involving the use of radioactive materials. He stated that the Committee gives approval to the facility manager, in this case Frantz, to operate the Radiation Calibration Facility. Frantz had designated Woodsum to be [redacted] supervisor and while Woodsum was on vacation, no one else had been designated by Frantz to supervise [redacted] activity. Frantz, who was present at the discussion, concurred in Beebe's statement.

72. With regard to corrective action, Mei stated that the Radiation Calibration Facility has been closed. He stated that a new Radiation Calibration Facility is now being constructed, which will have appropriate controls, interlocks and supervision. Mei stated this facility is being built at the Corrosion Test Facility. Frantz stated that the new facility will be a regular building, not a trailer, and that it will be surrounded by a wall of earth. Frantz stated that new and adequate instrumentation to measure levels of radiation has been procured.

73. [redacted]

Exhibit "A"



CO_2 CHAMBER
S/N G-928
2-19-69
EJO

EXHIBIT H.

31 R/HR at 1 METER

WANL RCF Investigation, August 8, 1969

EX6

A review of the specific acts [redacted] performed when he re-entered the RCF trailer on July 7, 1969 with the 30 Ci Co-60 source possibly exposed.

[redacted] with a survey meter, initially entered the trailer and proceeded to place equipment as required to conduct a calibration test. On completion of these tasks, [redacted] left the trailer and proceeded to the Co-60 source controls located outside the trailer and placed around an earth bank for shielding reasons. He manually cranked out the source and started toward the Rocker House. As he started toward the Rocker House, he remembered that he had not connected the cable leads to the detector being calibrated. He turned around and proceeded back to the trailer. He is not clear concerning his subsequent actions. He does not recall rewinding the source into its shielded housing and he admits leaving the survey meter lying next to the source control unit. He knows what he did on entering the trailer. After he completed connecting the leads to the detector and measuring the distance from source holder to detector, he left the trailer and proceeded to the source control unit and started to turn the manual crank to supposedly crank out the source. At this point in his actions, he was unsure which way the source was going, although he felt he was cranking the wrong way. He reversed his winding direction, perhaps several times, finally cranking the source to the out position. He continued into the Rocker House to conduct the test. He estimates length of test to be approximately 30 minutes.

The following action, nominal distance from source and time constitute a simulation of the possible exposure:

Second Walk Through

Act	Time	Nominal Distance	Radiation Level	Calculated Exposure (R)
Walking into trailer	15 sec.	--	10 R/hr	0.03 R
Securing cables	20 sec.	2 ft.	84 R/hr	0.46 R
Taping cables to fixture	20 sec.	1 ft.	350 R/hr	1.94 R
Connecting cables to probe	40 sec.	0.5 ft.	1450 R/hr	16.12 R
Measuring source to probe	50 sec.	0.5 ft.	1450 R/hr	20.15 R
Walking from trailer	15 sec.	--	10 R/hr	0.03 R
Total	160 sec.			38.73 R

EXHIBIT B

pg 1 of 2 pages

[redacted]

Activity	Time	Nominal Distance	Radiation Level	Calculated Exposure
Walking into trailer	15 sec.	--	10 R/hr	0.03 R
Securing cables	25 sec.	2 ft.	84 R/hr	0.57 R
Taping cables to fixture	50 sec.	1 ft.	350 R/hr	4.85 R
Connecting cables to probe	25 sec.	0.5 ft.	1450 R/hr	10.07 R
Measuring source to probe	30 sec.	0.5 ft.	1450 R/hr	12.09 R
Walking from trailer	15 sec.	--	10 R/hr	0.03 R
Total	160 sec.			27.64 R

$$\frac{38.73\ R + 27.64\ R}{2} = \frac{66.37}{2} = 33.18\ R$$

EW6 It appears that [redacted] would have received a much greater exposure than that recorded by his June 21 through July 4 film badge. This badge indicated 17.4 Rem exposure.

Walking into trailer
Securing ca[redacted]
Taping cabl[redacted]o fi[redacted]
Connecting c[redacted]les to
Measuring source
Walking from trai[redacted]

Subcontract NP-1

WANEF-46-68
REVISION A
JANUARY 1969

Westinghouse Astronuclear Laboratory

WESTINGHOUSE ASTRONUCLEAR EXPERIMENTAL FACILITY

OPERATING PROCEDURES
FOR
WANEF RADIATION CALIBRATION FACILITY
AND
ASSOCIATED EQUIPMENT

PREPARED BY:

J. W. Rowland

J. W. ROWLAND

APPROVED BY:

F. S. Frantz

F. S. FRANTZ, MANAGER

INFORMATION CATEGORY
Unclassified
F. S. Frantz — AUTHORIZED CLASSIFIER
1/16/69 — DATE

EXHIBIT "C"

INTRODUCTION

The WANEF Radiation Calibration Facility (RCF) has been set up to provide gamma ray, thermal and fast neutron detector and spectrometer calibration facilities and standards as a means of insuring accuracy and reproducibility in experimental measurements related to the reactor and its accessories. Although it would be desirable to have such a calibration facility in the open where scattering is minimized and the $1/r^2$ law holds with accuracy, this requirement must be tempered with safety requirements, weather protection and economics.

The RCF consists of two portions - a trailer laboratory enclosed by an earth mound, and a graphite sigma pile in the Rocker House basement. The sigma pile is more fully discussed in Appendix 4. This document discusses the operating and safety aspects of the RCF installation and associated equipment.

DESCRIPTION OF THE FACILITY TRAILER

The WANEF RCF trailer, located at about 140' from the Waltz Mill Site Rocker House, is enclosed in an earth wall approximately 18' high, 30' across the base and 0 to 5' across the top. The trailer may contain any of the sources found in Table I. The total amount of radioactive material within the RCF will be limited to sources with a total of 100 curies with a maximum of 50 curies of any single isotope.

For purposes of this document, the sources in Table I are classified as either ELECTRICAL, STRONG* or OTHER as indicated therein. The safety

* Isotopic sources producing a radiation field in excess of .1 rem/hr at 1 meter are classified as STRONG sources.

requirements for the use of each source within any one of these divisions are quite similar, but the requirements for different divisions are not necessarily very much alike. When not in use, all of the STRONG sources* will be stored in the source storage vault in the manner described in Appendix 1. OTHER sources may be stored in this vault or in other suitable containers within the trailer. The location of sources will be kept in a source log.

Operation of the STRONG and ELECTRICAL sources will be by remote control from the Rocker House. The only exceptions are:

1) WANEF's Tech-Ops Model 528 gamma ray projector (See Appendix 2 for additional procedures).

2) The Kaman Nuclear Model 801 pulsed neutron generator (See Appendix 3 for additional procedures).

3) The 200 millicurie Co^{60} (NBS secondary standard) gamma source (See Appendix 5 for further procedures).

PROTECTION OF NON-WANEF AND NON-WESTINGHOUSE PERSONNEL

Although the earth wall around the trailer is adequate as a personnel shield to neighborhood buildings, it is possible to climb the mound to enter the radiation area. The complete mound is enclosed in a 48" fence encircling the trailer facility and will be posted with appropriate signs as determined by Health Physics. The fence has a gate which will be locked as part of the

* The 30 curie Co^{60} source may, however, also be stored in the Tech-Ops Model 528 gamma ray projector. The 22 curie Cs^{137} source may also be stored in its presently approved gamma ray projector. The 200 millicurie Co^{60} NbS secondary standard will be handled as prescribed in Appendix 5.

control of the radiation area. The fence is lighted at night. A radiation survey of the area has been made with the strongest source exposed to ensure a 15 mr/hr level or lower at all locations outside the fence.

EQUIPMENT SECURITY

Security against equipment theft is accomplished by locks on the trailer doors. The source storage vault will be constructed so that sources may be removed only from inside the trailer.

PROTECTION OF WANEF PERSONNEL

Personnel exposures will be kept within those specified in the Waltz Mill Health Physics manual. The basic method of alerting WANEF personnel to the presence of dangerous radiation levels within the RCF trailer is a calibrated radiation monitor having its detector in the source area of the trailer. This unit provides not only an audible indication of count rate but also a bell-type alarm which is triggered at a preset count rate. In addition, warning lights located on the outside of the trailer, at the enclosure entrance gate, and in the Rocker House are activated by the high count rate alarm. The audible count rate signal is also heard in the Rocker House Control Room through the intercom system. Normal background radiation is easily detectable and the wiring is such that count rate audio volume is independent of the position on volume control on the intercoms.

Although the radiation monitoring system is basically a gamma ray detector, adequate neutron sensitivity may be obtained by detection of neutron capture gamma production. The radiation warning alarm will be set to operate at approximately 100 mr/hr at the detector. ~~The detector will be located near the highest radiation field within the trailer.~~

All WANEF personnel routinely carry β-γ and neutron film badges and pocket dosimeters while at the main WANEF building. Such dosimetry shall also be required at the RCF. In addition, tritium film badges will be employed as required by Health Physics.

ADMINISTRATIVE CONTROL OF THE FACILITY

1) The Manager, WANEF, will appoint a Facility Operator who will be responsible basically for the use and safety of the facility. The Facility Operator shall possess an understanding of the hazards and procedures involved in this facility.

2) The Manager, WANEF, will appoint qualified Experimental Operators for the various systems. The Experimental Operator shall possess an understanding of the hazards and procedures involved with the appropriate system.

3) Prior to any experiment or series thereof, the Facility Operator shall appoint an operator-of-the-day from the approved list of Experimental Operators. The Experimental Operator selected must be qualified to use the particular sources in question.

4) All keys to the STRONG and/or ELECTRICAL sources shall be under the supervision of the Facility Operator.

5) If for any reason a source is to be exposed during non-working hours, the fence on the gate will be locked. The Facility Operator will notify the Plant Guards. In any event, no key to the fence gate will be issued to the Plant Guards, and they will be instructed never to step over the fence. A heat rise or similar detector will provide fire detection warnings.

6) If for any reason a STRONG source should appear not to return to a safe position upon activation of the source retraction mechanism, the Facility Operator will be notified at once. He will then, upon observing the circumstances, determine a suitable course of action. If it is determined that the source is still exposed, he will request Health Physics surveillance.

FACILITY RULES

1) The operator-of-the-day will calibrate the radiation warning system on a daily basis if personnel are to be present on that day. Such calibration need not take place more often than once a day unless the radiation warning system has been disturbed.

2) The operator-of-the-day will be responsible for inspecting the trailer, the trailer pit, and the area inside the exclusion fence to ensure that the areas are free from personnel before exposing a STRONG or ELECTRICAL source. He will then lock the personnel gate upon leaving the exclusion area.

3) After the exposure of a STRONG source, the operator will enter the trailer with a portable radiation instrument as a check of warning system operation to ensure that the source is no longer exposed.

4) Personnel will not be within the RCF exclusion area when the high level warning lights are ON except with a Health Physics technician or other W personnel carrying a suitable portable radiation survey instrument as well as having the permission of the Facility Operator. The second person rule is not meant to apply to the operator-of-the-day when he is only checking out and calibrating the radiation warning system using a check source.

5) Personnel will observe standard Westinghouse rules concerning hazardous operation with high voltages, etc.

and Trailer

6) The fence will be locked whenever any significant* source is exposed during non-working hours.

7) The fence will be locked before exposure of a STRONG or ELECTRICAL source unless experimental personnel are present inside the exclusion area in accordance with Facility Rule 4.

8) The exposure of all sources producing a radiation field in the trailer in excess of the warning monitor level shall be accomplished remotely from the Rocker House. The only exceptions will be the Tech-Ops gamma ray projector (see Appendix 2) and the ~~200~~ 20 mci Co^{60} source (see Appendix 5).

9) Health Physics shall be responsible for:

a) Providing emergency personnel surveillance as requested by the Facility Operator or the Manager, WANEF. + as specified

b) Providing adequate posting of the RCF; i.e., radioactive material area sign, etc.

c) Taking adequate routine smear surveys of the RCF to guard against contamination. Such surveys may also be requested by the Facility Operator.

d) Providing radiation protection services as specified in the APD Health Physics Manual.

---

* Greater than those quantities regarded by the AEC as being generally licensed, typically 1-10 μ curies.

EMERGENCY PROCEDURES

1. General

The function of emergency procedures is to provide a plan of action to be followed under emergency conditions during which calm planning may be difficult. The following paragraphs describe the alarm systems used at the RCF and the interconnecting alarms which connect the RCF with the other facilities at the Waltz Mill Site. Also described are categories of emergency conditions and prescribed action for each, followed by a roster for emergency notification. All RCF personnel are required to be familiar with the various alarms and the action prescribed for the emergency conditions.

2. Alarm Systems

The alarm systems at the RCF are composed of three separate alarm systems as described below.

2.1 Local Area Evacuation Alarm

1. Description

A radiation level above a preset level in the RCF trailer will cause a buzzer to sound in that particular area and also in the RCF control room through the intercom. In addition, warning lights come on in the RCF control room, on the outside of the trailer, and at the entrance fence to the RCF exclusion area. Refer to Figures E1 and E2 for the radiation monitor and indicator locations.

2. Alarm Point

The trip point for the Area Radiation Alarm is set to trigger at approximately 100 mrem/hr.

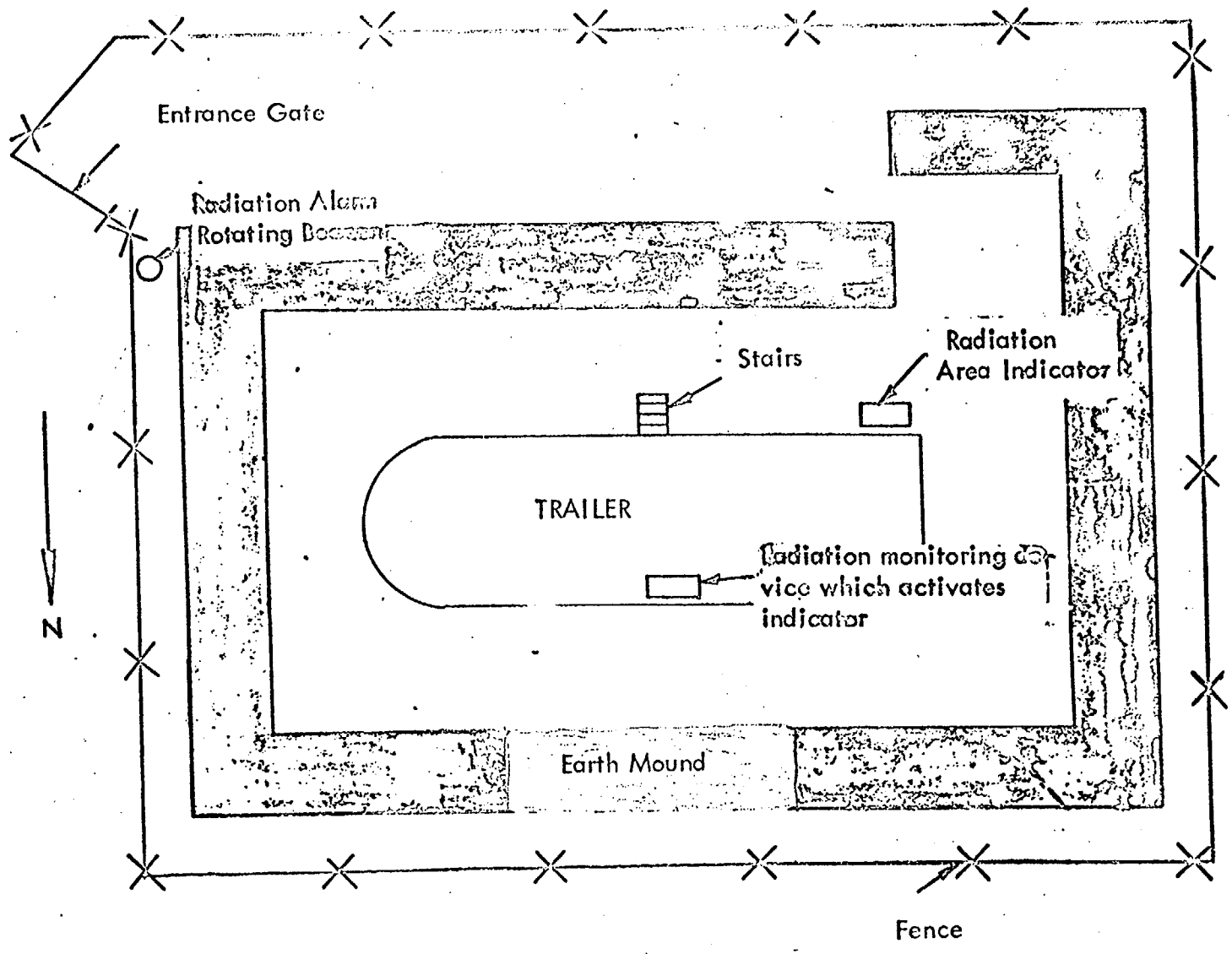


Figure E1. Location of the Radiation and Fire Alarms and Actuating Stations at the RCF Trailer

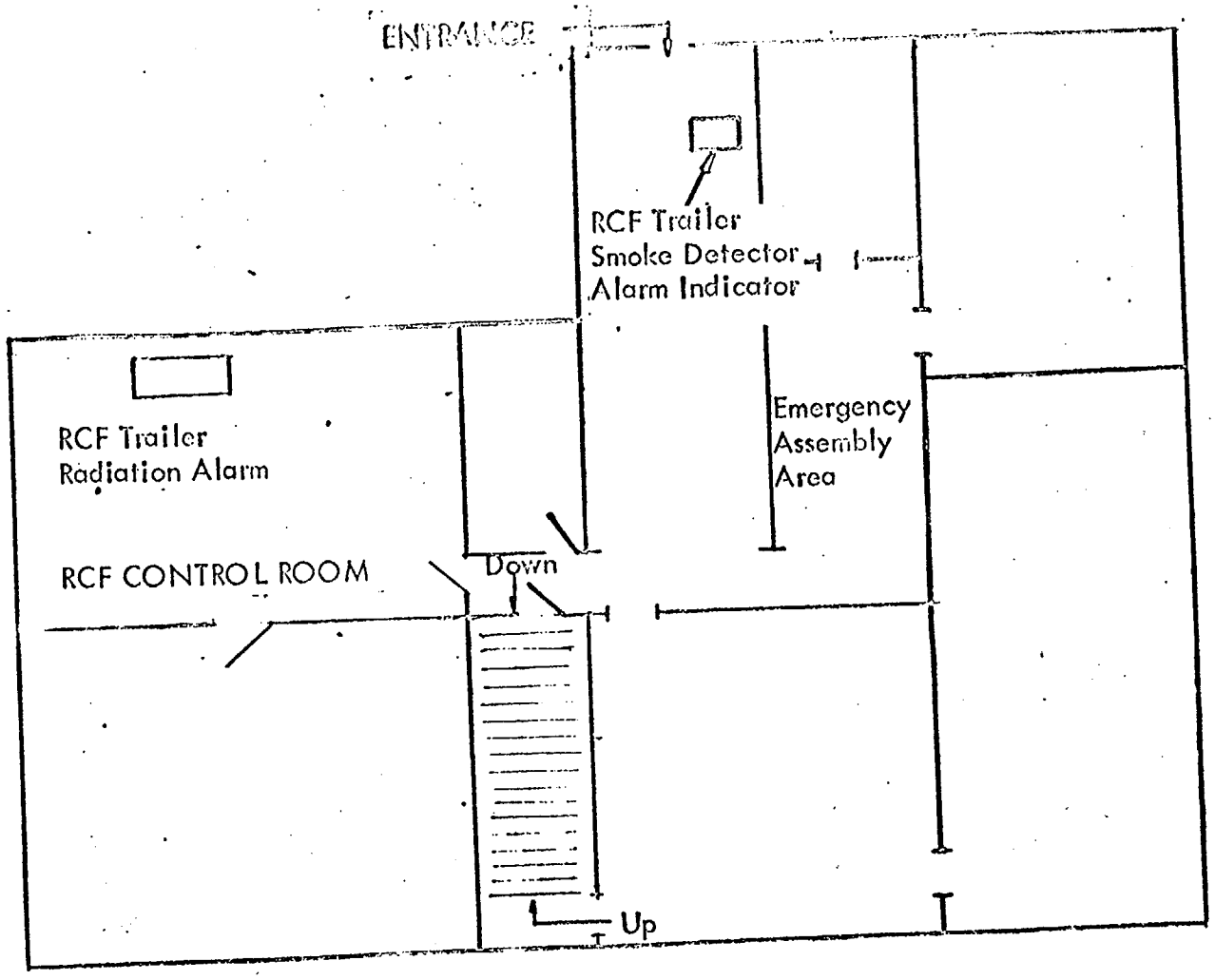


Figure 12. Location of Radiation and Fire Alarms and Emergency Assembly Area at RCF

3. Action

(1) All personnel within the RCF trailer upon hearing the Area Radiation Alarm will immediately evacuate the area.

(2) The staff member discovering the situation will notify all personnel at the RCF of the condition.

(3) In the event of an Area Radiation Alarm, the senior staff member present will notify the Manager, WANEF, or his designee. Reentry will require approval of WANEF management. The personnel entering must have suitable radiation monitoring equipment and must observe the radiation dose limits set forth in the Waltz Mill Site Health Physics Manual.

(4) Detailed and separate reports for any unanticipated alarm will be prepared by all personnel involved at the earliest opportunity, but not later than 24 hours after the alarm. Consolidation of these reports will be accomplished by the directing staff member.

2.2 Trailer Smoke Detector

the Emergency Notification Roster, bearing in mind that entrance inside the RCF enclosure fence may require the presence of appropriate WANEF personnel.

2.3 General Site Alarm

1. Description

The general site alarm is the ALERT signal (a high-pitched rapid warbler sound) which can be actuated at WREC, WANEF and the Health Physics office in the "G" Building. All emergency conditions requiring general site cognizance will be announced over the public address system in conjunction with the ALERT signal. The ALL CLEAR signal is a steady tone over the public address system. Until these signals are audible at the RCF, the senior person at WANEF will establish contact with personnel at the RCF.

2. Action

Detailed instructions are contained in the Waltz Mill Site Emergency Procedures. In brief, the following actions should be exercised by RCF personnel upon receipt of the alarms listed above:

(1) Alert

1) Report to the Rocker House emergency assembly point (shown in Figure E2) and standby for instructions over the Voice Command System or by telephone. If ordered to evacuate, secure all systems and proceed to the designated assembly point.

2) All members of the Fire Brigade should prepare to report to the scene of a fire unless otherwise directed. (Two members of the WANEF staff are in the Fire Brigade.)

APPENDIX 2

OPERATION OF THE TECH-OPS MODEL 528 MOBILE GAMMA RAY PROJECTOR

This unit, which presently contains a 30 curie Co^{60} source, is not capable of conforming to the previous restrictions on STRONG source operations. Because of mechanical considerations, there is a maximum limit of 35' from the source shield to the operating mechanism, and a discussion with the local sales representative indicates that it would be unwise to motorize this instrument. Thus, it cannot be run remotely from the Rocker House. Applying the $1/r^2$ law to this distance would give a dose rate to the operator of approximately 400 mr/hr, neglecting the considerable shadow shielding provided by the cask. This dose rate, while high, will not result in excessive exposures to the personnel involved during the 1/2 minute or so required to operate this source. The following rules, in addition to those included in the main text of this document, are thus provided for the operation of this source:

1) All personnel involved in physically positioning the source tube and the controls must be familiar with the instruction manual for this instrument.

2) The source must be operated with the maximum reasonably obtainable distance between the operating personnel and the source. The minimum straight-line distance between the source and any personnel shall not be less than 20' (~1 R/hr) unless suitable shielding material is interposed.

3) At least two people shall be present during the operation of the source exposure mechanism. One of these people will provide continuous radiation monitoring.

APPENDIX 2 - CONTINUED

4) During the time while the source is exposed, all personnel shall retire to a suitably shielded location in order to minimize their radiation dosage.

5) After the source has been retracted into its shield, the shield will be checked with portable survey instruments to ensure that the source is in place. The controls shall then be locked and the key removed.

6) If this device is operated at a location other than within the pit of the RCF (the WANEF test cell for example) all personnel not connected with the experiment shall be cleared to areas in which this device will produce a radiation field of ≤15 mRem/hr. In addition, suitable signs and/or guards shall be posted to prevent personnel from unintentionally entering the high radiation area produced by this device. Also, the EIC shall be notified before this device is operated at a location in or adjacent to the main WANEF building.

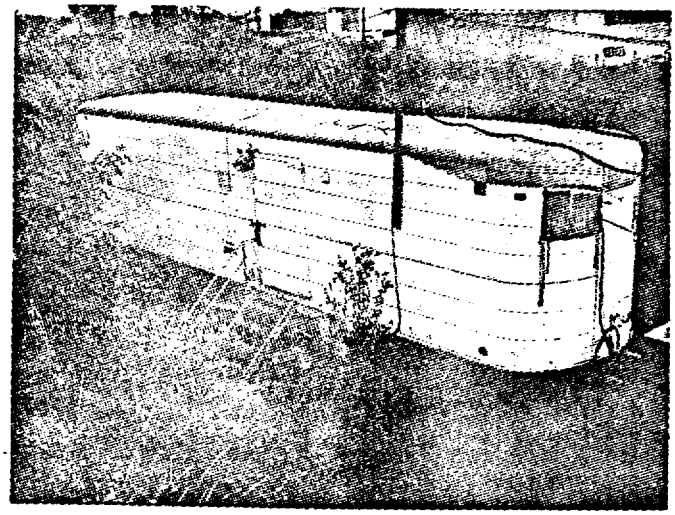
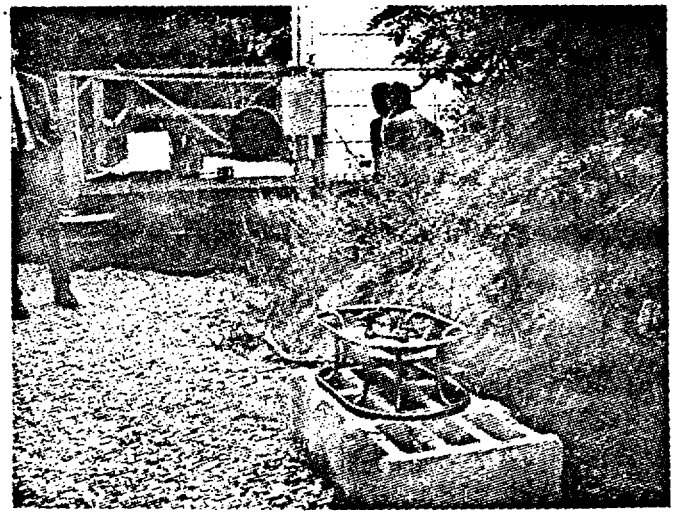
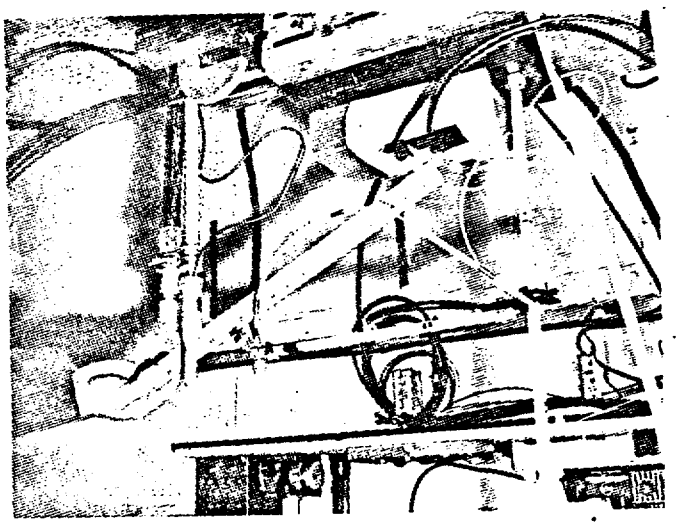


EXHIBIT F





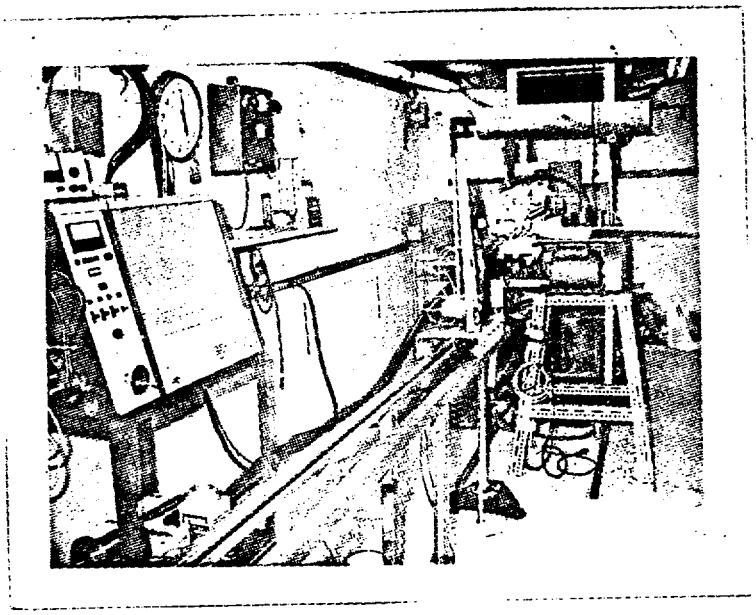


Exhibit H