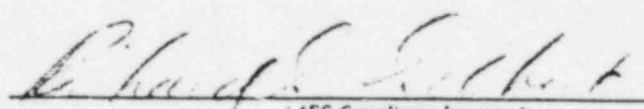


INSPECTION FINDINGS AND LICENSEE ACKNOWLEDGMENT

|  |   |
|--|---|
| <b>1. LICENSEE</b><br><b>Harvard College</b><br><b>Harvard University</b><br><b>Cambridge, Massachusetts 02138</b> | <b>2. REGIONAL OFFICE</b><br><b>U. S. ATOMIC ENERGY COMMISSION</b><br><b>Division of Compliance, Region I</b><br><b>970 Broad Street</b><br><b>Newark, N.J. 07102</b> |
| <b>3. LICENSE NUMBER(S)</b><br><b>20-00297-53</b>  | <b>4. DATE OF INSPECTION</b><br><i>K/I</i><br><b>6 - 7 NOVEMBER 1968</b>  |

**5. INSPECTION FINDINGS**

- ☒ A. No item of noncompliance was found.
- ☐ B. Rooms or areas were not properly posted to indicate the presence of a RADIATION AREA.  
10 CFR 20.203(b) or 34.42
- ☐ C. Rooms or areas were not properly posted to indicate the presence of a HIGH RADIATION AREA.  
10 CFR 20.203(e) (1) or 34.42
- ☐ D. Rooms or areas were not properly posted to indicate the presence of an AIRBORNE RADIOACTIVITY AREA.  
10 CFR 20.203(d)
- ☐ E. Rooms or areas were not properly posted to indicate the presence of RADIOACTIVE MATERIAL.  
10 CFR 20.203(e)
- ☐ F. Containers were not properly labeled to indicate the presence of RADIOACTIVE MATERIAL.  
10 CFR 20.203(f) (1) or (f) (2)
- ☐ G. A current copy of 10 CFR 20, a copy of the license, or a copy of the operating procedures was not properly posted or made available. 10 CFR 20.206(b)
- ☐ H. Form AEC-3 was not properly posted. 10 CFR 20.206(c)
- ☐ I. Records of the radiation exposure of individuals were not properly maintained. 10 CFR 20.401(a) or 34.33(b)
- ☐ J. Records of surveys or disposals were not properly maintained. 10 CFR 20.401(b) or 34.43(d)
- ☐ K. Records of receipt, transfer, disposal, export or inventory of licensed material were not properly maintained.  
10 CFR 30.51, 40.61 or 70.51
- ☐ L. Records of leak tests were not maintained as prescribed in your license, or 10 CFR 34.25(c)
- ☐ M. Records of inventories were not maintained. 10 CFR 34.26
- ☐ N. Utilization logs were not maintained. 10 CFR 34.27

  
 (AEC Compliance Inspector)

**6. LICENSEE'S ACKNOWLEDGMENT**  

The AEC Compliance Inspector has explained and I understand the items of noncompliance listed above. The items of noncompliance will be corrected within the next 30 days.

\_\_\_\_\_  
 (Date)

\_\_\_\_\_  
 (Licensee Representative - Title or Position)

ORIGINAL: LICENSEE. COPIES: ☐ CO REGION ☐ CO HEADQUARTERS ☐ CO ENFORCEMENT

8506190022 850327  
PDR FOIA  
BURKEB5-79  
PDR

*pc* 12

29 November 1968

To: R. S. Cleveland

From: R. G. Gilbert

Subj: Inspector Evaluation

Harvard University

Cambridge, Mass

License No. 20-297-53 (F(11E))

Well controlled broad academic program involving moderate use of radionuclides. Use of radionuclides has diminished somewhat since time of previous inspection (May 1965), primarily because of reduction in Federal research funds.

Suggest reinspection date of May 1970 (12 + 6 mos).

1/9/69

Note to next inspector - reviewed M.B.H. file shows that quantities of I-131 transferred from AEC to Harvard for burial at Southboro have exceeded limits for burial per 20.204 4 appendix C. 11/10/68 issued to Johnson (Harvard) 1/9/69 + bases improved burial practices, especially of material received from other licensees (Harvard at Boston) could be covered during next inspection.

Gilbert

18 Nov. 1968

Inspection Notes - Clear AEC 591

Harvard University, Cambridge, Mass.

Lic No 20-297-53 (F(1) II)

w/amends 17 + 21

Received 6/4/69  
759

Inspection Dates - 6 + 7 Nov 1968 (RI)

Participants -

J. Shapiro, PhD, RSO & Chairman Rad. Isot. Comm.

R. V. Johnson, Health Physicist

P. King, HP Technician

Various users as noted in details

State informed - no one accompanied inspector

Background Information

Last inspection conducted 25 + 28 May 1965 (initial)  
Handled by AEC-592 dated 7/12/65 with two items  
of NLC - (a) 20.201(b) - in adequate evaluation of H<sup>3</sup>  
releases to unrestricted areas so as to determine  
compliance with 20.106 (a); and,

(b) 30.32 (c) - unauthorized transportation  
of 250 mCi Kr<sup>85</sup> by licensee.

Licensee replied by letter of 7/30/65, this

Harvard Unit

## Details

### Organization

1. See also A's 2 + 4 report of May 1965 inspection & attachment #1 to and sections 3 - 6 (pp 3-6), Harvard Regulations (rev) submitted to DUC 5/6/68.
2. Johnson summarized the organizational & administrative aspects of the program, noting several minor changes that have occurred since 5/65. Current composition of the Radioisotope Committee: Shapiro, Chairman; Mullins, Purchasing Dept; Vanelli, Chemistry; Trum, Animal Research Center; Bainbridge, Physicist; and Johnson, HP representative. AT the direction of Shapiro the RIC meets formally three times during academic year. At these meetings new business and problems discussed and review made and final approval given to all authorizations issued since previous meeting. Unless unusual request authorizations signed by Shapiro after review and approval of applications by Johnson. No unusual requests received since last inspection acc. to Johnson. Minutes of meetings kept.
3. Johnson discussed method of review and approval of applications and amendments to existing authorization. The training & experience of each applicant, as well as that of each user listed on application (persons using under supervision of applicant), is checked and approved



interview with applicant and principal users to instruct in Harvard regulations, records required and issue copy of the regulations. A similar review given each time request for amendment received and at least every two years when authorization expires. A member of Johnson's survey team visits each use area before activation of program to verify monitoring equipment on hand, to ensure waste containers on hand and to provide required posting and tagging of any sinks designated as "hot" for disposal of specified soluble radionuclides: Over

4. Staffing of the Rad Safety section of Environmental Health & Safety (EHS) as follows. Shapiro, Chairman of EIC and designated Harvard RSO. He supervises Johnson who as Harvard Health Physicist handles issuance of authorizations, conducts the rad safety program and maintains all AEC license records. Shapiro now spends all time at Harvard, about 50% of time teaching fellowship courses and 50% on education courses for license users and program administration. Two survey technicians work for Johnson. Paul King, former radiation tech at Electric Boat, Quincy, and J. Iannini, former HP technician in Navy nuclear power group. Both are Northeastern Univ coop students majoring in physics and are taking HP courses at

is as follows:

President - Pusey

Dr. <sup>↓</sup>Farnsworth, Dir. of Univ. Health Services  
and Chairman University Safety Committee

Dr. <sup>↓</sup>B. Ferris, Dir. of Env. Health & Safety  
and Chairman Env H & S Committee. Has four  
divisions under him - Industrial Hygiene, Rad  
Safety, Bacteriology and Sanitation

Dr. Shapiro - Incharge of Rad Safety Group, RSO,  
Chairman RSC, & member of University policy  
making group, Nuclear Rad Safety Comm.,  
which formulates Univ. policies.

Shapiro suggests members ~~of~~ to RSC through Ferris  
and through Nuclear RSC institutes rad safety policy  
which is implemented by his group.

#### Control & Use of Radionuclides

6. See also RI's 5-78 previous report for Purchase & Receipt practices and RI's 9+10 for use of material and §'s 8, 9 (p. 8), 12, 13 (p. 10) Harvard Regs (1968 rev. for control procedures.
7. Johnson furnished additional information on this subject. Persons using generally licensed quantities of material (10CFR) did not require licensing (authorization from the RSC but in order to control these uses and keep university within its scheduled quantities

orders are for radionuclides) and survey members visit practically all labs of Harvard little chance of user escaping detection by Johnson. One person in purchasing handles all requests for radionuclides - he has list of all authorized users & batch of genetic quantities. Requests for less than 1mCi of licensed material may be sent directly to purchasing who then forwards copy of request to Johnson. If request for 1mCi or more of material authorized to use, user must send request to Johnson first for his approval. If users fails this, purchasing will not honor request. Using chart system discussed in A6 previous report and card file for each user, Johnson keeps informed of all receipts of radionuclides and whether or not individual users kept within authorization limits. AEC license limits are based on summation of amounts authorized for each user. Periodic disposal records submitted by users and review by survey technician as well as annual inventory submitted by each user keeps Johnson's use records fairly current.

- e. Johnson's records indicated about 80 active authorizations in effect. A total of about 200 supervisory personnel (auth. users) are listed on these authorizations together with about an equal no. of technicians & others involved to a limited degree, these persons requiring supervision. About

use at any one time not usually exceeding several mCi each

9. The last annual physical inventory at Harvard was taken in April 1968. Each auth. user listed quantity of each radionuclide on hand (not including material in waste storage). Review of Johnson's tabulation, broken down by Dept's within Harvard complex falling under this license, showed about 50 radionuclides were possessed. Acc. to Johnson this no., and the quantity of each radionuclide both for Harvard as a whole & for each Dept, would be representative of any month during academic year. The more significant quantities and radionuclides <sup>used</sup> were noted as follows.

$Co^{60}$  11 Ci, one 10 Ci sealed source, several sealed sources of 1 mCi  $\rightarrow$  100 mCi, and a small amount in unsealed form

$Cs^{137}$  1.1 Ci as a sealed source

$C^{14}$  300 mCi - organic compounds, Biology Dept (users) possessing ~~greatest~~ <sup>largest</sup> amounts - totalling <sup>Biol.</sup> 240 mCi (see also discussion in later A re tour of ~~Dept.~~ <sup>Biol.</sup>)

$H^3$  11 Ci - mostly as tritiated water - rest as organic compounds, max in Biology - about 1 Ci total, other Depts about 200 mCi max, max used at one time by one user for preparation of



mostly by Harvard Med School - small amounts used consistently - about 1/2 amount decay - tagging of bacteria - max per experiment 10 mCi of which only 1% taken up by cultures - rest to waste  
 $^{133}\text{Xe}$  - greatest use by Dr Brown of Med School - 250  $\mu\text{Ci}$  gas/experiment - about 1 mCi <sup>passed</sup> but used on average - several other users handle less than 1 mCi amounts

$\text{K}^{85} \text{ } ^{32}\text{P}$  - used by Physiology Dept at Med School by Drs Birch & Barger (See also WS 23 & 25 previous report). Use rate declining since 1965; in 1967 received 1 Ci about every 4 mos, one receipt 1.5 Ci gas 2/68 not used as of 11/68.

10. Additional information on uses of radionuclides noted in following section - Review of Lic Cond - and later section on - Tour of Selected Labs @ Cambridge, Med School - Boston, - and primate Center in Southboro.

#### Review of License Conditions

11. According to Johnson of byproduct material listed in cond #6 A-F only, <sup>have</sup> material possessed under A, B, and E. The latter  $\text{Am}^{241}$  is a sealed source ( $\text{Am-Be}$   $\beta$  source by NRC, 0.0159 gm  $\text{Am}^{241}$ ,  $16 \times 10^5 \beta/\text{sec}$ ) possessed by Health Services.
12. Condition 11, amend no 18. Acc to Johnson several of the locations listed herein do not have



Boston and Animal Farm in Southboro were visited during this inspection). The other locations on license are listed solely because license material for studies operated there under Harvard auspices is procured under Harvard license.

13. Condition 13 amend no 17 - review with Johnson and tour of several areas indicated no discrepancy with this condition.
14. Cond 14 amend no 17 - acc. to Johnson & his use records 1mCi  $C^{14}$  plated on to planchet used for two month period at each location approx. two years ago. Project now completed.
15. Cond 15 & Cond 16 amend no 17. No instances of opening sealed sources noted. Sealed sources procured commercially - most with Physics & Health Services. Johnson maintains file of all sources noting location of use, auth user, leak test history and date next test due - now have system such that sealed sources on an Apr - Oct leak test schedule. (See also 9431 previous report). Leak test procedures noted in attachment 6, <sup>(last page)</sup> application dated 12/17/62. No instances of removable contamination exceeding <sup>since last inspection</sup> 0.005  $\mu Ci$  noted in review of records. Several  $H^3$  chromatograph sources included with this group of sealed sources (two @ Mass Gen eral Hosp & one in

17. Condition 18, amend no 19. Subcond A -  
 (See also P's 28-30 previous inspection report) -  
 acc. to Johnson most material incinerated consists of  
 $C^{14}$  &  $H^3$  combustible wastes & <sup>small amounts of other, most</sup> radionuclides are carried  
 off in gas. Each incineration of wastes containing  
 radionuclides has written authorization by Johnson.  
 Persons (auth. users) desiring to dispose of waste by  
 incineration furnishes Johnson with specifics -  
 type of material (animal wastes, paper, sealast),  
 radionuclide & max. amount present. Johnson evaluates  
 incineration process for compliance with condition,  
 schedules date for incineration & sends written auth  
 to requestor. Material boxed (special cartons required by  
 incinerator operator) and tagged by user at HPTech  
 if assistance requested. Incineration auth. must be  
 attached to box & operator not allow incineration.  
 Johnson's preincineration evaluation also includes need to  
 evaluate radionuclide content of ash. For  $H^3$  &  $C^{14}$  not  
 always assay ash - for other radionuclides if ash assay  
 needed schedule separate burn & eval ash, imm'd  
 after burn (fly ash & bone ash). <sup>acc to records</sup> E.g., 4/10/67 - burn of  
 $130 \mu Ci I^{125}$ ,  $0.565 \mu Ci P^{32}$ ,  $2 \mu Ci I^{131}$  &  $Na^{24}$ , <sup>trace of  $C^{14}$ ,  $S^{35}$ ,  $H^3$</sup>  Hopper  
 cleaned before burn - all ash collected & buried & although  
 assay of sample not indicate presence of contamination -  
 evaluation indicated 80% of  $I^{125}$ ,  $I^{131}$  & 100% of  $S^{35}$ ,  $C^{14}$ ,  $H^3$

0.5 mCi  $S^{35}$  and one special burn of 2.2 mCi  $I^{131}$ , plus traces of  $I^{125}$  &  $I^{131}$  from other burns; following amounts in ash (buried) -  $Na^{22}$  55  $\mu$ Ci,  $Fe^{59}$  16  $\mu$ Ci,  $P^{32}$  3  $\mu$ Ci,  $Cr^{51}$  130  $\mu$ Ci,  $Rb^{86}$  3  $\mu$ Ci,  $K^{42}$  1  $\mu$ Ci, & several other radionuclides total activity less than 0.5  $\mu$ Ci. The 1968 incineration records to date show considerably less quantities of radionuclides being burned. The records showed incineration practices more conservative than those in letter incineration rates < 10% of limits (1.3% in 1967) application of 3/25/65, and no instances of non-compliance with Cond 10A. The last comprehensive smear survey of the incinerator & operating area was in Nov-7 - no detectable removable contamination detected.

19. Cond 10B - acc. to Johnson there has been no incineration of wastes at the Southboro facility to date. See also A 26 previous report.
20. Condition no. 19, amend no 17. A General policy is not to encourage sewer disposal although many authorized users who anticipated such disposal received auth to do so and have "hot" sinks designated within their labs. <sup>Much</sup> ~~most~~ material that does go to sink is soluble short half lived. Daily amounts for each lab limited to quantities specified in Harvard Regs, Appendix I Table 2 column b (same as Appendix C 10CFR20). Waste policy noted in § 11.1, p 9 same regs. User notes quantity of material to sink on record posted at sink - & dilution factor if required. Records reviewed by technician during each periodic survey. Records tabulated once/yr. by Johnson.

- Secretary yearly records kept in terms of total quantity each radionuclide by Dept (Chem, Bio, Phys etc)
21. Review of yearly records less than 0.2 Ci/yr to sewer system. 1967 record showed - med/Dental School - 40 mCi  $H^3$ , 3.7 mCi  $C^{14}$ , 1.4 mCi  $S^{35}$ , 2.9 mCi  $I^{131}$ , 3.2 mCi  $P^{32}$  & lesser amounts of  $Na^{22,24}$ ,  $K^{42}$ ,  $Ir^{89}$ ,  $Se^{75}$ ,  $Co^{60}$ ,  $Cl^{36}$ ; Harvard, Cambridge (Chem & Biol) - 240  $\mu$  Ci  $C^{14}$ , 4 mCi  $H^3$ , 2.5 mCi  $P^{32}$ ; about 12 other locations with small amounts of above noted radionuclides. Johnson stated he is continually reviewing sink disposal to ensure point 20 limits and concentrations are not exceeded. The governing criteria is total quantity per day.
22. Cond 20, amend no 19. Referenced documents were possessed by Johnson. These were reviewed with Johnson & no instances of failure to act in accordance with stated provisions <sup>were</sup> noted.
23. Cond 21, amend no 17. Acc to Johnson only one use of  $P^{32}$  and this occurred in 1964
24. Cond 22, amend no 17. Acc to Johnson all transportation of licensed material is done directly under his supervision, actual driving by one of his technicians. Packaging & label<sup>ing</sup> in accordance with DOT & AEC regs. Transport only licensed material for use at local Harvard places of use & transfer of waste to Smith boro for burial.
- Personnel Monitoring (See also A's 11-15, previous report) <sup>4 16 of</sup>
25. Use of film badges was reviewed with Johnson. Monthly, biweekly and quarterly badges are used

by practically all persons exposed to ionizing radiation and working under authorizations issued by EHS.

Johnson directly supervises the program (need for badges, changing, developing, review of results, maintenance of individual AEC 5 equivalent forms and preparation of quarterly & annual statistical summary).

26. The 4/1 - 6/30/68 quarter was noted as representative of any quarter since the last inspection. 1484 persons were issued whole body badges - results

437 (91.8%) no detectable exposure; 87 (8.2%) had detectable exposure, average 75 mrem, max 330 mrem - one case where person (D. Strauss, Research Fellow - Chemistry) received 2nd & exposure of 575 mrem not attributable to radioactive material since known not working with, but investigation not able to rule out any exposure  $\therefore$  assigned to him as valid exposure.

27. About 250 film badges are used as area monitors in approx 50 locations (restricted areas, unrestricted areas, licensed mat'l, X-ray tubes & labs). Restricted area badges - max.  $\approx$  100 mrem/mo, most about min detectable dose as with unrestricted areas. The location of each area monitor badge has been marked on survey maps of each area.

28. Whisk badges (monthly change) are used for several labs in the Teaching Hospital & at the Med/Dental School. <sup>Files of</sup> Several dozen persons using such badges spot checked - max noted 130 mrem/mo of which 105 mrem from p. Others mostly  $< 10$  mrem.

29. Johnson stated that in instances where by



dosimeters were used the records of such readings were kept locally at the place of use. No instances of use of dosimeters noted during tour of labs at time of inspection, hence no records reviewed.

30. The bioassay program was described as follows by Johnson. Clinic for  $H^3$  users - <sup>weekly</sup> persons using or handling more than 10 mCi at time (presently only tritiated water or organic compounds). Records indicated max amount was 2.3  $\mu\text{Ci/l}$  for a Miss M Parker, tech for Dr. Tungan who worked with 100 mCi of ~~tritiated~~ tritiated water. Level rapidly dropped off in following week. All others much less than 1.0  $\mu\text{Ci/l}$  for any assay. Thyroid scan for iodine users - very seldom at Johnson's request other no evidence of I uptake. Others do at local level for own benefit. Only whole body counting about four yrs ago for several old time Ra workers at Harvard. Max. detected  $\approx 1/10 \text{ MPB}$ .

#### Waste Disposal

31. Liquid + incineration practices have been discussed above in connection with review of license conditions. Solid wastes are disposed of via burial at Southboro (animal carcasses containing long half life material - several barrels <sup>and</sup>  $\text{kg}$  in accordance with 10 CFR 20.304) and by transfer to T/Seb. The latter is mostly noncombustible material such as scintillation vials. Many labs having waste for transfer have a 30 gal drum positioned in the lab. When filled an HP tech seals drum, affixes label and taken to

loading dock for pickup by T/Hub. Johnson keeps detailed records of each transfer (no of drums and content of each). About 40 drums/mo during academic year to transferred. (See also # 27 previous inspection report)

Harvard Survey & Inspection Program

32. See also #s 17-19, 21-22 & 25 previous report. As to Johnson each use area is visited at least once/mo by an HP tech for purpose of making direct physical measurements, smear or <sup>status of filters, gloves and boots</sup> air samples, if required, and to review program for ~~compliance~~ compliance with Harvard & AEC <sup>radiation</sup> General policy is to allow no detectable levels in unrestricted areas, min radiation levels in restricted areas and no removable contamination in any area. If hood or glove box repair or filter require changing this is done by the Bldg Maintenance Dept under the supervision of a Technician.

33. Results of technicians' surveys noted in log of daily activities and in file for each <sup>on spot check basis</sup> authorization. Both records reviewed by inspector. No instances of excessive levels in unrestricted areas noted. Several instances of violation of Harvard reg noted and in each case complete record of how situation brought attention of auth. user and how corrected. Also each case immediate followup survey to ensure corrective action taken and not recurring. In general Johnson stated violations a problem first brought to users attention by the

technician with phone call or visit by Johnson as soon as he is informed of problem. If not promptly corrected or problem recurs next step is letter signed by Shapiro; 3rd step is revocation of the authorization. Example of problems - (1) 1967 - Dr Brown user of  $\text{Xe}^{133}$  for animal research - the hood in which experiments performed noted by technician not to have min. of 100 lfm (was 275 lfm) - his use was not allowed to continue until hood flow rate improved (change of filter & new blower installed). Evaluation after improvements (made by Johnson) showed conc released to unrestricted area < 5% MPC and if all material accidentally released to lab conc < 50% MPC. (2) 10/5/65 - Dr Comb, Biochemistry - using up to 35 mCi  $\text{P}^{32}$  in lab - was smoking & eating in lab, not wearing film badge, had higher than necessary rad levels at bench where working ( $\approx 140 \text{ mrem/hr}$  at 2" from vial containing stock solution of  $\text{P}^{32}$ ), and was dumping small amounts of tagged  $\text{P}^{32}$  wastes in parking lot. His auth. was terminated by Johnson on 10/6, Shapiro & Dept Head had conference with user on 10/7 & 10/14, and final written termination & enforcement letter (requiring reply) sent to Comb on Oct 18. Reply by Comb stated he would be good boy from now on but Johnson stated still no reactivated the auth. Johnson's evaluation of this problem indicated no hazard to Harvard personnel or to Comb. (3) - several instances of improper posting - corrective action immediately by the technician.

Inspectors Tour

34. Hot lab in basement of Health Services Bldg -  
 use for instrument calibration with sealed sources &  
 storage of sealed sources in storage wells (see 436  
 previous report). Proper posting and labeling noted -  
 using Harvard Ray-D-Tec GM meter calibrated  
 & Nor noted map 0.05 mil Ci level in restricted  
 anteroom leading to the Hot lab.

Six labs in Biology Bldg - use of  $\mu$ Ci quantities  
 $H^3$ ,  $C^{14}$ ,  $P^{32}$  (max in storage 100 mCi  $H^3$ , 5 mCi  $P^{32}$   
 20  $\mu$ Ci  $C^{14}$ ) by professor & post doctoral candidates.  
 Mr E.S. Lenhoff local HP & handles distribution of  
 stock solution, instruction & observation of lab users.  
 Except for C214 sign posted on hood no longer used in  
 radioisotope work, posting and labeling properly  
 done. Waste containers & hot sinks had records  
 showing amounts of waste discarded to each. Several  
 users exhibited knowledge of AEC & Harvard regs  
 & good handling procedures when queried by the  
 inspector.

Three labs in Chem visited. Local HP Mr  
 Chemistry Tech. Smart. Well run program with continual check by  
 Mr Smart who also handled all solid waste disposal  
 and maintenance of local survey & disposal records.

Four labs in Biochem Dept at Med School  
 and the waste storage area in basement of Bldg  
 O-1. Principal use here  $P^{32}$ ,  $C^{14}$ ,  $H^3$  in  $\mu$ Ci  
 quantities. Handling techniques here <sup>included</sup> use  
 of remote device, stainless steel trays, and absorp

paper. Storage areas noted posted and secured against unauthorized entry.

Animal Primate Center at Southboro - max. amt. of 2 mlb  $H^3$  used - two 100% L doses of  $H^3$  to each animal. Dr Hunt with user stated all wastes, including animal carcasses collected & turned over to Johnson for disposal.

Burial Site No 2 at Southboro - noted to be in remote area - fenced in with ~~an~~ ORN warning signs posted in fence. Trench recently dug for next burial noted to be at least 6' deep & acc to Johnson & King always keep 4-6' of earth cover over burial pits. Inspector noted soil such that no water problems & good drainage to wooded area on Harvard property.

#### Miscellaneous

35. Supply of instruments kept by EHS & inspector noted presence of monitoring & counting instruments available in each Dept for use by personnel. Johnson stated all instruments are now on a scheduled maintenance & calibration program conducted by H's Office.

36. AEC Form 3 and Harvard "Regs for Use of Radionuclides" and Emergency Instructions (back of Regs) noted posted in every Dept and remains labs visited.

37. No instances of personnel exposures to rad levels or concentrations of ~~of~~ material areas to approach anywhere near 10 CFR 20 levels or limits.



38. Informed Shapiro and Johnson acceptable program. Licensing inspection & enforcement programs appear to be working effectively. The only possible weakness pointed out was not requiring users of generally licensed quantities of radioactivity to be ~~at~~ as stringent as other users under the terms of the broad license. Johnson stated he had not problems with ~~the~~ the present cm that system but would consider possibility of having all users under authorization system. Clear has not given to Johnson.

U.S. ATOMIC ENERGY COMMISSION  
REGULATORY OPERATIONS, REGION I  
Inspection Field Notes

Rev. 11/15/77

|  |  |   |  |  |                             |  |  |
|--|--|---|--|--|-----------------------------|--|--|
| A. Docket Number   |  | B. Report Number<br>7501  |  | C. Priority/ Category<br>F(1-A) - 2                          |                             | D. Inspection Dates<br>MAR 2, 1973           |  |
| E. Licensee<br>PRESIDENT AND FELLOWS OF<br>HARVARD COLLEGE |  |   |  | F. Facility<br>HARVARD UNIVERSITY<br>CAMBRIDGE, MASS         |                             | G. License No.<br>20-00297-53                |  |
| H. Type of Inspection<br>UNANNOUNCED<br>REINSPECTION       |  | I. No. and date of last Amend-<br>ment #25<br>MAY 21, 1971            |  | J. Dates of Last Inspection<br>NOV 6, 7, 1968                |                             |  |  |
| K. Principal Inspector<br>and Date of Report<br>W.D. ALLEN |  | L. Accompanying<br>Inspector<br>NONE                                  |  | M. Other Accompanying Personnel<br>NONE - STATE WAS NOTIFIED |                             |  |  |
| N. Proprietary Info.<br>NONE                               |  | O. Reviewer<br>R. W. HEDGECOCK  |  |  | P. Date of Review<br>3/7/73 |  |  |
| Q. Individuals Interviewed* and Titles                     |  |   |  |  |                             | R. Date of Interview                         |  |
| * a. MR. ROBERT J. JENSEN,<br>DIR. OF RAD SERVICES         |  |   |  |  |                             | c. JAN SORENSEN, PURCHASING<br>AGENT FOR BIA |  |
| * b. DR. WARREN WHITEL<br>DIRECTOR UNIVERSITY HEALTH SVCS  |  |   |  |  |                             | f. DR. EKSTRATIADES,<br>BIOLOGY RESEARCHER   |  |
| * c. DR. J. SHAPIRO, RSO                                   |  |   |  |  |                             | g. DR. STROMINGER, BIOLOGY<br>RESEARCHER     |  |
| d. E. LENIKOFF, BIOLOGY<br>ISOTOPE COORDINATOR             |  |   |  |  |                             | h. DEBBIE GERARD,<br>BIOLOGY TECHNICIAN      |  |
| S. Place of Interview<br>C's OFFICE                        |  |   |  |  |                             |  |  |
| T. Enforcement Action<br>NONE - CLEAR 591 ISSUED           |  |   |  | U. Previous Outstanding Items<br>NONE                        |                             |  |  |
| V. Unresolved Items<br>NONE                                |  |   |  | W. Previously Reported Unresolved Items<br>NONE              |                             |  |  |
| X. Recom. Reinspection<br>1 YR + 6 MONTHS<br>AUG 1974      |  | Y. Name & Tele. # of RSO<br>BOB JENSEN OR DR SHAPIRO<br>(17-495-2061) |  | Z. RMS Code Number<br>01100                                  |                             |  |  |

22. Scope of Inspection: (X) complete, ( ) partial, ( ) special

at HARVARD

\*Identify individuals who attended Management Interview by asterisks.

EDWARDS WERE INTERVIEWED FOR ORAL  
LOCATIONS

15

## DETAILS

### Scope of the Program

-Number of individuals occupationally exposed 600.

-Number of individuals subject to significant\* risk 50 - *Isolation* - *med school*

-Potential for external exposure

|             | Negligible | Slight | Moderate | High |
|-------------|------------|--------|----------|------|
| Whole body  |            | ✓      |          |      |
| Skin        |            |        | ✓        |      |
| Extremities |            |        | ✓        |      |

-Potential for internal exposure ( ) negligible ( ) slight (✓) moderate  
( ) high

IN BIOLOGY  
DEPT ONLY  
(P-32)  
ALL OTHERS  
NEGLECTABLE

-Effluents

|          | Negligible | Slight | Moderate | High |
|----------|------------|--------|----------|------|
| Airborne |            | ✓      |          |      |
| Liquids  |            | ✓      |          |      |

-Unusual aspects

### General

All records examined and all inquiries made by the inspector related to records and events made or experienced in the time interval from the date of the last inspection, or the date of license issuance in the case of initial inspections, until the date of this inspection, unless otherwise noted.

Unless otherwise specified, radiation level measurements, shown in these notes as having been made by the inspector, were made using a radiation survey meter type EDR-100 model 120, calibrated 1/73 by BNL.

The findings reported here were based on: (1) observations made by the inspector during his physical inspection of the licensee's facilities (2) a selective examination of procedures and representative records and documents, (3) Information furnished by Individuals Interviewed and (4) Measurements made by the inspector.

\*Reasonable probability of incurring 25% or more of MPC or MPE.

Items of Noncompliance and Safety Found in the Last Inspection

The licensee's action to correct and prevent recurrence of items of noncompliance and/or safety, found in the last inspection, were given particular attention during this inspection. Unless these items are shown under the section below, entitled "Findings Indicating Noncompliance or Conditions Prejudicial to Health and Safety", the inspector found that the licensee's corrective and preventive action was adequate.

Findings Indicating Compliance

Annex A identifies the specific procedures followed by the inspector in determining compliance with each relevant section of Title 10. The inspector also made such inquiries, examined such records and made such observations as were necessary for him to determine that the licensee had complied with the requirements of each license condition.

When a section of Annex A is notated "N/I", this means that compliance with this section was not determined during this inspection. During the next inspection this area will be covered.

When a section of Annex A is notated "N/A", this means that it is readily apparent that the section is not applicable to the licensee's program (e.g. the requirements of 10 CFR 20.103 or 106 are not applicable if the licensee possesses only sealed sources).

The paragraphs in Annex A that are initialed by the inspector indicate how the inspector determined compliance.

Status of Previously Reported Unresolved Items

NONE

Additional Information Relating to Incidents Reported Since Last Inspection

Attached as Annex B, or referenced on identified pages of these notes.

Findings Indicating Noncompliance or Conditions Prejudicial to Health and Safety

Attached as Annex C, or referenced on identified pages of these notes.

Principals

| Persons                         | Radionuclides  | Locations of Use              | Rate of Use  |
|---------------------------------|--|-------------------------------|--|
| Emergency (D) as<br>coordinator | H <sup>3</sup><br>P <sup>32</sup><br>S <sup>35</sup><br>I <sup>125</sup> , C <sup>14</sup> , G <sup>60</sup> | Bio. BDC<br>" "<br>" "<br>" " | ~ 12 G/yr<br>~ 15 G/yr<br>~ 1.5 G/yr<br>~ 100-200 mil/yr |
| Dr. Friedman                    | I <sup>131</sup>   | HMS, Tarkenton School         | 2-3 mil/yr   |
| Harvard Med. School<br>complex  | H <sup>3</sup> , I <sup>125</sup> , I <sup>131</sup><br>C <sup>14</sup> , G <sup>60</sup>                    | HMS                           | 100-200 mil/yr   |

### Equipment



Special Equipment:

( ) BZ samplers: ( ) adequate no., ( ) properly used, ( ) accessible  
(☒) fume hoods, ( ) glove boxes, ( ) hot cells-large, (☒) hot cells-small  
(☒) local exhaust ventilation, (☒) remote tongs, (☒) shields,  
(☒) protective handwear, (☒) protective footwear, (☒) protective clothing,  
(☒) absorbent paper, (☒) working trays, (☒) designated radioactive waste disposal sinks,  
( ) respirators, (☒) eye wash fountains, ( ) DOP filter testing equipment, (☒) disposable pipettes,  
(☒) disposable syringes, ( ) Other:

Management Interview

The inspector(s) met with A, B and C in B's office, on 2/27/73, at the conclusion of the inspection. The inspector(s) gave  
date

B a Form AEC-591 indicating (that no items of) noncompliance had been found during the inspection.

-----  
The inspector(s) met with \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ in \_\_\_\_\_'s office, on \_\_\_\_\_, at the conclusion of the inspection. The inspector(s) informed  
date

\_\_\_\_\_ that no items of noncompliance had been found during this inspection. He informed \_\_\_\_\_ that he would receive a letter enclosing a Form AEC-591 confirming these findings. (Inspector: No Form AEC-591 may be issued if there were Outstanding Items reviewed during this inspection except, if our acknowledgement letter, written following the issuance of an AEC Form 592, predated July 1, 1971.)

No form AEC-591 was issued because Outstanding Items had been reviewed during this inspection.

-----  
The inspector(s) met with \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ in \_\_\_\_\_'s office, on \_\_\_\_\_, at the conclusion of the inspection. The inspector(s) explained the purpose of the inspection. With respect to the item(s) of noncompliance, the inspector(s) explained the relevant requirements of the AEC regulations and described the inspection findings that indicated noncompliance with these requirements. \_\_\_\_\_ acknowledged the validity of the citation(s) and stated that prompt action would be taken to correct them. He also described procedures whereby he would assure that these and similar item(s) of noncompliance would not recur. He signed and dated the Form AEC-591.

-----  
The inspector(s) met with \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ in \_\_\_\_\_'s office, on \_\_\_\_\_, at the conclusion of the inspection. The inspector(s) ex-  
date

plained the purpose of the inspection. With respect to the items of non-compliance, the inspector(s) explained the relevant requirements of the AEC regulations and/or the conditions of the license and described the inspection findings that indicated noncompliance with these requirements.

\_\_\_\_\_ acknowledged the validity of the citations and stated that prompt action would be taken to correct them. He also described procedures whereby he would assure that these and similar items of noncompliance would not recur.

- - - - -

Other:

ANNEX A

1.0 10 CFR 20

1.1 20.101, "EXPOSURE OF INDIVIDUAL TO RADIATION IN RESTRICTED AREAS"

1.1.1 By examination of records of (✓) receipts, (✓) inventories, (✓) surveys, ( ) personnel dosimetry, (✓) bioassay, and (✓) disposal transfers, and/or (✓) by questioning the RSO and/or (✓) these users A C, (✓) and by my physical inspection of the restricted areas, I IDENTIFIED those INDIVIDUALS WHOSE external EXPOSURES MIGHT reasonably be expected to EXCEED 25% OF THE LIMITS of 20.101(a). WTR

1.1.1.1 I asked the RSO and/or the principal users HOW the EXPOSURES to these individuals had been EVALUATED and what magnitudes of exposure had been found. WTR

1.1.2 I found that the licensee's METHODS of evaluating exposures was in each case APPROPRIATE to the type and energy of the radiation and the area of the individuals body that was at risk. WTR

1.1.3 I found that the licensee's evaluations of exposures showed that NO INDIVIDUAL had been EXPOSED IN EXCESS of the limits of 20.101. WTR

1.1.4 A stated that the licensee did not avail himself of the provisions of 10 CFR 20.101(b) and therefore NO FORMS AEC-4 WERE MAINTAINED. WTR

1.1.5 ( ) I observed a CORRECTLY COMPLETED FORM AEC-4 for each individual whose quarterly whole body exposure exceeded 1.25 rems; or

( ) I identified approximately      % of the individuals whose quarterly whole body exposure had exceeded 1.25 rems and examined each individual's Form AEC-4 and found each to be correctly completed.

1.2 20.103, "EXPOSURE OF INDIVIDUALS TO CONCENTRATIONS OF RADIOACTIVE MATERIAL IN RESTRICTED AREAS"

1.2.1 By examination of records of (✓) receipts, (✓) inventories, (✓) surveys, ( ) personnel dosimetry, ( ) effluent monitoring, and (✓) disposals/transfers, by questioning the RSO and these users P F G, and by my physical inspection of the restricted areas, I IDENTIFIED those INDIVIDUALS WHOSE internal EXPOSURES MIGHT reasonably be expected to EXCEED 25% OF THE LIMITS of 20.103. WTR

1.2.1.1 I asked the RSO and/or the principal users HOW the EXPOSURES to these individuals had been EVALUATED and what magnitude of exposure had been found. WTR

1.2.2 I found that the licensee's METHODS of evaluating compliance with 20.103 was APPROPRIATE to the circumstances of exposure in each case. *WDR*

1.2.3 I found that the licensee's evaluations of exposures showed that in NO instance had an INDIVIDUAL been EXPOSED IN EXCESS of the limits of 20.103. *WDR*

### 1.3 20.104, "EXPOSURE OF MINORS"

1.3.1 I determined by questioning (✓) the RSO, and/or (✓) A, and/or (✓) examining Forms AEC-5 or their equivalents and/or (✓) observing individuals in the restricted areas that NO INDIVIDUALS under 18 years of age had been EXPOSED in the restricted areas, or *WDR*

1.3.2 In the manner indicated above, I IDENTIFIED those INDIVIDUALS under 18 years of age who had been exposed in the restricted areas by questioning ( ) the RSO, ( ) the minors, ( ) the minor's supervisors. I determined the circumstances of exposure and the licensee's method of evaluating the minor's exposures. I determined that the METHOD OF EVALUATION had been ADEQUATE. I found that the evaluations showed that the exposures had NOT EXCEEDED 10% of the limits of 10 CFR 20.101(a).

### 1.4 20.105, "PERMISSIBLE LEVELS OF RADIATION IN UNRESTRICTED AREAS"

1.4.1 By questioning the RSO and/or the principal users, and (✓) by examining records of (✓) receipts, (✓) inventories, (✓) disposals/transfers, and (✓) surveys, and by a physical inspection of the restricted areas, I DETERMINED the TIMES AND CIRCUMSTANCES under WHICH the licensee's use and/or storage of materials would have resulted in the generation of exposure levels in the unrestricted area of a magnitude of WARRANTED CALCULATION OR MEASUREMENT to assure compliance with 20.105. *WDR*

1.4.2 I questioned the RSO and/or the involved principal users to determine if these calculations or MEASUREMENTS had been MADE; HOW they had been MADE; and what CONCLUSIONS had been DRAWN. I found that adequate surveys had been made indicating that the levels of radiation in the unrestricted area had not exceeded the limits of 20.105. *WDR*

1.4.3 I MEASURED THE EXPOSURE RATES IN THE UNRESTRICTED AREAS and found that at the time of inspection none exceeded the allowed levels. *WDR*



1.4.4 Following the procedures described in paragraph 1.4.1 above, I determined that there had been NO circumstances under which there was any REASONABLE PROBABILITY OF the levels HAVING EXCEEDED the limits of 20.105.

1.5 20.106, "CONCENTRATION IN EFFLUENTS TO UNRESTRICTED AREAS"

1.5.1 By questioning the RSO and these principal users C F D, by examination of records of (✓) receipts, (✓) inventories, (✓) effluent monitoring, and (✓) surveys, (✓) and by observations made during my physical inspection of the restricted areas, I IDENTIFIED those OPERATIONS WHERE there was a REASONABLE PROBABILITY of generation OF CONCENTRATIONS of radioactive material in effluents to the unrestricted area. *WJH*

1.5.2 I asked the RSO or the principal user to describe the evaluation that had been made to ASSURE that the CONCENTRATION of radioactive material in these effluents DID NOT EXCEED THE LIMITS of 20.106. *WJH*

1.5.3 I determined that the licensee's (✓) calculations, ( ) location of samplers, ( ) collection methods, and (✓) assay methods were SUITABLE for EVALUATION of the concentrations of the types of radioactive material that were discharged (i.e. considering its identity, physical and chemical form, particle size, the presence of dust loading or moisture . . . etc). I noted that the licensee's evaluations showed compliance with 20.106. *WJH*

1.5.4 Having assured myself, from the findings of previous AEC inspectors, that the licensee's procedures for calculating, sampling and assaying the samples were in accord with accepted practices I ONLY EXAMINED the RECORDS of his measured concentrations. I found that these showed him to be in compliance with 20.106.

1.5.5 Following the procedures described in paragraph 1.5.1 above, I determined that quantities and forms of the material, and the circumstances under which it was handled were such that THERE WAS NO SIGNIFICANT PROBABILITY OF VIOLATION OF THE SECTION.

1.6 20.201, "SURVEYS"

1.6.1 In the course of determining the licensee's status of compliance with all sections of Part 20, I found that ADEQUATE SURVEYS had been CONDUCTED *WJH*



## 1.7 20.202, "PERSONNEL MONITORING"

1.7.1 As stated in paragraph 1.1.1 above, I identified those individuals whose external exposure might reasonably be expected to exceed 25% of the 20.101(a) limits. I ascertained that a FORM AEC-5 or its equivalent was maintained FOR EACH of these INDIVIDUALS. *WDA*

1.7.1.1 I concurred in the licensee's evaluation that personnel monitoring was not required for any individual using material under this license.

1.7.1.2 A stated that each of these individuals had been INSTRUCTED TO WEAR his personnel DOSIMETER while he was in the restricted areas. *WDA*

1.7.1.3 I noted that the licensee's written OPERATING PROCEDURES directed occupants of the restricted areas to wear their personnel dosimeters. *WDA*

1.7.1.4 During my inspection of the restricted areas I OBSERVED that all individuals who I encountered, and who were required to wear PERSONNEL DOSIMETERS, were wearing them. *WDA*

1.7.2 \_\_\_\_\_ identified those individuals under 18 YEARS OF AGE who entered the restricted areas. He DESCRIBED the PROCEDURES followed by each of these individuals and the duration of times spent in the restricted areas. I noted that for each individual whose exposures could reasonably be expected to EXCEED 5% of the LIMITS of 20.101(a) there was on file a Form AEC-5 or its equivalent.

1.7.3 A stated that NO individuals UNDER 18 YEARS OF AGE entered the restricted areas. *WDA*

1.7.4 By questioning the following individuals \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ who were responsible for controlling access to High Radiation Areas or who entered these areas, I determined that all INDIVIDUALS WHO ENTERED the HIGH RADIATION AREAS were PROVIDED with PERSONNEL MONITORING equipment.

1.7.5 A stated, and my findings verified the fact, that there were NO HIGH RADIATION AREAS under the licensee's control. *WDA*

1.8 20.203, "CAUTION SIGNS, LABELS, SIGNALS, AND CONTROLS"

- 1.8.1 In my physical inspection of the operational areas I observed that EACH ROOM OR AREA I visited was POSTED with the appropriate sign reading (✓) CRM, (✓) CRA, ( ) CHRA, or ( ) CARA, as applicable, and showing the radiation caution symbol. *WDR*
- 1.8.2 In my physical inspection of the operational area I observed that EACH CONTAINER that required a label was in fact LABELED CRM, showing the radiation caution symbol, the identity of its contents and sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures. *WDR*

1.9 20.206, "INSTRUCTION OF PERSONNEL; POSTING OF NOTICES TO EMPLOYEES"

- 1.9.1 A stated that all INDIVIDUALS working in or frequenting the restricted areas were ORALLY INSTRUCTED to a degree commensurate with the radiation hazards encountered. *WDR*
- 1.9.2 I examined the licensee's OPERATING PROCEDURES and found that they PROVIDED individuals working in or frequenting the restricted areas with INSTRUCTIONS for the safe handling of material that were commensurate with the radiation hazards encountered. *WDR*
- 1.9.3 I observed that the licensee had POSTED a current COPY of 10 CFR 20 a copy of the LICENSE and a copy of OPERATING PROCEDURES applicable to work under the license in a sufficient number of places to permit occupants of the restricted areas to observe them on the way to or from their place of employment.
- 1.9.3.1 A stated that these DOCUMENTS were AVAILABLE for employee's examination upon request. I saw these documents. *WDR*
- 1.9.4 I observed that FORMS AEC-3 were conspicuously POSTED in a sufficient number of places to permit employees working in or frequenting any portion of the restricted areas to observe a copy on the way to or from their place of employment. *WDR*

1.10 20.207, "STORAGE OF LICENSED MATERIALS"

- 1.10.1 In my inspection of the licensee's facilities, I observed that NO MATERIAL was STORED IN an UNRESTRICTED AREA. *WDR*
- 1.10.1.1        stated that all areas in which MATERIAL was stored were SECURED WHEN UNATTENDED by individuals who had been instructed in the safe use of the material.

1.10.2 I ASCERTAINED by physical inspection that all MATERIAL stored in unrestricted areas was SECURED against unauthorized removal from the place of storage.

1.11 20.301, "WASTE DISPOSAL - GENERAL REQUIREMENTS"

1.11.1 By questioning the RSO and these principal users D F, by examination of records of (✓) receipts, (✓) surveys, (✓) effluent monitoring, (✓) inventories, (✓) disposal/transfer, and u m by my physical inspection of the licensee facilities, I IDENTIFIED the PROCEDURES used by the licensee to dispose of waste material.

1.11.1.1 I determined that no material had been disposed of as waste.

1.11.2 I determined that these procedures INVOLVED either one or a combination of the FOLLOWING METHODS: (✓) Transfer to an authorized recipient, (✓) In accordance with a license condition, (✓) Release into sanitary sewage system, (✓) Burial in soil, or (✓) As allowed by 20.106.

1.12 20.303, "DISPOSAL BY RELEASE INTO SANITARY SEWAGE SYSTEMS"

1.12.1        stated that no licensed material had been released into the sanitary sewage system.

✓ 1.12.2 In the manner indicated in Paragraph 1.11.1, I IDENTIFIED those OPERATIONS from which waste was discharged to the sanitary sewage system. WDA

✓ 1.12.3 By questioning the RSO and these principal users A D, regarding the details of the procedures being followed, I determined that the effluent was READILY SOLUBLE or DISPOSABLE in water. WDA

✓ 1.12.4 By questioning the RSO and these principal users A, and by my examination of records of (✓) receipts, (✓) disposals/transfers, (✓) survey of sewage release rates, (✓) calculations of concentrations of material per unit volume of sewage, or ( ) measurements of concentration of material per unit volume of sewage, I determined that: WDA

1. The QUANTITY of radioactive material RELEASED in any one DAY did not exceed the larger of the following limits: (a) Appendix B, Table I, Col. 2 concentrations averaged over any one day or (b) Ten times the quantity of such material specified in Appendix C. WDA

2. The MONTHLY average did not exceed Appendix B, Table I, Col. 2 CONCENTRATIONS. *WTR*

3. The GROSS quantity of radioactive MATERIAL did not exceed 1 curie/ year. *WTR*

1.13 20.304, "DISPOSAL BY BURIAL IN SOIL"

1.13.1 By questioning the RSO and these principal users A and by examination of records of burials I DETERMINED that the LICENSEE had MET the requirements of this section. *WTR*

1.13.2        stated that no licensed material was disposed of by burial in soil.

1.13 20.305, "TREATMENT OR DISPOSAL BY INCINERATION"

1.13.1 Having noted that incineration was AUTHORIZED BY THE LICENSE, I questioned the RSO and these principal users who utilized this method of disposal, I EXAMINED the RECORDS, which showed the identity of the material, its quantity, and the date of incineration. I also determined that the QUANTITY LIMITATIONS (if any) given in the license had NOT been EXCEEDED. I determined that the licensee had made valid surveys to ensure that the EFFLUENT AND ASH limits given in the license had not been exceeded. I did this by examining his sample collection techniques and his assay procedures. *WTR*

1.13.2 By examination of waste disposal records, by questioning the principal users and the RSO, and by physical inspection of the licensee's facilities, I determined that he had NOT UTILIZED INCINERATION as a means of treatment or disposal of material.

1.14 20.401 "RECORDS OF SURVEYS, RADIATION MONITORING, AND DISPOSAL"

1.14.1 I examined ( ) all, (✓) approximately 30 % of, the RECORDS OF RADIATION EXPOSURE of all individuals for whom monitoring was required under 20.202. I found that these records were maintained on FORMS AEC-5 or on clear and legible forms containing all the information required by Form AEC-5. I found they were kept in accordance with the INSTRUCTIONS contained ON THE REVERSE SIDE of Form AEC-5. *WTR*

1.14.2 As indicated in paragraph 1.7.1.1 of these notes no individuals were required to wear personnel monitoring equipment.

1.14.3 I examined ( ) all records; (✓) a representative number of records, of surveys conducted in accordance with (✓) 20.201(b), disposals made under (✓) 20.302 (As allowed by License Amendment), (✓) 20.303 (Release to Sanitary Sewers) and (✓) 20.304 (Burial in Soil) and found that the records contained the essential elements for adequate evaluation of compliance. *WTR*

1.15 20.402, "REPORTS OF THEFT OR LOSS OF LICENSED MATERIAL"

1.15.1 A STATED that there had been NO LOSS OR THEFT of licensed material in such quantities and under such circumstances that a substantial hazard might result to persons in unrestricted areas. *WTR*

1.15.1.1 I VERIFIED this fact by comparison of records of (✓) receipts, (✓) inventories, and (✓) disposal/transfer, taking into consideration the decay rates of the various radionuclides. *WTR*

1.16 20.403, "NOTIFICATION OF INCIDENTS"

1.16.1 In the course of my inspection of all sections of Part 20 I found that there had been NO CIRCUMSTANCES that WARRANTED the submission of NOTIFICATION under 20.403. *WTR*

1.16.2 In the course of my inspection of all sections of Part 20 I found that in each instance where NOTIFICATION had been required such notification HAD BEEN MADE in accordance with the specifications of this section.

1.17 20.404, "REPORT TO FORMER EMPLOYEES OF EXPOSURE TO RADIATION"

1.17.1 A stated that NO FORMER EMPLOYEE HAD REQUESTED A REPORT of his exposure. *WTR*

1.17.2 \_\_\_\_\_ stated that one or more FORMER EMPLOYEES HAD REQUESTED REPORTS of their exposures. \_\_\_\_\_ showed me copies of the licensee's response to these requests. I examined the copies and noted that they furnished all the information required by this section.

1.18 20.405, "REPORTS OF OVEREXPOSURES AND EXCESSIVE LEVELS AND CONCENTRATIONS"

1.18.1 In the course of my inspection of all sections of Part 20, I found that there had been NO CIRCUMSTANCES that WARRANTED the SUBMISSION of reports under 20.405. *WTR*



1.18.2 In the course of my inspection of all sections of Part 20, I found that in each instance where a 20.405 REPORT had been required the report HAD BEEN SUBMITTED in accordance with the specifications of the section.

1.19 20.406, "NOTICE TO EMPLOYEES OF EXPOSURE TO RADIATION"

1.19.1 A stated that NO EMPLOYEE had REQUESTED an annual REPORT of his exposure. *WZ*

1.19.2        stated that each employee who had requested an annual REPORT of his exposure HAD BEEN FURNISHED with such report.

1.20 20.407, "PERSONNEL EXPOSURE AND MONITORING REPORTS"

1.20.1 By comparing the licensee's program with the specifications of this section I determined that the provisions of THIS SECTION DID NOT APPLY to the licensee. *WZ*

1.20.2 I compared the licensee's copies of REPORTS with the specifications of this section and determined that they MET THE REQUIREMENTS.

1.21 20.408, "REPORTS OF PERSONNEL EXPOSURE ON TERMINATION OF EMPLOYMENT OR WORK"

1.21.1 As indicated above, I determined that the requirements of 20.407, and hence 20.408, were NOT APPLICABLE to this licensee. *WZ*

1.21.2 By questioning        and by examining all records that gave evidence of the presence or absence of individuals who were using licensed materials (e.g. Forms AEC-5, B.Z sampling, bioassay isotope committee authorizations, etc.) I IDENTIFIED those INDIVIDUALS who had TERMINATED employment or work. I examined the licensee's copies of reports of their exposures which he had submitted to the individuals and to the AEC. I found that they had been completed in accordance with the requirements of this section.

2.1 30.3, 40.3 and 70.3 "ACTIVITIES REQUIRING LICENSE"

2.1.1 By questioning (✓) the RSO and/or (✓) the following individuals, C D, and/or (✓) by examination of records of (✓) receipts and (✓) transfer/disposal, I determined that the licensee had neither manufactured, produced, transferred, received, acquired, owned, possessed, used imported or exported licensed material except as authorized in a specific or general license issued pursuant to the regulations of Title 10. *WZ*

1.14.3 I examined ( ) all records; (✓) a representative number of records, of surveys conducted in accordance with (✓) 20.201(b), disposals made under (✓) 20.302 (As allowed by License Amendment), (✓) 20.303 (Release to Sanitary Sewers) and (✓) 20.304 (Burial in Soil) and found that the records contained the essential elements for adequate evaluation of compliance. *WTR*

1.15 20.402, "REPORTS OF THEFT OR LOSS OF LICENSED MATERIAL"

1.15.1 A STATED that there had been NO LOSS OR THEFT of licensed material in such quantities and under such circumstances that a substantial hazard might result to persons in unrestricted areas. *WTR*

1.15.1.1 I VERIFIED this fact by comparison of records of (✓) receipts, (✓) inventories, and (✓) disposal/transfer, taking into consideration the decay rates of the various radionuclides. *WTR*

1.16 20.403, "NOTIFICATION OF INCIDENTS"

1.16.1 In the course of my inspection of all sections of Part 20 I found that there had been NO CIRCUMSTANCES that WARRANTED the submission of NOTIFICATION under 20.403. *WTR*

1.16.2 In the course of my inspection of all sections of Part 20 I found that in each instance where NOTIFICATION had been required such notification HAD BEEN MADE in accordance with the specifications of this section.

1.17 20.404, "REPORT TO FORMER EMPLOYEES OF EXPOSURE TO RADIATION"

1.17.1 A stated that NO FORMER EMPLOYEE HAD REQUESTED A REPORT of his exposure. *WTR*

1.17.2 \_\_\_\_\_ stated that one or more FORMER EMPLOYEES HAD REQUESTED REPORTS of their exposures. \_\_\_\_\_ showed me copies of the licensee's response to these requests. I examined the copies and noted that they furnished all the information required by this section.

1.18 20.405, "REPORTS OF OVEREXPOSURES AND EXCESSIVE LEVELS AND CONCENTRATIONS"

1.18.1 In the course of my inspection of all sections of Part 20, I found that there had been NO CIRCUMSTANCES that WARRANTED the SUBMISSION of reports under 20.405. *WTR*

Miss Kate Galt (3)

### Solid waste

2 shipments/month to Interco Corp  
Licensee has surveys and places appropriate  
DOT label - Each shipment summarized  
as to amounts, isotope, # of bbls on a report  
for record.

Instrument - calibrated weekly by RSC -  
group - during survey of lots, these  
instruments are checked

### Burial -

RSC maintains a running inventory  
of amount in ground corrected for decay  
- as of 11/1/73 - ~22 mcs remained in ground  
4 Burials during 72 - total of 76 mcs (including decay)

Sealed Sources - Has ~70 sealed sources  
last <sup>test</sup> tested on 9/1/72 - Routinely done  
in Sept and Mar.

Gas Effluent - Had flow rates all checked and  
calculations of max amt to be lost relative  
compliance with 22.1:69

1.18.2 In the course of my inspection of all sections of Part 20, I found that in each instance where a 20.405 REPORT had been required the report HAD BEEN SUBMITTED in accordance with the specifications of the section.

1.19 20.406, "NOTICE TO EMPLOYEES OF EXPOSURE TO RADIATION"

1.19.1 A stated that NO EMPLOYEE had REQUESTED an annual REPORT of his exposure. UD

1.19.2            stated that each employee who had requested an annual REPORT of his exposure HAD BEEN FURNISHED with such report.

1.20 20.407, "PERSONNEL EXPOSURE AND MONITORING REPORTS"

1.20.1 By comparing the licensee's program with the specifications of this section I determined that the provisions of THIS SECTION DID NOT APPLY to the licensee. 77-

1.20.2 I compared the licensee's copies of REPORTS with the specifications of this section and determined that they MET THE REQUIREMENTS.

1.21 20.408, "REPORTS OF PERSONNEL EXPOSURE ON TERMINATION OF EMPLOYMENT OR WORK"

1.21.1 As indicated above, I determined that the requirements of 20.407, and hence 20.408, were NOT APPLICABLE to this licensee. UD

1.21.2 By questioning            and by examining all records that gave evidence of the presence or absence of individuals who were using licensed materials (e.g. Forms AEC-5, B.2 sampling, bioassay isotope committee authorizations, etc.) I IDENTIFIED those INDIVIDUALS who had TERMINATED employment or work. I examined the licensee's copies of reports of their exposures which he had submitted to the individuals and to the AEC. I found that they had been completed in accordance with the requirements of this section.

2.1 30.3, 40.3 and 70.3 "ACTIVITIES REQUIRING LICENSE"

2.1.1 By questioning (✓) the RSO and/or (✓) the following individuals, C D, and/or (✓) by examination of records of (✓) receipts and (✓) transfer/disposal, I determined that the licensee had neither manufactured, produced, transferred, received, acquired, owned, possessed, used imported or exported licensed material except as authorized in a specific or general license issued pursuant to the regulations of Title 10. UD

## Misc Notes (2)

These individuals to determine they'd  
for verification - These data indicate concerning

largest noted H<sup>3</sup> urine sample was 3 µl

Anything involving an air problem - A industrial  
business routine on a permit condition.

Film Badge - license processes - 600 badges  
(their own service) on a monthly basis - TLD  
finger rings are used for extremities from London

Most exposure minimal - highest exposures  
were P<sup>32</sup> skin doses to extremities - highest  $\frac{1}{4}$  - 2950<sup>m</sup>

RSU has 2 or 3 techs to perform monthly  
rod and coat surveys which he personally reviews

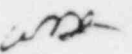
Sewage release rate study performed and  
each release documented - ~25 m<sup>3</sup> total down  
drain during 1972.

Incinerator runs (air) 40 hrs per week  
tight controls of records show that air  
effluent was < .5% of max allowed by <sup>for 72</sup> UK  
Ashes are periodically checked - a survey  
of ash release rate was used to determine  
ash produced per day. Any isotopes that are  
questionable concerning combustion is assumed  
to completely remain in ashes. - Very well contained



2.2 30.51, 40.61 and 70.51, "RECORDS"

2.2.1 I inspected the licensee's records of receipt, transfer, export and disposal and found them to be complete; indicating the identities of the materials and the dates of change of status.



### MISC NOTES

Committee meets 3 times / yr met last in Nov 72 and documented. A and C are members. All permits and permit requests are channeled thru A; members are notified and if any questions are resolved at meetings.

A formal training course is given 2/yr for all technicians and doctors who've had no formal Rad health training

Biology Dept is the major user of isotopes. The program in the dept is directly supervised by "D" who keeps in close touch with A. Program involves ~125 tech and users. Principal isotopes used during 1972 are:  $P^{32}$  - 22 C,  $H^3$  - 12 C,  $O^{15}$  - 97 mil,  $S^{35}$  - 152 C,  $C^{14}$  - 140 mil,  $I^{125}$  - 163 mil. A labeling of compounds, hormones, DNA, RNA, etc accomplished. A has thoroughly looked into and surveyed situations involving any volatile materials. Surveys indicate that no problem with present procedures - (Seal ports of line open to atmosphere and all work accomplished on hood.)

Becassary includes urine samples and thyroid scans for people using iodine - A did thyroid scans and with the water NaI crystal. A used monitor with  $I^{125}$  simulating sources ( $Ge^{68}$ ) to calibrate. - Some people did indicate some uptake e.g. MDRB/Garden - A set

Inspector Evaluation

TO : FILE  
TAKU. R. O. McChesnut  
SUBJECT : HARVARD UNIVERSITY  
LICENSE No: 20-00297-53  
FROM : W. D. ALLEN, RADIATION SPECIALIST

The broad Licensed program is extremely well run with impressive documentation of all activities.

The majority of activity at the Cambridge campus is concentrated in the Biology Department which maintains a coordinator to act as liaison between the RSO and the numerous investigators.

To reinspect the Cambridge campus during our next visit would be repetition to say the least. The next inspector should visit some of the Boston authorized locations namely: Harvard Medical School and School of Dental Medicine and/or Harvard School of Public Health with a phone call to the RSO to coordinate his arrival with appropriate records.

There were no apparent health and safety problems. Recommend reinspection in one year plus 6 months, Aug 1974

W D Allen  
Radiation Specialist