



**DEPARTMENT OF THE ARMY**  
NORTH ATLANTIC REGIONAL MEDICAL COMMAND  
AND  
WALTER REED ARMY MEDICAL CENTER  
6900 GEORGIA AVENUE NW  
WASHINGTON DC 20307-5000

REPLY TO  
ATTENTION OF

Health Physics (MCHL-HP)

7 May 2004

**MEMORADUM FOR RECORD**

**SUBJECT: WRAMC Building T-2 Radiological Historical Site Assessment (HSA)**

1. Building T-2 is a temporary steel building constructed in 1971. It is a two-story building with a basement. Upon a thorough review of available documents, we have determined what rooms in the building were used in handling or storing radioactive material (RAM). The documents available for review included the following:

- a. Principle User Authorizations back to 1981
- b. Approved radioactive material research protocols back to 1981
- c. Radioactive material inventories back to 1979
- d. Sealed source leak tests back to 1989
- e. As-built drawings and related floor plans back to 1970 (see Appendix A)
- f. Radiation Safety Committee (RSC) minutes back to 1970

2. The use of RAM in Building T-2 can be summarized as follows:

- a. Medical treatment using sealed sources in mCi quantities (e.g., radium brachytherapy seeds).
- b. Health physics support using sealed sources in  $\mu$ Ci quantities (e.g., calibration sources).
- c. Clinical and biomedical research using unsealed  $\mu$ Ci and mCi quantities. Of the various unsealed isotopes used in research, only the long-lived H-3 and C-14 appear to present any potential for residual contamination.

3. In this HSA, each principal investigator authorization issued under the WRAMC broad scope license was assessed for approved radionuclide research protocols, which identified specific rooms for research, and then further assessed for isotope quantities via RAM receipt and inventory records. This detailed information is useful for classifying rooms and assigning room-specific isotope-weighted Derived Concentration Guidance Levels (DCGLs) as discussed in NUREG 1575, Revision 1, August 2000. A detailed isotope history for each room identified for consideration in this HSA is provided in Appendix B.

4. A review of significant events reported in the RSC minutes and miscellaneous spills reports over the last 30+ years yielded room-specific information on past spills in other buildings. However, no spills were identified for rooms in Building T-2. Bulk supplies of unsealed RAM were purchased and stored in 5 –10 mCi vials. Although no spills were identified in archived records, such amounts would be indicative of maximal credible spills. In 1974, the WRAMC standard operating procedure (SOP) for weekly and monthly contamination surveys, conducted by the Health Physics Office, specified requirements for decontamination for any area found to

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exceed 100 dpm/100 cm<sup>2</sup>. By 1996, the SOP had been modified such that unrestricted areas required decontamination below 200 dpm/100 cm<sup>2</sup> and restricted areas required decontamination below 1000 dpm/100 cm<sup>2</sup>.

5. Sealed source leak test reports over the previous 15+ years do not indicate sealed sources having leaked in Building T-2. Mr. Dave Burton, a seventeen-year veteran of the WRAMC Health Physics Office, also does not recall any reports of sealed source leakage. Going back as far as 1963, WRAMC standard procedures for quarterly leak tests of sealed sources required source removal if leakage was in excess of 0.005  $\mu$ Ci. Sealed alpha sources less than 10  $\mu$ Ci and sealed beta-gamma sources less than 100  $\mu$ Ci did not require leak testing.

6. Impacted Rooms. Given known inventory amounts, known transfers of RAM out of Building T-2, and decay for RAM not thoroughly documented, only the isotopes Ra-226 in Room 15, and H-3 and C-14 in Rooms 159, 225, 227, 236, 237, 238, 240, and 241 have potential for persisting residual contamination. Given available documentation and long-standing health physics procedures at WRAMC, it is highly unlikely that an isotope-specific DCGL would be exceeded in any of the rooms. A review of documents does not indicate any record of Ra-226 sealed source leakage or of H-3 or C-14 spills in Building T-2. Although this could sufficiently justify the rooms as NUREG 1575 Class 3, there are some gaps in the document archives so the rooms should be conservatively classified as Class 2. Since the nature of the work confined the use of isotopes to floors and bench tops, upper walls and ceilings in all the rooms were non-impacted. Very good evidence of this is documented in the recent decommissioning of Building 40 where the same type of research was conducted on a much larger scale.

7. Non-Impacted Rooms. Except for the rooms listed in the paragraph above, all other rooms and areas within Building T-2 are classified as non-impacted. Most of the rooms and areas classified as non-impacted have no history of RAM usage or storage. Non-Impacted rooms with RAM history, yet with no potential for residual contamination, include Rooms 9, 11, 37 and 154. Rooms 9 and 11 were only used for thyroid bioassay counting under the Health Physics authorization. Only low-level I-129 and Ba-133 sealed sources used for calibration of the bioassay system were stored in these rooms. Room 37 stored a low-level Ra-226 sealed source that was further contained within a liquid scintillation counting system. Room 154 stored two Ni-63 sealed sources that were contained within gas chromatograph systems. The Ni-63 sources were leak tested quarterly with no evidence of leakage. Unsealed Co-57 and I-125 was also used in Room 154. However, these isotopes were transferred out of the room in 1992. Given the short half-lives of these two isotopes, residual contamination not discovered at the time of the health physics room close-out survey presents no chance of persisting today.

8. The undersigned, along with the assistance of Mr. Dave Burton, is responsible for the content of this HSA. The undersigned may be contacted at (202) 356-0058 or [john.mercier@us.army.mil](mailto:john.mercier@us.army.mil).



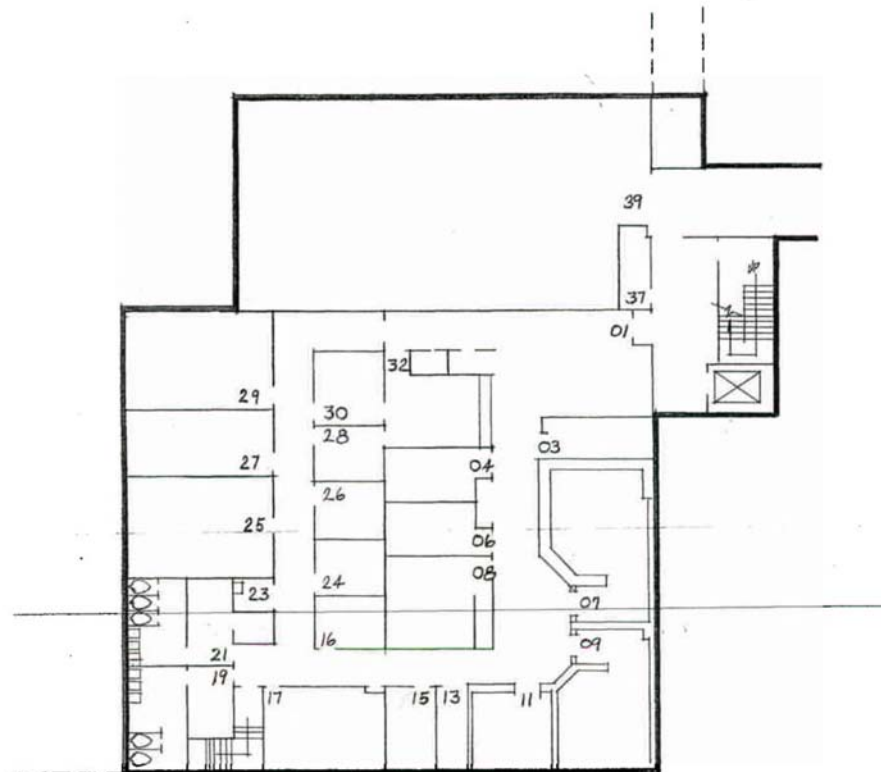
JOHN R. MERCIER, Ph.D.  
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## APPENDIX A

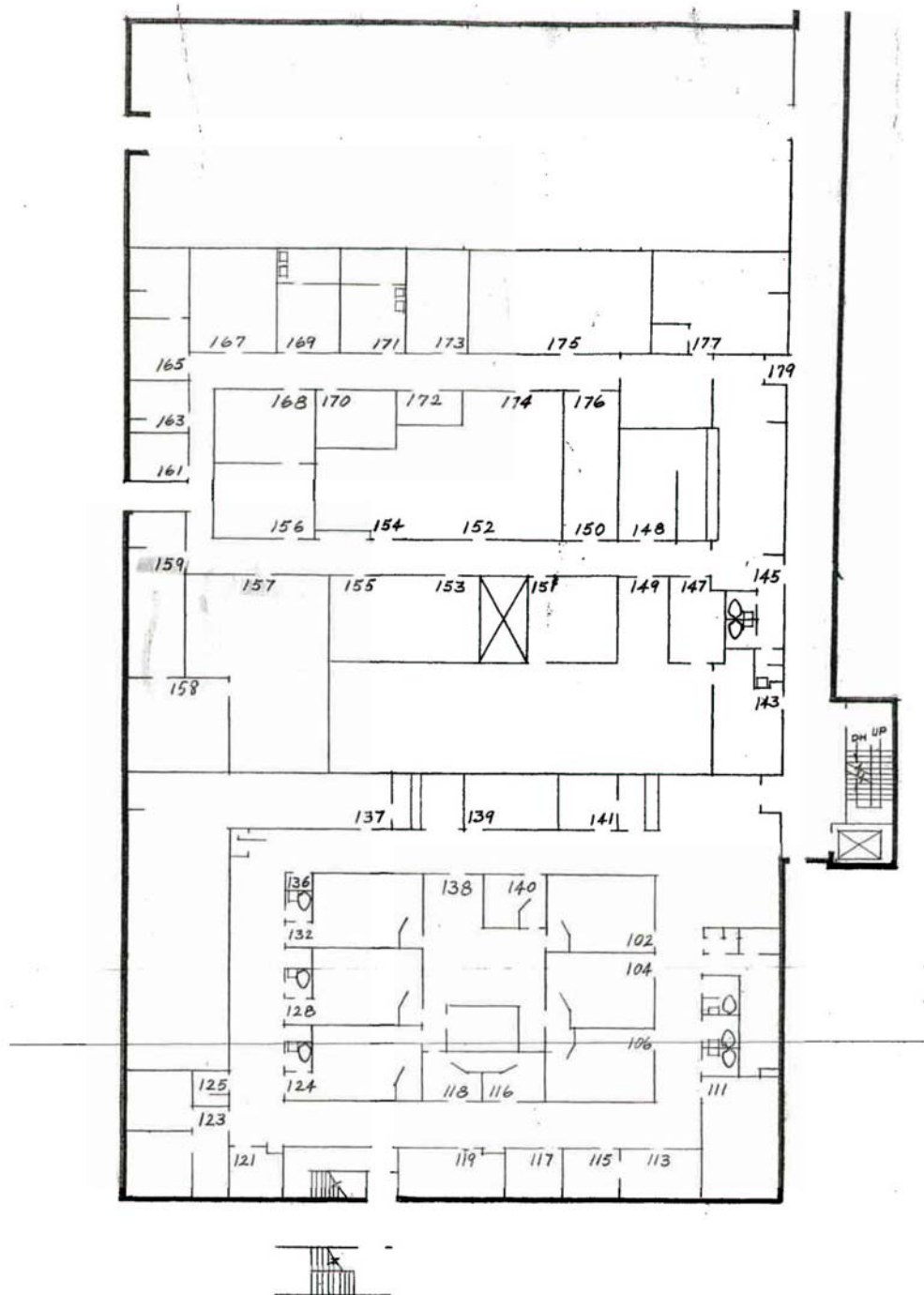
WRAMC Building T-2 Radiological Historical Site Assessment (HSA)

1971 Floor Plans



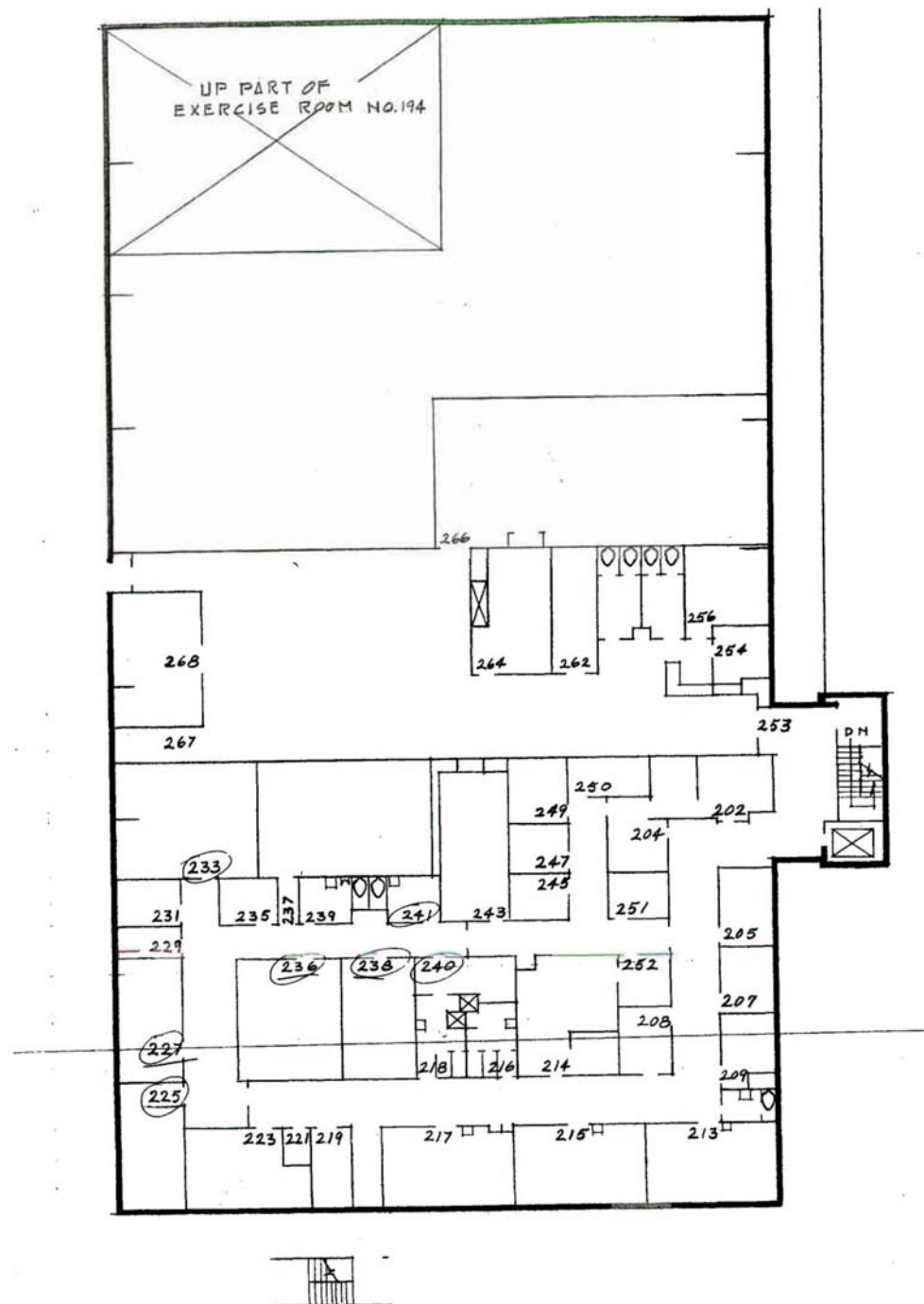
**T-2 BASEMENT PLAN (1971)**  
SCALE 1/16" = 1'-0"

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**T-2 FIRST FLOOR PLAN (1971)**  
SCALE 1/16" = 1'-0"

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**T-2 SECOND FLOOR PLAN (1971)**  
SCALE 1/16" = 1'-0"

APPENDIX B

WRAMC Building T-2 Radiological Historical Site Assessment (HSA)

Room-Specific Historical Data Sheets

Room # 9						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (sealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
221	I-129	N/A	Prior to Oct-1987	0.001	Nov-2002	I-129 sealed source used for calibrating thyroid bioassay system. Source transferred to Room 11 in Oct-1987 with thyroid bioassay system.
	Ba-133	N/A	Prior to Oct-1987	0.001	Nov-2002	Ba-133 sealed source used for calibrating thyroid bioassay system. Source transferred to Room 11 in Oct-1987 with thyroid bioassay system.
FSS design notes: Treat Room 9 as a non-impacted area.						



Room # 11						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (sealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
221	I-129	N/A	Oct-87 - Nov-02	0.001	Nov-2002	I-129 sealed source used for calibrating thyroid bioassay system. Source transferred to Bldg 516 in 1992 for disposal processing.
	Ba-133	N/A	Oct-87 - Nov-02	0.001	Nov-2002	Ba-133 sealed source used for calibrating thyroid bioassay system. Source transferred to Bldg 516 in 1992 for disposal processing.
FSS design notes: Treat Room 11 as a non-impacted area.						

Room # 15						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (sealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
N/A	Ra-226	N/A	sometime prior to 1976	unknown	sometime prior to 1976	As-Built drawings for Bldg T-2, dated 15 Dec 1970, designated Room 15 as the 'Radium Storage Room' within the radiotherapy department. Consistent with radiotherapy practices of the 1970's, Radium in multi-mCi amounts was used in sealed source form as brachytherapy seeds and these were stored in corner vault of the room. Leak test records have long since been discarded. The medical industry did experience leaks of radium needles and seeds in past decades. If such sources leaked at Building T-2, the events were not captured in Radiation Safety Committee minutes. If still on-hand, sources would have been transferred in 1975 when Building 2 was opened with a new radiotherapy department.
FSS design notes: Ra-226 (100%)						

Room # 37						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (sealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
221	Ra-226	N/A	N/A	< 0.01	Feb-1994	Ra-226 sealed metallic source contained within a liquid scintillation counting (LSC) system for internal quench correction/auto-calibration. Sometime prior to 1985 the LSC system was place in storage in Room 37. In Feb-94, the source was removed from the LSC system and returned to the vendor for disposal processing.
FSS design notes: Treat Room 37 as a non-impacted area.						

Room # 154						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (unsealed and sealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
660	I-125	1.5	Dec-86 - Nov-92	58.81	Nov-92	57.46 mCi of I-125 used prior to 28 Sep 92 and 1.35 mCi I-125 transferred to new Authorization 660 location in Building 2 in Nov-92 (ref. Authorization 660 inventory records dated 9/28/92 and 1/04/93). Any residual I-125, if present in 1992, would now be decayed away.
	Co-57	0.1	Dec-86 - Nov-92	1.453	Nov-92	1.397 mCi of Co-57 used prior to 28 Sep 92 and 0.0565 mCi Co-57 transferred to new Authorization 660 location in Building 2 in Nov-92 (ref. Authorization 660 inventory records dated 9/28/92 and 1/04/93). Any residual Co-57, if present in 1992, would now be decayed away.
	Ni-63	15	Dec-86 - Nov-92	30	Nov-92	Two 15mCi Ni-63 sealed sources within gas chromatograph equipment transferred to Authorization 660 new location in Building 2 in Nov-92.
FSS design notes: Treat Room 154 as a non-impacted area.						

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Room # 159 (also designated as 157A, 157B, and 158 at different times over the last 30 years) Room number changes for same location sorted out with 13 Mar 85 as-built drawing, undated fire alarm exiting floor plan, and interview with long-term employee as documented in 7 May 04 email.						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
642	H-3	0.2	Oct-80 - Nov-86	0.75	Nov-86	Purchased amounts used for FSS design.
	C-14	0.2	Oct-80 - Nov-86	0.55	Nov-86	Purchased amounts used for FSS design.
	Cr-51	2	Oct-80 - Nov-86	2	Nov-86	Cr-51 Decayed Away.
676	P-32	0.25	Jul-97 - Jan-01	13	Jan-01	P-32 Decayed Away.
FSS design notes: 0.75 mCi H-3 decayed 16.5 years gives 0.3 mCi H-3 (35%) and 0.55 mCi C-14 (65%)						

Room # 225						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
511-B	H-3	10	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	5	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	20	Jan78 - Feb-79		Feb-79	Decayed Away
	Zn-65	10	Jan78 - Feb-79		Feb-79	Decayed Away
	Se-75	5	Jan78 - Feb-79		Feb-79	Decayed Away
519	H-3	104	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	4	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	59	Jun78 - Feb-79		Feb-79	Decayed Away
	I-131	59	Jun78 - Feb-79		Feb-79	Decayed Away
	Co-57	2	Jun78 - Feb-79		Feb-79	Decayed Away
	P-32	2	Jun78 - Feb-79		Feb-79	Decayed Away
	S-35	5	Jun78 - Feb-79		Feb-79	Decayed Away
	Hg-203	10	Jun78 - Feb-79		Feb-79	Decayed Away
557	H-3	15	Jul78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	15	Jul78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	Ca-45	5	Jul78 - Feb-79		Feb-79	Decayed Away
	P-32	5	Jul78 - Feb-79		Feb-79	Decayed Away
	I-125	15	Jul78 - Feb-79		Feb-79	Decayed Away
	I-131	10	Jul78 - Feb-79		Feb-79	Decayed Away
FSS design notes: 129 mCi H-3 decayed 25 years gives 32 mCi H-3 (57%) and 24 mCi C-14 (43%)						

Room # 227						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
519	H-3	104	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	4	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	59	Jun78 - Feb-79		Feb-79	Decayed Away
	I-131	59	Jun78 - Feb-79		Feb-79	Decayed Away
	Co-57	2	Jun78 - Feb-79		Feb-79	Decayed Away
	P-32	2	Jun78 - Feb-79		Feb-79	Decayed Away
	S-35	5	Jun78 - Feb-79		Feb-79	Decayed Away
	Hg-203	10	Jun78 - Feb-79		Feb-79	Decayed Away

FSS design notes: 104 mCi H-3 decayed 25 years gives 25 mCi H-3 (86%) and 4 mCi C-14 (14%)

Room # 236						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
515-A	H-3	8	Dec-77 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	2.2	Dec-77 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	Cr-51	0.5	Dec-77 - Feb-79		Feb-79	Decayed Away
	I-125	10	Dec-77 - Feb-79		Feb-79	Decayed Away
	I-131	5	Dec-77 - Feb-79		Feb-79	Decayed Away
511-B	H-3	10	Jan-78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	5	Jan-78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	20	Jan-78 - Feb-79		Feb-79	Decayed Away
	Zn-65	10	Jan-78 - Feb-79		Feb-79	Decayed Away
	Se-75	5	Jan-78 - Feb-79		Feb-79	Decayed Away
557	H-3	15	Jul-78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	15	Jul-78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	Ca-45	5	Jul-78 - Feb-79		Feb-79	Decayed Away
	P-32	5	Jul-78 - Feb-79		Feb-79	Decayed Away
	I-125	15	Jul-78 - Feb-79		Feb-79	Decayed Away
	I-131	10	Jul-78 - Feb-79		Feb-79	Decayed Away
FSS design notes: 33 mCi H-3 decayed 25 years gives 8.1 mCi H-3 (27%) and 22.2 mCi C-14 (73%)						



Room # 237						
Authorization Number	Isotope	Protocol Max Use (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
511-B	H-3	10	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	5	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	20	Jan78 - Feb-79		Feb-79	Decayed Away
	Zn-65	10	Jan78 - Feb-79		Feb-79	Decayed Away
	Se-75	5	Jan78 - Feb-79		Feb-79	Decayed Away
676	H-3	0.15	Jul-97 - Jan-99	2.77	Jan-99	All remaining H-3 turned into HPO for disposal in Jan-99 (ref. Authorization 676 inventory records dated 1/19/99).
		0.15	Jul-02 - Jan-03	0.275	Oct-02	All H-3 used (ref. Authorization 676 inventory records dated 10/4/02).
	I-125	0.003	Jul-97 - Jan-99	0.001	Jan-99	All remaining I-125 turned into HPO for disposal in Jan-99 (ref. Authorization 676 inventory records dated 1/19/99).
		0.003	Jul-02 - Oct-03	0.0075	Oct-03	4.5 uCi of I-125 used (ref. Authorization 676 inventory records dated 10/4/02 and 4/2/03) and 3 uCi of I-125 transferred to new Authorization 676 location in Building 7 in Oct 03 (ref. Authorization 676 inventory records dated 10/4/03 and 1/28/04).
	Co-57	N/A	N/A	0	N/A	Authorized but never purchased.
	S-35		Jul-97 - Jan-99	0.02	Jul-97	Decayed Away
	P-32	0.25	Jul-97 - Jan-01	13	Jan-01	Decayed Away
FSS design notes: 10 mCi H-3 decayed 25 years gives 2.5 mCi H-3 (33%) and 5 mCi C-14 (67%)						

Room # 238						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
511-B	H-3	10	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	5	Jan78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	20	Jan78 - Feb-79		Feb-79	Decayed Away
	Zn-65	10	Jan78 - Feb-79		Feb-79	Decayed Away
	Se-75	5	Jan78 - Feb-79		Feb-79	Decayed Away
FSS design notes: 10 mCi H-3 decayed 25 years gives 2.5 mCi H-3 (33%) and 5 mCi C-14 (67%)						

Room # 240						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
519	H-3	104	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	4	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	59	Jun78 - Feb-79		Feb-79	Decayed Away
	I-131	59	Jun78 - Feb-79		Feb-79	Decayed Away
	Co-57	2	Jun78 - Feb-79		Feb-79	Decayed Away
	P-32	2	Jun78 - Feb-79		Feb-79	Decayed Away
	S-35	5	Jun78 - Feb-79		Feb-79	Decayed Away
	Hg-203	10	Jun78 - Feb-79		Feb-79	Decayed Away

FSS design notes: 104 mCi H-3 decayed 25 years gives 25 mCi H-3 (86%) and 4 mCi C-14 (14%)

Room # 241						
Authorization Number	Isotope	Max Poss. Limit (in mCi)	Inventory (unsealed sources)			Remarks
			Dates of Use	Amounts Purchased (mCi)	Most Recent Possession	
519	H-3	104	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	C-14	4	Jun78 - Feb-79		Feb-79	No protocol or specific inventory information found for authorization. Authorization amounts used for FSS design.
	I-125	59	Jun78 - Feb-79		Feb-79	Decayed Away
	I-131	59	Jun78 - Feb-79		Feb-79	Decayed Away
	Co-57	2	Jun78 - Feb-79		Feb-79	Decayed Away
	P-32	2	Jun78 - Feb-79		Feb-79	Decayed Away
	S-35	5	Jun78 - Feb-79		Feb-79	Decayed Away
	Hg-203	10	Jun78 - Feb-79		Feb-79	Decayed Away

FSS design notes: 104 mCi H-3 decayed 25 years gives 25 mCi H-3 (86%) and 4 mCi C-14 (14%)