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UNION CARBIDE CORPORATION
P.O. BOX 8361, SOUTH CHARLESTON, WV 25303

January 27, 1998

Mr. John D. Kinneman, Chief
Nuclear Material Safety Branch 2
Division of Nuclear Materials Safety
U. S. NRC Region I
475 Allendale Road
King of Prussia, PA 19406-1416

Re: Mail Control No. 125121
License No. 37-19533-01
Docket No. 030-17840

Dear Mr. Kinneman:

In response to your December 30, 1997, request for additional information, included below is Union Carbide Corporation's (UCC) response to this request pertaining to your review of the Decommissioning Plan and Site Characterization Report for the Bushy Run Research Center (BRRC) in Export, Pennsylvania, License No. 37-19533-01.

Additional information Item 1.

The first item refers to the selection of release criteria for tritium. The release criteria were proposed in our January 20, 1997 letter, stated in Section 1.2 of the Site Characterization Report and adopted in our Decommissioning Plan submitted on September 11, 1997. The proposed release criteria for tritium was 200,000 dpm/100 cm^2 total beta-gamma with a 1000 dpm/100 cm^2 removable limit. As these limits are higher than the current limits for beta-gamma emitters, a model has been requested demonstrating the risk of tritium at our site is small and that the limits selected are in accordance with the principle of ALARA.

UCC proposes a new total average surface release criteria of 20,000 dpm/100 cm^2 for tritium. The removable limit will remain at 1000 dpm/100 cm^2. A model of these limits is presented herein.

On January 8, 1998, Mr. Sean T. Norris spoke via telephone with Mr. Richard Gibson and Ms. Betsy Ullrich of NRC Region I concerning the acceptability of computer modeling software. In July of 1996

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the NRC and Sandia National Laboratories released an interim version of DandD in support of NUREG/CR-5512. The final version of the software is due for release early in 1998. However, the final release is not yet available. The use of the interim version to model and select release criteria at BRRC was verbally approved by both Mr. Gibson and Ms. Ullrich during separate phone calls.

The Bushy Run Research Center is a small complex of buildings designed for use as office and laboratory facilities. The size and number of rooms in each building and the design of the heating, cooling and ancillary systems in the buildings are industrial or commercial in nature. The surrounding area includes some residential use, however industrial and commercial uses predominate. While in operation, the facility was a commercial property and UCC has no reason believe that use will change. While the ultimate use of the facility can only be determined by the owner, Carnegie Mellon University, it is reasonable to assume that the facility will not be converted into residential use. Thus a building occupancy scenario has been adopted for use in this release criteria selection model.

For a building occupancy scenario the standard DandD model assumes the initial radionuclide activity is 100% removable with respect to a resuspension parameter. Thus a total surface contamination activity of 3000 dpm/100 cm^2 would be viewed by the model as all removable, when in reality, the removable portion of the total measured activity might be 50 dpm/100 cm^2. To allow for a more realistic modeling of a facility, several scenarios were considered. These include the use of the maximum, average and removable surface activities which could be expected following decontamination. The following scenarios were run to describe the most realistic model:

BRRC Tritium Release Criteria Model #1:

> This model is a building occupancy model for beta-gamma emitters from tritium. A total average surface contamination activity of 20,000 dpm/100 cm^2 was used as the initial radionuclide activity. No default parameters of the model were changed.

BRRC Tritium Release Criteria Model #2

> This model is a building occupancy model for beta-gamma emitters from tritium. A removable surface contamination activity of 1,000 dpm/100 cm^2 was used as the initial radionuclide activity. No default parameters of the model were changed.

BRRC Carbon-14 and Tritium Release Criteria Model #1

> This model is a building occupancy model for beta-gamma emitters from carbon-14 and tritium. A total average surface contamination of 5,000 dpm/100 cm^2 for C-14 and 20,000 dpm/100 cm^2 H-3 was used as the initial radionuclide activities. No default parameters of the model were changed.

BRRC Carbon-14 and Tritium Release Criteria Model #2

This model is a building occupancy model for beta-gamma emitters from carbon-14 and tritium. A removable surface contamination of 1,000 dpm/100 cm^2 for C-14 and H-3 was used as the initial radionuclide activities. No default parameters of the model were changed.

BRRC Carbon-14 and Tritium Release Criteria Model #3

This model is a building occupancy model for beta-gamma emitters from carbon-14 and tritium. A maximum total surface contamination (3 times average) of 15,000 dpm/100 cm^2 for C-14 and 60,000 dpm/100 cm^2 H-3 was used as the initial radionuclide activities. No default parameters of the model were changed.

A DandD models for these scenarios result in a TEDE expressed in mrem/yr. and an exposure pathway component of maximum annual dose.

Bushy Run Research Center, Export PA		NUREG-5512 DandD dose assessment models for BRRC release criteria selection				Radionuclide: H-3, C-14					
		DandD Model parameters						TEDE mrem/yr.			
Model #		Activity	Time on Bldg.	Occupancy period	Breathing rate	Resuspension factor	Ingestion Rate	External	Inhalation	Ingestion	Total
		dpm/100 cm^2	days/year	days	m^3/hour	m-1	m^3/hour				
H-3 #1	Total average surface activity	20,000	121.5	365.25	0.89	7.61E-05	1.88E-03	0.00E+000	1.11E-002	3.07E-001	3.19E-001
H-3 #2	Removable activity	1,000	121.5	365.25	0.89	7.61E-05	1.88E-03	0.00E+000	5.54E-004	1.54E-002	1.59E-002
C-14 H-3 #1	Total average surface activity	5,000 20,000	121.5	365.25	0.89	7.61E-05	1.88E-03	1.41E-004	1.04E-001	2.88E+000	2.99E+000
C-14 H-3 #2	Removable activity	1,000 1,000	121.5	365.25	0.89	7.61E-05	1.88E-03	2.81E-005	1.91E-002	5.31E-001	5.50E-001
C-14 H-3 #3	Maximum total surface activity	15,000 60,000	121.5	365.25	0.89	7.61E-05	1.88E-03	4.22E-004	3.12E-001	8.65E+000	8.96E+000

Report results of the DandD scenarios are included in Attachment 1. Decontamination methods implemented at BRRC have proven effective at reducing surface activities to below the proposed total average surface activity release criteria.

The three pathways of exposure are external, inhalation and ingestion. The external hazard is essentially zero. The inhalation hazard is very low as compared to the total TEDE. Ingestion represents the greatest potential hazard for exposure. The total average surface activity for the C-14 and H-3 model #1 results in a TEDE of 3 mrem/yr. within the first 1 year period. This is well below the 25 mrem/yr. public exposure limit for a decommissioned site released for unrestricted use.

The majority of the 3 mrem TEDE is from levels of C-14 allowed by Reg. Guide 1.86. The modeled release criteria of 20,000 dpm/100 cm^2 for tritium results in a TEDE of 0.3 mrem/yr. The contributing

component to the total dose from tritium is 10% of the combined C-14 and H-3 TEDE. Removal of tritium contaminant activities below the proposed limits of 20,000 dpm/100 cm^2 total average surface activity could cause workers to be required to demolish cabinets, floors and other facilities. These efforts require the additional exposure of workers to physical hazards and becomes more costly than removal of the radiological hazard would require.

Additional information Item 2.

The second item refers to the areas which UCC has requested the Agency release based on characterization data. This item also requests the support information for post decontamination survey results for exhaust hoods and cabinets in the Chemical Hygiene Building. These areas are designated in your letter as "exhaust hoods and cabinets located in Room Nos. 131, 137 and 146 of the Chemical Hygiene Building."

Based on the discussion and data presented in the Site Characterization Report and post survey data presented in the Decommissioning Plan and herein, the release of the following facilities and areas is requested:

- The Chemical Hygiene Building.
- The incinerator.
- The Waste Treatment Process Building.
- Gas Bottle and drum storage Area.
- All Grounds, Walkways and Driveways.

The maintenance/garage building will be surveyed for release and the data presented in the Decommissioning Report. Release of this building will be included in the request for release of the Radiation Laboratories Building.

The post decontamination survey data for exhaust hoods and cabinets located in Room Nos. 131, 137 and 146 of the Chemical Hygiene Building is discussed in the Decommissioning Plan and the Site Characterization Report. the post decontamination survey results are presented herein as a supplement to the Characterization Report and Decommissioning Plan.

Section 4.3.1 CHB Exhaust Hood Decontamination, in the Decommissioning Plan for BRRC discusses the decontamination and post survey results for the exhaust hoods in Rooms 131 and 146. The data was presented in table format in Table D4-1. These two hoods were surveyed during the characterization of the facility. The results of those surveys indicated the presence of carbon 14 and tritium above the proposed C14 release criteria. The units were cleaned as a pilot test to determine if proposed decontamination methods would be effective, and to remove contaminants so that the CHB could be released as soon as possible. The efforts were successful in achieving levels below the release criteria. For convenience of the reader, the characterization data and post decontamination survey data for these two exhaust hoods are included here as attachments. Attachment 2 contains the characterization data for Room 131. Attachment 3 contains the drawings illustrating post decon data

for the exhaust hood in Room 131. Attachment 4 contains the characterization data for Room 146. Attachment 5 contains the drawings illustrating post decon data for the exhaust hood in Room 146.

Section 3.2 Cabinet Survey Results, Site Characterization Report discusses the finding of contaminants in excess of the proposed release criteria within a cabinet under the exhaust hood in Room 146. The cabinet was decontaminated and post decon surveys performed. The results were then presented in the Table D4-1. The drawings showing results of these post decon surveys of the cabinet are included in Attachment 4 discussed above.

The cabinet in Room 137 of the CHB was removed as stated in the last sentence of the second paragraph of Section 3.2 Cabinet Survey Results, Site Characterization Report. The cabinet in Room 137 of the CHB was removed from the building and transferred to the Radiation Laboratories Building Room 110. This cabinet will be decontaminated or disposed of and the dispensation will be discussed in the final report for the BRRC Site Decommissioning.

We are proceeding with the decommissioning of this site. Decontamination efforts and post decon surveys in the RLB continue, using the release criteria presented herein. The selection of a lower release criteria for tritium has not impacted any of the facilities for which release has been requested. Post decontamination verification surveys for these facilities indicate all of the areas are below the lower release criteria described above. If you have any questions regarding this response to your deficiency letter, please contact me at 304-747-3763 or Sean Norris at 970-434-5611.

Sincerely,

Timothy A. King
Project Manager
Union Carbide Corporation

cc: Sean T. Norris, Norris Environmental
Mike Manski, Enercon Services, Inc.
Commonwealth of Pennsylvania

enc.: Attachment 1 DandD model reports.
Attachment 2 Characterization data CHB Room 131.
Attachment 3 Post decon data, exhaust hood, CHB Room 131.
Attachment 4 Characterization data CHB Room 146.
Attachment 5 Post decon data, exhaust hood & cabinet, CHB Room 146.

Attachment 1

DandD Model Reports

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Program : DandD Version 1.0

* * Interim Release 1.0. Not to be used to demonstrate Level 1 * *
compliance with decommissioning criteria.

Session : BRRC Tritium Release Criteria Model 1
Description :
Building Occupancy Model. Total beta-gamma limit of 20,000 dpm/100 cm2. (Model assumes 100% removable)

Executed : 01/14/98 at 15:51:56

NRC Report

Occupancy Input Section

Execution Options

History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

Initial Radionuclide Activities

Chain	dpm/100cm^2
3H	20000.00

Code-Generated Radionuclide Activities

Chain	dpm/100cm^2
3H	2.0000E+004

Variable Parameters

No parameters have been changed.

Occupancy Output Section

Maximum Annual TEDE

This scenario started 0.00 year(s) from now

and ran for 1.00 year(s).

The peak dose of 3.19E-001 TEDE (mrem) occurred 1.00 year(s) after license termination.

Pathway Component of Maximum Annual Dose

Pathway	TEDE (mrem)	Percentage
External	0.00E+000	0.00
Inhalation	1.11E-002	3.48
Ingestion	3.07E-001	96.52
Total	3.19E-001	100.00

Radionuclide Component of Maximum Annual Dose

Radionuclide	TEDE (mrem)	Percentage
3H	3.19E-001	100.00
Total	3.19E-001	100.00

Output From Program 'OCCU'

* * *Interim Release 1.0. Not to be used to demonstrate Level 1* * *
final compliance with decommissioning criteria.

Building Occupancy Scenario
Run Date: 01/14/1998
Run Time: 15:51:53

INPUT DATA:
Title: BRRC Tritium Release Criteria Model 1
Notes:
History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

PARAMETER DATA:
Time In Building : 1.2150E+02 d/y
Occupancy Period : 3.6525E+02 d
Breathing Rate : 8.9000E-01 m**3/h
Resuspension Factor : 7.6100E-05 /m
Secondary Ingestion Transfer Rate: 1.8800E-03 m**2/h

TIME DATA:
Start Time : 0.0000E+00 d
End Time : 3.6525E+02 d
DT Size : 3.6525E+02 d
Time Step Size : 3.6525E+02 d
Write results every : 1 calculation times

INITIAL ACTIVITIES:

Number of chains: 1

Chain Number	Chain Name	Initial Activity dpm/100 cm^2
1	3H	2.0000E+04

Chain No. 1: 3H

Nuclide	Chain Position	Half Life (d)	Initial Inventory dpm/100 cm^2	First Parent	Fractional Yield	Second Parent	Fractional Yield
Nuclides in chain : 1							
3H	1	4.5100E+03	2.0000E+04	0	.00000	0	.00000

TIMESTEP DATA:
Number of nuclides : 1
Number of time steps : 1
Number of print steps: 1

Timestep of maximum : 1
Day of maximum : .3652500000E+03
Year of maximum : .1000000000E+01

For Period 1: 0.0000000000E+00 days to 3.6525000000E+02 days
0.0000000000E+00 years to 1.0000000000E+00 years

Dose Components of Maximum TEDE

Nuclide	External Dose (mrem/y)	Inhalation Dose (mrem/y)	Ingestion Dose (mrem/y)	Total Dose (mrem/y)	Average Activity (dpm/100 cm^2)
Dose Components					
3H	0.00000E+00	1.10765E-02	3.07458E-01	3.18534E-01	1.94490E+04
Totals	0.00000E+00	1.10765E-02	3.07458E-01	3.18534E-01	

Component Maximums and Time of Occurrence

Type	Time Step	Maximum Value	Time of Occurrence (days)	(years)	
External	0	0.00000E+00	0.00000E+00	0.00000E+00	
Inhalation	1	1.10765E-02	0.00000E+00	0.00000E+00	
Ingestion	1	3.07458E-01	0.00000E+00	0.00000E+00	
TEDE	1	3.18534E-01	0.00000E+00	0.00000E+00	
3H	0	0.00000E+00	0.00000E+00	0.00000E+00	Maximum External
3H	1	1.10765E-02	0.00000E+00	0.00000E+00	Maximum Inhalation
3H	1	3.07458E-01	0.00000E+00	0.00000E+00	Maximum Ingestion
3H	1	3.18534E-01	0.00000E+00	0.00000E+00	Maximum Nuclide

Program : DandD Version 1.0

* * Interim Release 1.0. Not to be used to demonstrate Level 1 * * compliance with decommissioning criteria.

Session : BRRC Tritium Release Criteria Model 2
Description :
Building Occupancy Model. Total beta-gamma limit of 1000 dpm/100 cm2. (Model assumes 100% removable)

Executed : 01/14/98 at 16:01:35

NRC Report

Occupancy Input Section

Execution Options

History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

Initial Radionuclide Activities

Chain	dpm/100cm^2
3H	1000.00

Code-Generated Radionuclide Activities

Chain	dpm/100cm^2
3H	1.0000E+003

Variable Parameters

No parameters have been changed.

Occupancy Output Section

Maximum Annual TEDE

This scenario started 0.00 year(s) from now

and ran for 1)0 year(s).

The peak dose of 1.59E-002 TEDE (mrem) occurred 1.00 year(s) after license termination.

Pathway Component of Maximum Annual Dose

Pathway	TEDE (mrem)	Percentage
External	0.00E+000	0.00
Inhalation	5.54E-004	3.48
Ingestion	1.54E-002	96.52
Total	1.59E-002	100.00

Radionuclide Component of Maximum Annual Dose

Radionuclide	TEDE (mrem)	Percentage
3H	1.59E-002	100.00
Total	1.59E-002	100.00

Output From Program 'OCCU

* * *Interim Release 1.0. Not to be used to demonstrate Level 1* * *
final compliance with decommissioning criteria.

Building Occupancy Scenario
Run Date: 01/14/1998
Run Time: 16:01:31

INPUT DATA:
Title: BRRC Tritium Release Criteria Model 2
Notes:
History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

PARAMETER DATA:
Time In Building : 1.2150E+02 d/y
Occupancy Period : 3.6525E+02 d
Breathing Rate : 8.9000E-01 m**3/h
Resuspension Factor : 7.6100E-05 /m
Secondary Ingestion Transfer Rate: 1.8800E-03 m**2/h

TIME DATA:
Start Time : 0.0000E+00 d
End Time : 3.6525E+02 d
DT Size : 3.6525E+02 d
Time Step Size : 3.6525E+02 d
Write results every : 1 calculation times

INITIAL ACTIVITIES:

Number of chains: 1

Chain Number	Chain Name	Initial Activity dpm/ 100 cm^2
1	3H	1.0000E+03

Chain No. 1: 3H

Nuclide	Chain Position	Half Life (d)	Initial Inventory (dpm/ 100 cm^2)	First Parent	Fractional Yield	Second Parent	Fractional Yield
Nuclides in chain : 1							
3H	1	4.5100E+03	1.0000E+03	0	.00000	0	.00000

TIMESTEP DATA:
Number of nuclides : 1
Number of time steps : 1
Number of print steps: 1

Timestep of maximum : 1
Day of maximum : .3652500000E+03
Year of maximum : .1000000000E+01

For Period 1: 0.0000000000E+00 days to 3.6525000000E+02 days
0.0000000000E+00 years to 1.0000000000E+00 years

Dose Components of Maximum TEDE

Nuclide	External Dose (mrem/y)	Inhalation Dose (mrem/y)	Ingestion Dose (mrem/y)	Total Dose (mrem/y)	Average Activity (dpm/100 cm^2)
Dose Components					
3H	0.00000E+00	5.53824E-04	1.53729E-02	1.59267E-02	9.72450E-02
Totals	0.00000E+00	5.53824E-04	1.53729E-02	1.59267E-02	

Component Maximums and Time of Occurrence

Type	Time Step	Maximum Value	Time of Occurrence (days)	(years)	
External	0	0.00000E+00	0.00000E+00	0.00000E+00	
Inhalation	1	5.53824E-04	0.00000E+00	0.00000E+00	
Ingestion	1	1.53729E-02	0.00000E+00	0.00000E+00	
TEDE	1	1.59267E-02	0.00000E+00	0.00000E+00	
3H	0	0.00000E+00	0.00000E+00	0.00000E+00	Maximum External
3H	1	5.53824E-04	0.00000E+00	0.00000E+00	Maximum Inhalation
3H	1	1.53729E-02	0.00000E+00	0.00000E+00	Maximum Ingestion
3H	1	1.59267E-02	0.00000E+00	0.00000E+00	Maximum Nuclide

Program : DandD Version 1.0

** Interim Release 1.0. Not to be used to demonstrate Level 1 ** compliance with decommissioning criteria.

Session : BRRC Carbon-14 Tritium Release Criteria Model #1
Description :
Building Occupancy Model. Total beta-gamma average limit of 5,000 dpm/100 cm2 C-14 20,000 dpm/100 cm2 H-3

Executed : 01/16/98 at 10:08:51

NRC Report

Occupancy Input Section

Execution Options

History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

Initial Radionuclide Activities

Chain	dpm/100cm^2
3H	20000.00
14C	5000.00

Code-Generated Radionuclide Activities

Chain	dpm/100cm^2
3H	2.0000E+004
14C	5.0000E+003

Variable Parameters

No parameters have been changed.

Occupancy Output Section

Maximum Annual TEDE

This scenario started 0.00 year(s) from now and ran for 1.00 year(s).

The peak dose of 2.99E+000 TEDE (mrem) occurred 1.00 year(s) after license termination.

Pathway Component of Maximum Annual Dose

Pathway	TEDE (mrem)	Percentage
External	1.41E-004	0.00
Inhalation	1.04E-001	3.48
Ingestion	2.88E+000	96.52
Total	2.99E+000	100.00

Radionuclide Component of Maximum Annual Dose

Radionuclide	TEDE (mrem)	Percentage
3H	3.19E-001	10.66
14C	2.67E+000	89.34
Total	2.99E+000	100.00

Output From Program 'OCCU

* * *Interim Release 1.0. Not to be used to demonstrate Level 1* * *
final compliance with decommissioning criteria.

Building Occupancy Scenario
Run Date: 01/16/1998
Run Time: 10:08:42

INPUT DATA:
Title: BRRC Carbon-14 _Tritium Release Criteria Model #1
Notes:
History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

PARAMETER DATA:
Time In Building : 1.2150E+02 d/y
Occupancy Period : 3.6525E+02 d
Breathing Rate : 8.9000E-01 m**3/h
Resuspension Factor : 7.6100E-05 /m
Secondary Ingestion Transfer Rate: 1.8600E-03 m**2/h

TIME DATA:
Start Time : 0000E+00 d
End Time : 3.6525E+02 d
DT Size : 3.6525E+02 d
Time Step Size : 3.6525E+02 d
Write results every : 1 calculation time

INITIAL ACTIVITIES:

Number of chains: 2

Chain Number	Chain Name	Initial Activity (dpm/100 cm^2)
1	3H	3.0000E+04
2	14C	5.0000E+00

Chain No. 1: 3H

Nuclide	Chain Position	Half Life	Initial Inventory (dpm/100 cm^2)	First Parent	First Fractional Yield	Second Parent	Second Fractional Yield

Nuclides in chain : 1

3H : 4.51[illegible]E+ 3.0000E+04 [illegible] [illegible] 1 1.0000

Chain No. 2: 14C

Nuclide	Chain	Half Life	Initial	First	Fractional	Second	Fractional

Position		Inventory	Parent	Yield	Parent	Yield
	(d)	(dpm/ 100 cm^2)				
Nuclides in chain : 1						
14C	1	2.0900E+06	5.0000E+03	0	.00000	0 .00000

TIMESTEP DATA:

Number of nuclides	:	2
Number of time steps	:	1
Number of print steps	:	1
Timestep of maximum	:	1
Day of maximum	:	.3652500000E+03
Year of maximum	:	.1000000000E+01

For Period 1: 0.0000000000E+00 days to 3.6525000000E+02 days
0.0000000000E+00 years to 1.0000000000E+01 years

Dose Components of Maximum TEDE

Nuclide	External Dose (mrem/y)	Inhalation Dose (mrem/y)	Ingestion Dose (mrem/y)	Total Dose (mrem/y)	Average Activity (dpm/100 cm^2)
Dose Components					
3H	0.00000E+00	1.10765E-02	3.07458E-01	3.18834E-01	1.94490E+04
14C	1.40720E-04	9.28285E-02	2.57670E+00	2.66967E+00	4.94971E+03
Totals	1.40720E-04	1.03905E-01	2.88416E+00	2.98821E+00	

Component Maximums and Time of Occurrence

Type	Time Step	Maximum Value	Time of Occurrence (days)	(years)	
External	1	1.40720E-04	0.00000E+00	0.00000E+00	
Inhalation	1	1.03905E-01	0.00000E+00	0.00000E+00	
Ingestion	1	2.88416E+00	0.00000E+00	0.00000E+00	
TEDE	1	2.98821E+00	0.00000E+00	0.00000E+00	
3H	0	0.00000E+00	0.00000E+00	0.00000E+00	Maximum External
3H	1	1.10765E-02	0.00000E+00	0.00000E+00	Maximum Inhalation
3H	1	3.07458E-01	0.00000E+00	0.00000E+00	Maximum Ingestion
3H	1	3.18834E-01	0.00000E+00	0.00000E+00	Maximum Nuclide
14C	1	1.40720E-04	0.00000E+00	0.00000E+00	Maximum External
14C	1	9.28285E-02	0.00000E+00	0.00000E+00	Maximum Inhalation
14C	1	2.57670E+00	0.00000E+00	0.00000E+00	Maximum Ingestion
14C	1	2.66967E+00	0.00000E+00	0.00000E+00	Maximum Nuclide

Program : DandD Version 1.0

* * Interim Release 1.0. Not to be used to demonstrate Level 1 * *
compliance with decommissioning criteria.

Session : BRRC Carbon-14 Tritium Release Criteria Model #2
Description :
Building Occupancy Model. Removable beta-gamma limits of 1000 dpm/100 cm2 for C-14 and for H-3

Executed : 01/16/98 at 10:13:18

NRC Report

Occupancy Input Section

Execution Options

History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

Initial Radionuclide Activities

Chain	dpm/100cm^2
3H	1000.00
14C	1000.00

Code-Generated Radionuclide Activities

Chain	dpm/100cm^2
3H	1.0000E+003
14C	1.0000E+003

Variable Parameters

No parameters have been changed.

Occupancy Output Section

Maximum Annual TEDE

This scenario started 0.00 year(s) from now
and ran for 1.00 year(s).

The peak dose of 5.50E-001 TEDE (mrem) occurred 1.00 year(s) after license termination.

Pathway Component of Maximum Annual Dose

Pathway	TEDE (mrem)	Percentage
External	2.81E-005	0.01
Inhalation	1.91E-002	3.48
Ingestion	5.31E-001	96.52
Total	5.50E-001	100.00

Radionuclide Component of Maximum Annual Dose

Radionuclide	TEDE (mrem)	Percentage
3H	1.59E-002	2.90
14C	5.34E-001	97.10
Total	5.50E-001	100.00

Output From Program 'OCCU'

* * *Interim Release 1.0. Not to be used to demonstrate Level 1* * *
final compliance with decommissioning criteria.

Building Occupancy Scenario
Run Date: 01/16/1998
Run Time: 10:13:14

INPUT DATA:
Title: BRRC Carbon-14 _Tritium Release Criteria Model #2
Notes:
History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

PARAMETER DATA:
Time In Building : 1.2150E+02 d/y
Occupancy Period : 3.6525E+02 d
Breathing Rate : 8.9000E-01 m**3/h
Resuspension Factor : 7.6100E-05 /m
Secondary Ingestion Transfer Rate: 1.8800E-03 m**2/h

TIME DATA:
Start Time : 0.0000E+00 d
End Time : 3.6525E+02 d
DT Size : 3.6525E+02 d
Time Step Size : 3.6525E+02 d
Write results every : 1 calculation times

INITIAL ACTIVITIES:

Number of chains: 2

Chain Number	Chain Name	Initial Activity dpm/ 100 cm**2
1	3H	1.0000E+03
2	14C	1.0000E+03

Chain No. 1: 3H

Nuclide	Chain Position	Half Life (d)	Initial Inventory (dpm/ 100 cm**2)	First Parent	Fractional Yield	Second Parent	Fractional Yield
Nuclides in chain : 1							
3H	1	4.5100E+03	1.0000E+03	0	.00000	1	.00000

Chain No. 2: 14C

Nuclide	Chain	Half Life	Initial	First	Fractional	Second	Fractional

Position		Inventory (d)	Inventory (dpm/100 cm^2)	Parent	Yield	Parent	Yield
Nuclides in chain : 1							
14C	1	2.0900E+06	1.0000E+03	0	.00000	0	.00000

TIMESTEP DATA:

Number of nuclides	2
Number of time steps	1
Number of print steps	1
Timestep of maximum	1
Day of maximum	.3652500000E+03
Year of maximum	.1000000000E+01

For Period 1: 0.0000000000E+00 days to 3.6525000000E+02 days
0.0000000000E+00 years to 1.0000000000E+00 years

Dose Components of Maximum TEDE

Nuclide	External Dose (mrem/y)	Inhalation Dose (mrem/y)	Ingestion Dose (mrem/y)	Total Dose (mrem/y)	Average Activity (dpm/100 cm^2)
Dose Components					
3H	0.00000E+00	5.53824E-04	1.53729E-02	1.59267E-02	9.72450E+02
14C	2.81440E-05	1.85657E-02	5.15341E-01	5.33935E-01	9.99939E+02
Totals	2.81440E-05	1.91195E-02	5.30714E-01	5.49862E-01	

Component Maximums and Time of Occurrence

Type	Time Step	Maximum Value	Time of Occurrence (days)	Time of Occurrence (years)	
External	1	2.81440E-0.	0.00000E+00	0.00000E+00	
Inhalation	1	1.91195E-02	0.00000E+00	0.00000E+00	
Ingestion	1	5.30714E-01	.00000E+00	0.00000E+00	
TEDE	1	5.49862E-01	.00000E+00	0.00000E+00	
3H	0	0.00000E+00	.00000E+00	0.00000E+00	Maximum External
3H	1	5.53824E-04	0.00000E+00	0.00000E+00	Maximum Inhalation
3H	1	1.53729E-02	0.00000E+00	0.00000E+00	Maximum Ingestion
3H	1	1.59267E-02	0.00000E+00	0.00000E+00	Maximum Nuclide
14C	1	2.81440E-05	0.00000E+00	0.00000E+00	Maximum External
14C	1	1.85657E-02	0.00000E+00	0.00000E+00	Maximum Inhalation
14C	1	5.15341E-01	0.00000E+00	0.00000E+00	Maximum Ingestion
14C	1	5.33935E-01	0.00000E+00	0.00000E+00	Maximum Nuclide

Program : DandD Version 1.0

* * Interim Release 1.0. Not to be used to demonstrate level 1 * *
compliance with decommissioning criteria.

Session : BRRC Carbon-14 Tritium Release Criteria Model #3
Description :
Building Occupancy Model. Maximum total beta-gamma limits for hot spots (3 times average). 15,000 dpm/100 cm2 C-14 and 60,000 dpm/100cm2 H-3.

Executed : 01/16/98 at 10:18:44

NRC Report

Occupancy Input Section

Execution Options

History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

Initial Radionuclide Activities

Chain	dpm/100cm^2
3H	60000.00
14C	15000.00

Code-Generated Radionuclide Activities

Chain	dpm/100cm^2
3H	[illegible]
14C	[illegible]

Variable Parameters

No parameters have been changed.

Summary Output Section

Maximum Annual Dose

This scenario started 0.00 year(s) from now
and ran for 1.00 year(s).

The peak dose of 8.96E+000 TEDE (mrem) occurred 1.00 year(s) after license termination.

Pathway Component of Maximum Annual Dose

Pathway	TEDE (mrem)	Percentage
External	4.22E-004	0.00
Inhalation	3.12E-001	3.48
Ingestion	8.65E+000	96.52
Total	8.96E+000	100.00

Radionuclide Component of Maximum Annual Dose

Radionuclide	TEDE (mrem)	Percentage
3H	9.56E-001	10.66
14C	8.01E+000	89.34
Total	8.96E+000	100.00

Output From Program 'OCCU

* * *Interim Release 1.0. Not to be used to demonstrate Level 1* * *
final compliance with decommissioning criteria.

Building Occupancy Scenario
Run Date: 01/16/1998
Run Time: 10:18:40

INPUT DATA:
Title: BRRC Carbon-14 _Tritium Release Criteria Model #3
Notes:
History file will be generated.
Implicit progeny doses will not be included with explicit parent.
Concentration data will be calculated.

PARAMETER DATA:
Time In Building : 1.2150E+02 d/y
Occupancy Period : 3.6525E+02 d
Breathing Rate : 8.9000E-01 m**3/h
Resuspension Factor : 7.6100E-05 /m
Secondary Ingestion Transfer Rate: 1.8800E-03 m**2/h

TIME DATA:
Start Time : 0.0000E+00 d
End Time : 3.6525E+02 d
DT Size : 3.6525E+02 d
Time Step Size : 3.6525E+02 d
Write results every : 1 calculation times

INITIAL ACTIVITIES:

Number of chains: 2

Chain Number	Chain Name	Initial Activity dpm/100 gm^2
1	3H	1.0000E+04
2	14C	1.0000E+04

Chain No. 1: 3H

Nuclide	Chain Position	Half Life	Initial Inventory	First Parent	Fractional Output	Fractional Yield
		d	dpm/100 gm^2			
Nuclides in chain : 1						
3H	1	4.5[illegible]E+[illegible]	[illegible]E+04	0	[illegible]	[illegible]

Chain No. 2: 14C

Nuclide	Chain	Half Life	Initial	First	Fractional	Fractional

Position		Inventory	Parent	Y[illegible]	Parent	Yield
	(d)	(dpm/ 100 cm^2)				

Nuclides in chain : 1

14C	1	2.0900E+06	1.5000E+04	0	.00000	0	.00000

TIMESTEP DATA:

Number of nuclides	:	2
Number of time steps	:	1
Number of print steps	:	1
Timestep of maximum	:	1
Day of maximum	:	.3652500000E+03
Year of maximum	:	.1000000000E+01

For Period 1: 0.0000000000E+00 days to 3.6525000000E+02 days
0.0000000000E+00 years to 1.0000000000E+00 years

Dose Components of Maximum TEDE

Nuclide	External Dose (mrem/y)	Inhalation Dose (mrem/y)	Ingestion Dose (mrem/y)	Total Dose (mrem/y)	Average Activity (dpm/100 cm^2)
Dose Components					
3H	0.00000E+00	3.3229[illegible]E-02	9.22373E-[illegible]	9.5560[illegible]E-01	[illegible]
14C	4.22160E-04	2.7[illegible]E-01	7.73011E+[illegible]	[illegible]	[illegible]
Totals	4.22160E-04	3.11[illegible]E-01	6.65249E+00	[illegible]	

Component Maximums and Time of Occurrence

Type	Time Step	Maximum Value	Time of Occurrence (days)	(years)	
External	1	4.2216[illegible]	[illegible]	[illegible]	
Inhalation	1	3.1171[illegible]	[illegible]	[illegible]	
Ingestion	1	6.6[illegible]	[illegible]	[illegible]	
TEDE	1	6.9[illegible]	[illegible]	[illegible]	
3H	0	0.[illegible]	[illegible]	[illegible]	Maximum External
3H	1	3.3229[illegible]	[illegible]	[illegible]	Maximum Inhalation
3H	1	9.2237[illegible]	[illegible]	[illegible]	Maximum Ingestion
3H	1	9.5560[illegible]	0.000000E+00	0.[illegible]	Maximum Nuclide
14C	1	4.2216[illegible]	[illegible]	[illegible]	Maximum External
14C	1	2.7[illegible]	[illegible]	[illegible]	Maximum Inhalation
14C	1	7.7[illegible]	[illegible]	[illegible]	Maximum Ingestion
14C	1	8.[illegible]	[illegible]	[illegible]	Maximum Nuclide

Attachment 2

Characterization data for CHB Room 131

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

Room: 131

Classification: Affected

Technician's Name: Clugston, Jr., Clugston, Sr., Shonkwiler

Legend:

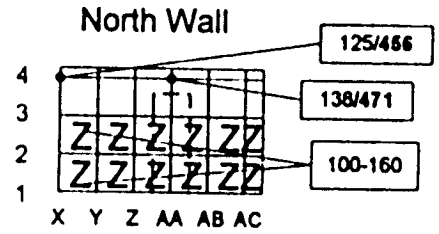
C-14/H-3 (H-3 readings are Bold)

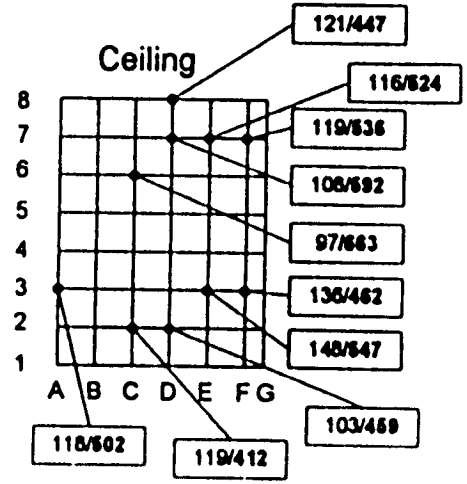
Z= 100% scan of grid block (C-14 reading)

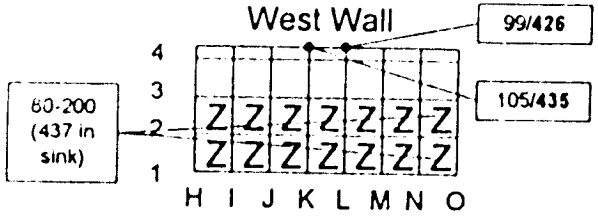
All readings in CPM

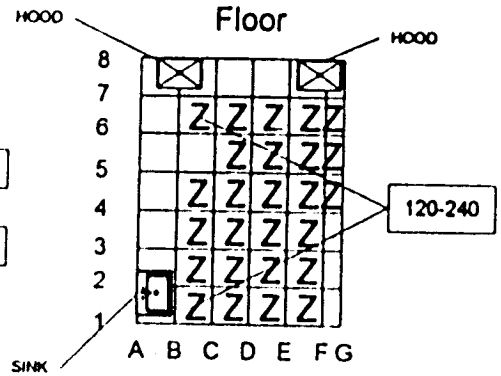
Survey Unit: 131, 132

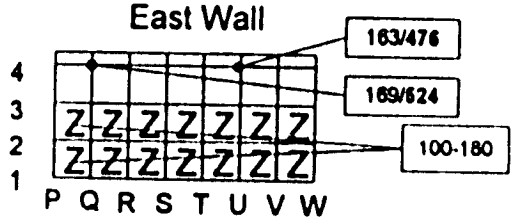
Comments: West and South Wall C-14 readings were taken 12/18/96

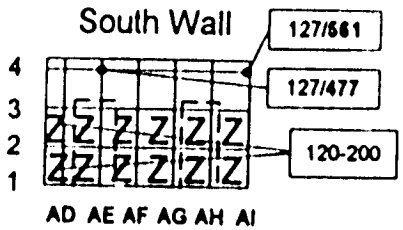












C-14: Date: 12/17/96 (12/18/96) (3/11/97)
Model 43-68 #: 095221 (129754) (129754)
Model 2221 #: 108881 (117366) (117366)
Efficiency 13.0 % (14.2 %) (13.1%)
Background 116 CPM (147 CPM) (135 CPM)

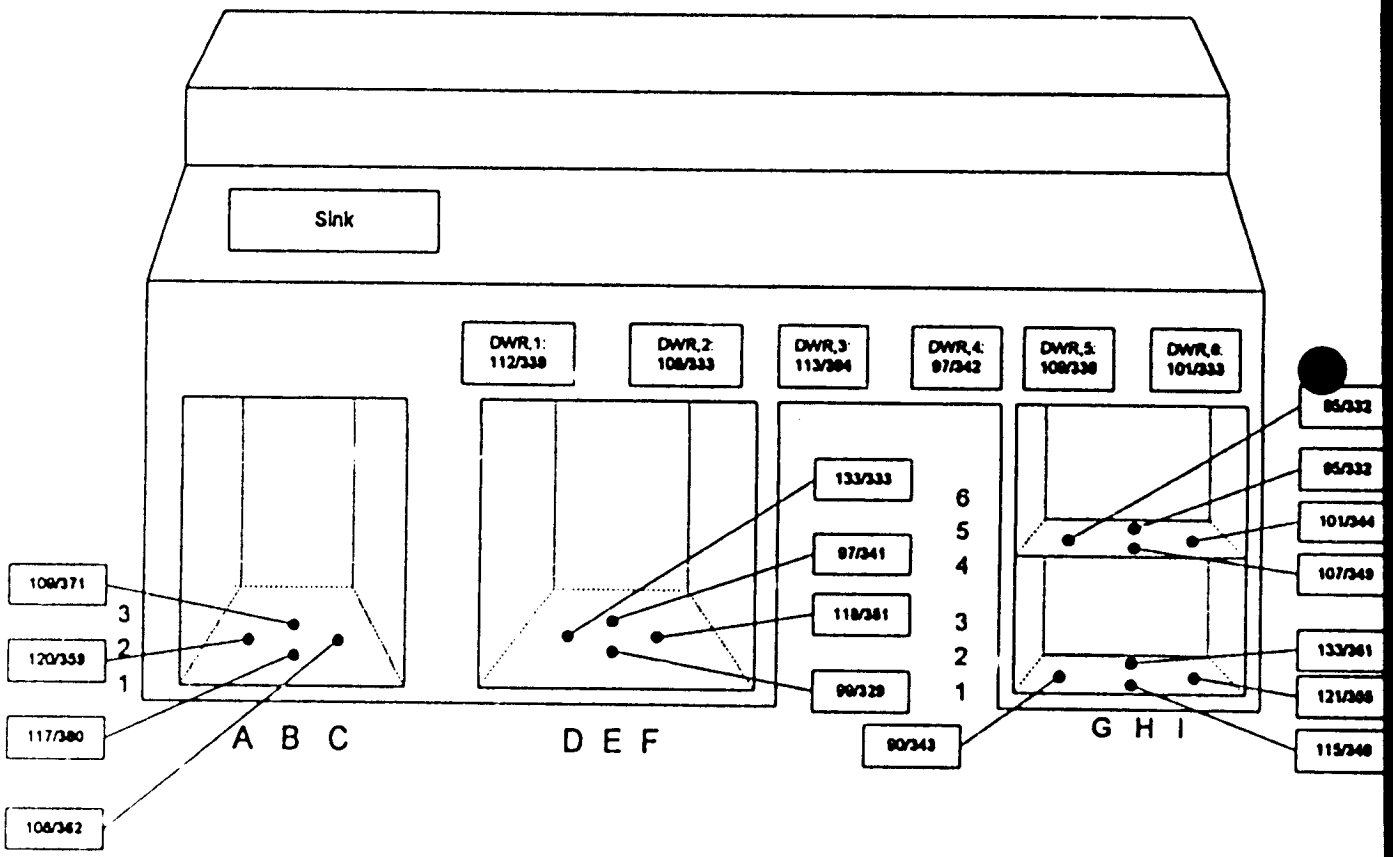
C-14 Scan: Date: 12/17/96
Model 43-68 #: 095221
Model 2221 #: 108881
Efficiency 13.0 %
Background 116 CPM

H-3: Date: 12/17/96 (3/11/97)
Model 44-110 #: 134889 (123264)
Model 2221 #: 84458 (126321)
Efficiency 30.0 % (30%)
Background 413 CPM

Not Drawn to Scale

● Data Measurement Point
○ Additional Measurement Point

Location: Chemical Hygiene Building
Room: Room 131 Cabinet
Classification: Affected
Technician's Name: Shonkwiler
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A
Comments: Overall size approx. 200" x 50"



100 % C-14 Scans=
Drawers and Cabinets: 80-140

C-14: Date: 1/30/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.9 %
Background 97 CPM

C-14 Scan: Date: 1/24/97
Model 43-68 #:129754
Model 2221 #:117366
Efficiency 12.9 %
Background 104 CPM

H-3: Date: 1/24/97
Model 44-110 #:134889
Model 2221 #:84458
Efficiency 30 %
Background 361 CPM

Two

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

Room: Exhaust Hood Room 131 Northwest Corner (EH 131-A)

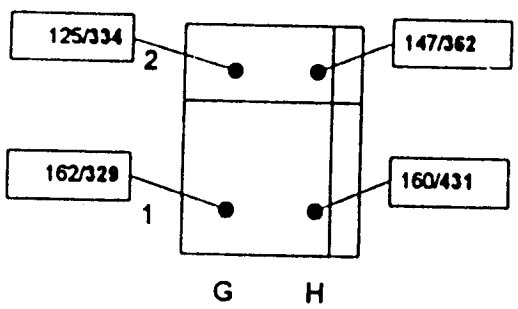
Classification: Affected

Technician's Name: Shonkwiler

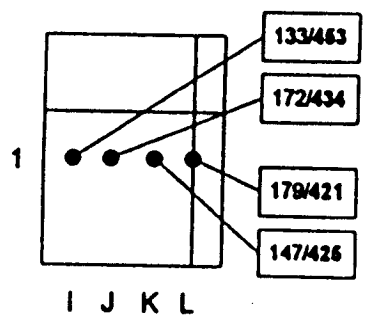
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A

Comments: 100% C-14 scan of all surfaces

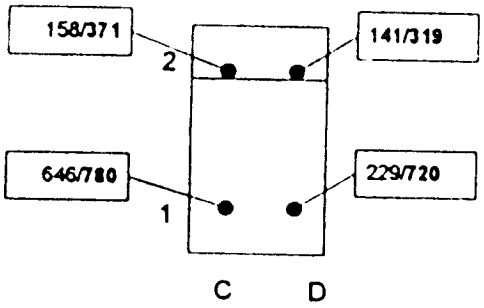
Back



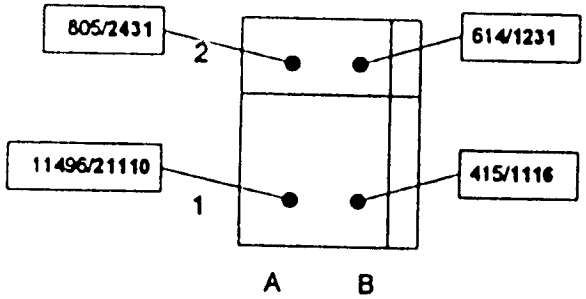
Plenum



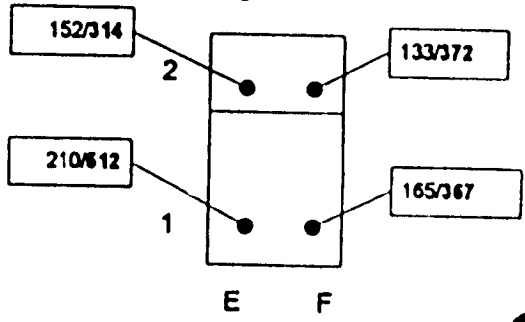
Left Side



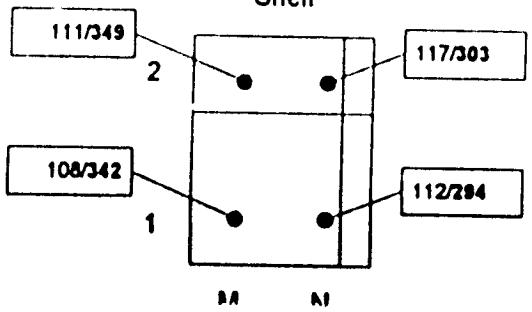
Floor



Right Side



Shelf



C-14 Scan Data
Left Side: 140-600
Right Side: 140-180
Floor: 330-12000
Back: 160-200
Shelf: 120-160
Plenum: 120-160

C-14: Date: 1/30/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.9 %
Background 97 CPM

C-14 Scan: Date: 1/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.2%
Background 93 CPM

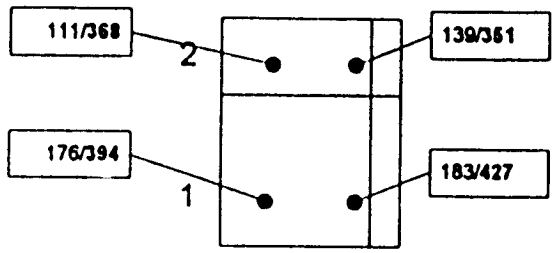
H-3: Date: 1/30/97
Model 44-110 #: 134896
Model 2221 #: 126521
Efficiency 30 %
Background 355 CPM

1 m x 1 m grid

● Data Measurement Point
○ Additional Measurement Point

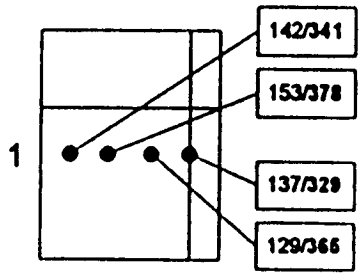
Location: Chemical Hygiene Building
Room: Exhaust Hood Room 131 Northeast Corner (EH 131-B)
Classification: Affected
Technician's Name: Shonkwiler
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A
Comments: 100% C-14 scan of all surfaces

Back



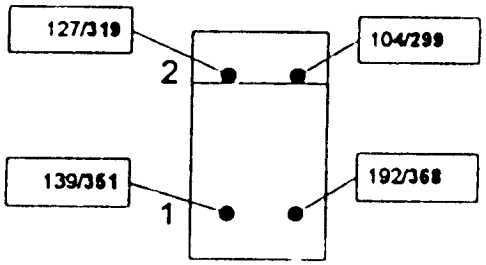
G H

Plenum



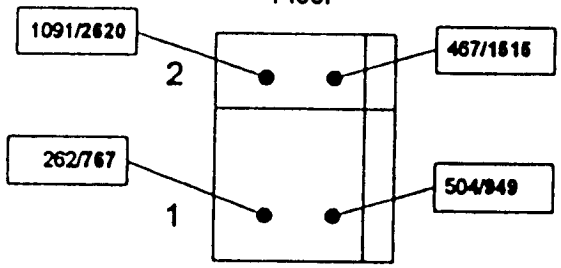
I J K L

Left Side



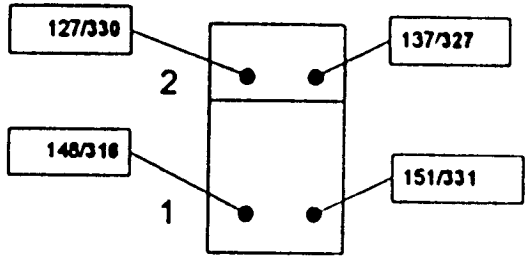
C D

Floor



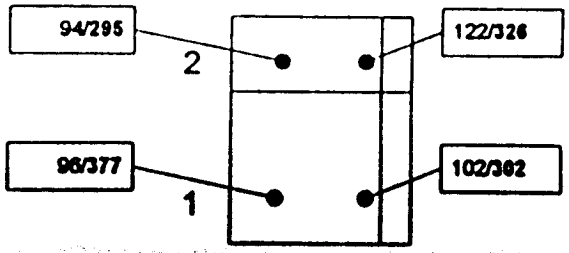
A B

Right Side



E F

Shelf



M N

C-14 Scan Data
Left Side: 140-180
Right Side: 160-200
Floor: 250-900
Back: 140-160
Shelf: 100-140
Plenum: 140-180

C-14: Date: 1/30/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.9 %
Background 97 CPM

C-14 Scan: Date: 1/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.2%
Background 93 CPM

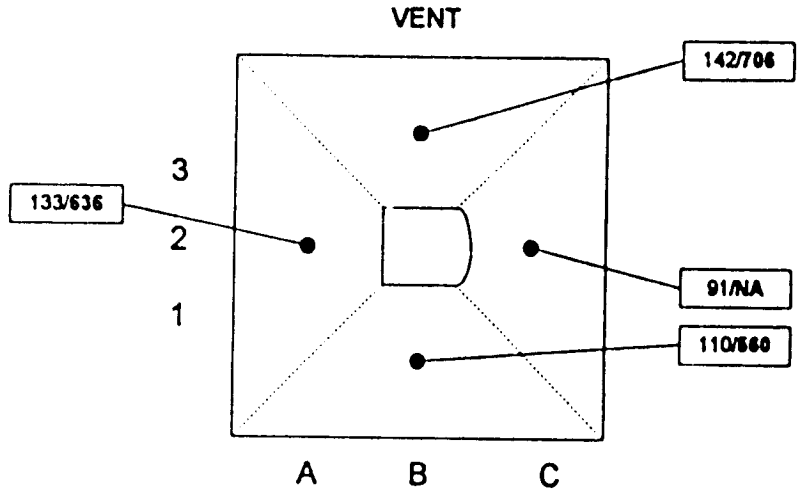
H-3: Date: 1/30/97
Model 44-110 #: 134896
Model 2221 #: 126521
Efficiency 30 %
Background 355 CPM

05

Not Drawn to Scale

● Data Measurement Point
○ Additional Measurement Point

Location: Chemical Hygiene Building
Room: Room 131 Roof Vent
Classification: Affected
Technician's Name: Shonkwiler
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit:
Comments: East internal wall is curved, therefore H-3 reading at (c 2) unattainable All readings/scans are on internal duct walls



100 % C-14 Scans:
60-160 CPM

C-14: Date: 3/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.7 %
Background 138 CPM

C-14 Scan: Date: 3/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.7 %
Background 138 CPM

H-3: Date: 3/27/97
Model 44-110 #: 123284
Model 2221 #: 126521
Efficiency 30 %
Background 374 CPM

Attachment 3

Post Decon data for exhaust hood CHB Room 131

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

Room: Exhaust Hood Room 131 Northwest Corner (EH 131-A)

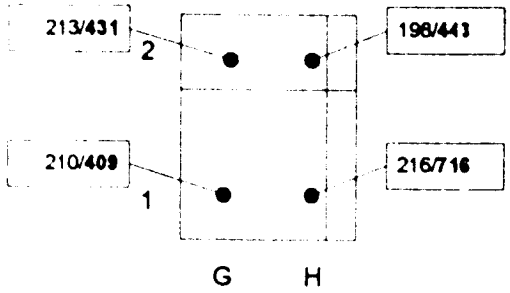
Classification: Affected

Technician's Name: Weyant

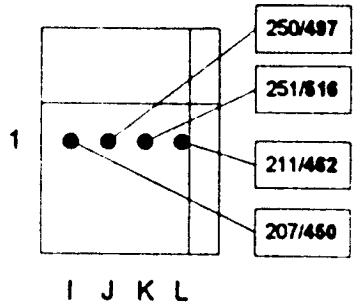
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A

Comments: 100% C-14 scan of all surfaces

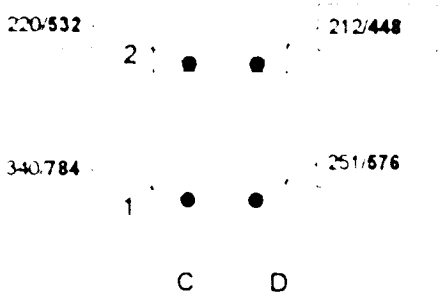
Back



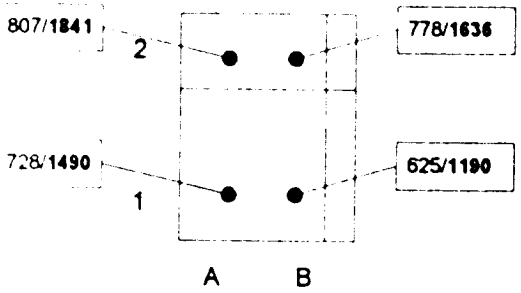
Plenum



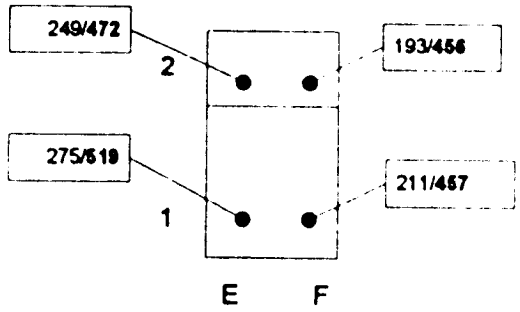
Left Side



Floor



Right Side



C-14 Scan Data
Left Side: 400-450
Right Side: 200-275
Floor: 500-800
Back: 225-275
Plenum: 250-275

C-14: Date: 8/13/97
Model 43-68 #: 124497
Model 2221 #: 84458
Efficiency 14.6 %
Background 240 CPM

C-14 Scan: Date: 8/13/97
Model 43-68 #: 129754
Model 2221 #: 124497
Efficiency 14.6 %
Background 240 CPM

H-3: Date: 8/13/97
Model 44-110 #: 134896
Model 2221 #: 84458
Efficiency 30 %
Background 448 CPM

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

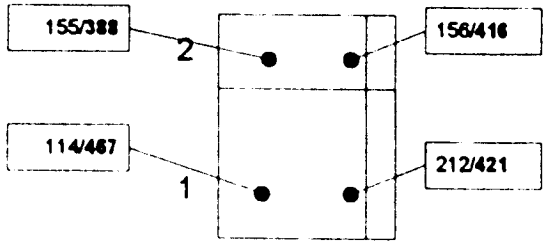
Room: Exhaust Hood Room 131 Northeast Corner (EH 131-B)

Classification: Affected

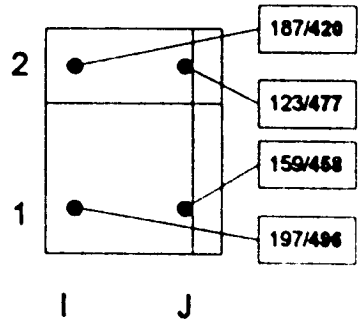
Technician's Name: Shonkwiler

Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A
Comments: 100% C-14 scan of all surfaces

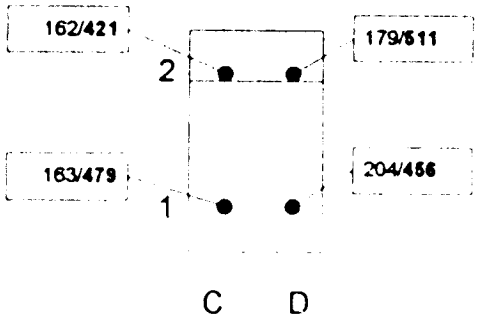
Back



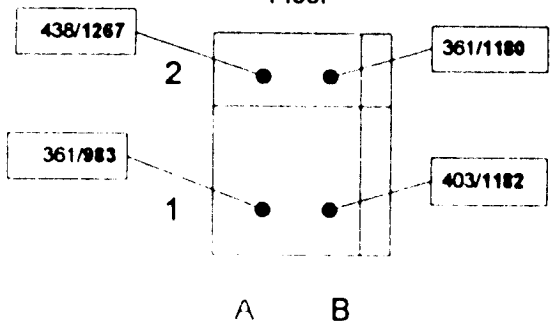
Plenum



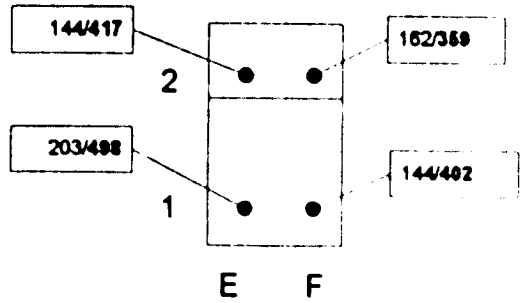
Left Side



Floor



Right Side



C-14 Scan Data
Left Side: 140-200
Right Side: 120-200
Floor: 300-420
Back: 120-200
Plenum 160-200

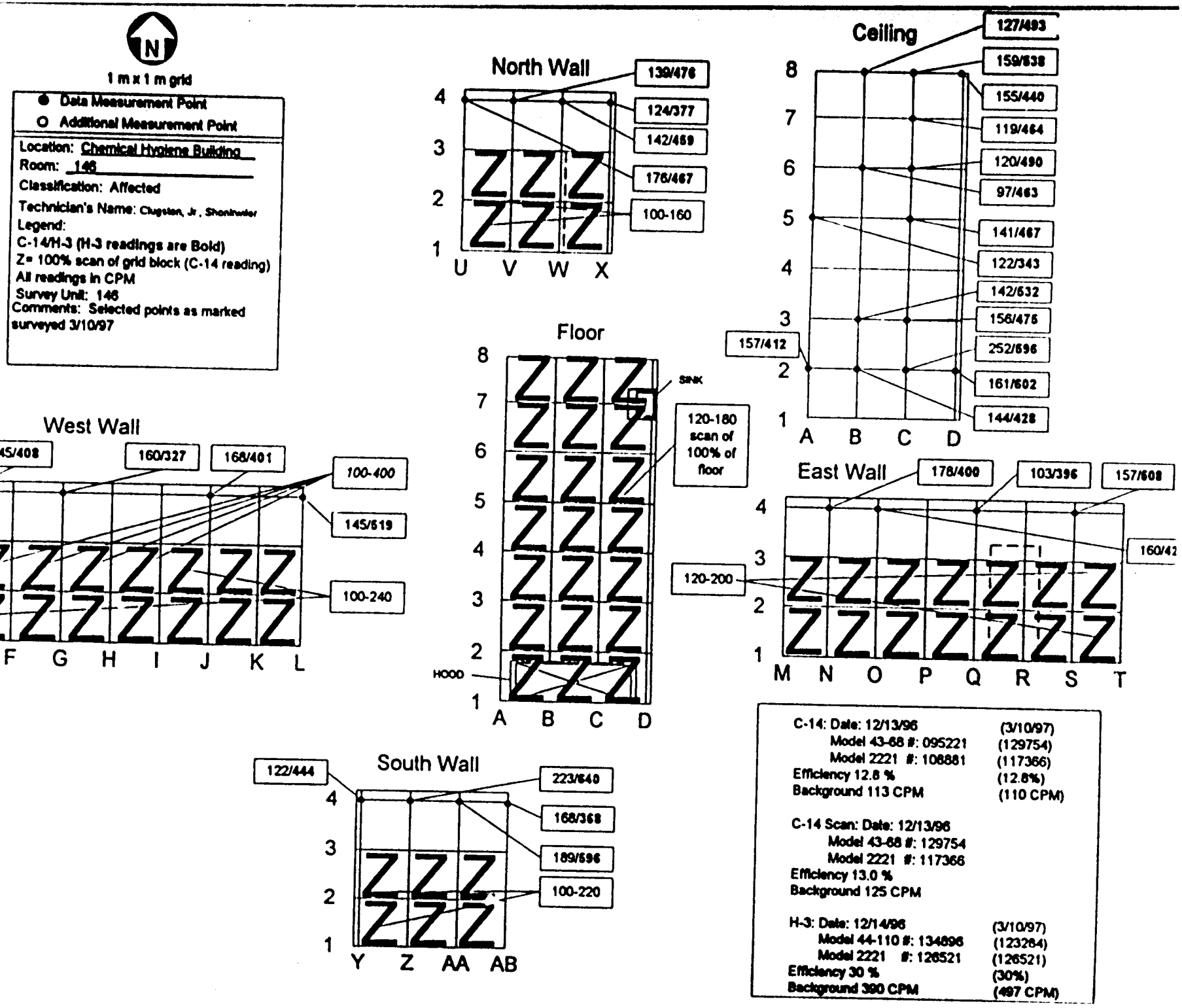
C-14: Date: 7/24/97
Model 43-68 #: 124497
Model 2221 #: 108881
Efficiency 13.3 %
Background 130 CPM

C-14 Scan: Date: 7/24/97
Model 43-68 #: 124497
Model 2221 #: 108881
Efficiency 13.3 %
Background 130 CPM

H-3: Date: 7/24/97
Model 44-110 #: 134896
Model 2221 #: 84458
Efficiency 30 %
Background 398 CPM

Attachment 4

Characterization data for CHB Room 146

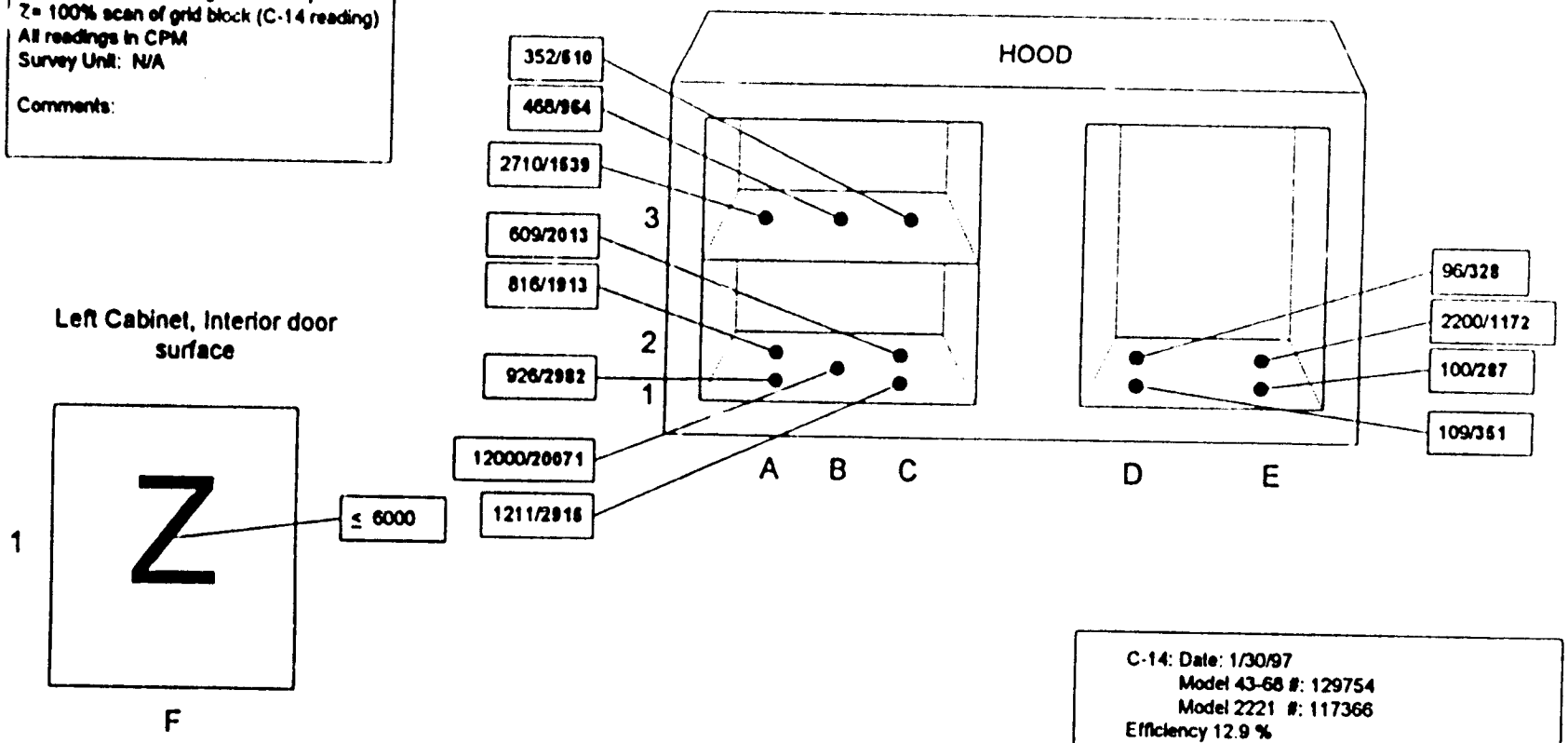

N
1 m x 1 m grid
Data Measurement Point
Additional Measurement Point
Location: Chemical Hygiene Building
Room: 146
Classification: Affected
Technician's Name: Clugston, Jr., Shonhuster
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: 146
Comments: Selected points as marked surveyed 3/10/97
North Wall
139/476
124/377
142/459
176/467
100-160
U V W X
Ceiling
127/493
159/538
155/440
119/464
120/490
97/463
141/467
122/343
142/532
156/476
252/696
161/602
144/428
157/412
A B C D
West Wall
145/408
160/327
168/401
100-400
145/519
100-240
E F G H I J K L
Floor
SINK
120-180 scan of 100% of floor
HOOD
A B C D
East Wall
178/400
103/396
157/608
160/42
120-200
M N O P Q R S T
South Wall
122/444
223/640
168/368
189/596
100-220
Y Z AA AB
C-14: Date: 12/13/96 (3/10/97)
Model 43-68 #: 095221 (129754)
Model 2221 #: 108881 (117366)
Efficiency 12.8 % (12.8%)
Background 113 CPM (110 CPM)
C-14 Scan: Date: 12/13/96
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 13.0 %
Background 125 CPM
H-3: Date: 12/14/96 (3/10/97)
Model 44-110 #: 134896 (123284)
Model 2221 #: 126521 (126521)
Efficiency 30 % (30%)
Background 390 CPM (497 CPM)

Not Drawn to Scale

● Data Measurement Point
O Additional Measurement Point

Location: Chemical Hygiene Building
Room: Room 146 Cabinet
Classification: Affected
Technician's Name: Shonkwiler
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: N/A

Comments:



Left Cabinet, Interior door surface

100 % C-14 Scans=
Left Floor (A,1):300-2000
Left Shelf (A,3): 200-1800
Right Floor (D,1): 100-140

C-14: Date: 1/30/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.9 %
Background 97 CPM

C-14 Scan: Date: 1/29/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.6 %
Background 95 CPM

H-3: Date: 1/30/97
Model 44-110 #: 134896
Model 2221 #: 126521
Efficiency 30 %
Background 334 CPM

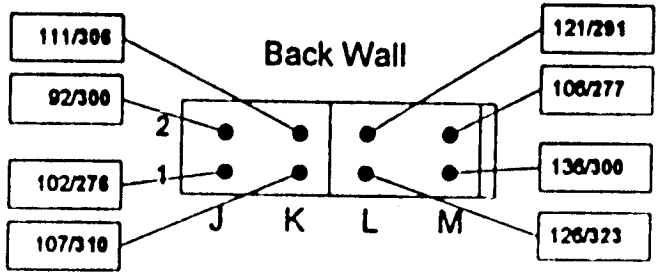
1 m x 1 m grid

● Data Measurement Point

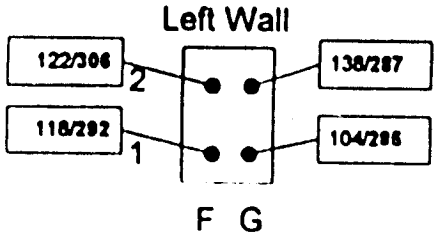
O Additional Measurement Point

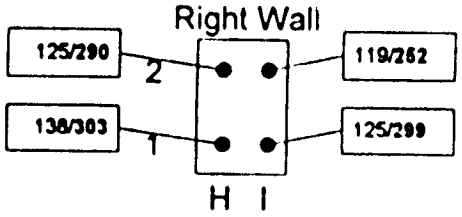
Location: Chemical Hygiene Building
Room: Exhaust Hood 146
Classification: Affected
Technician's Name: Mansid
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: NA

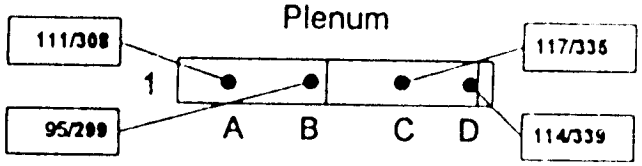
Comments:

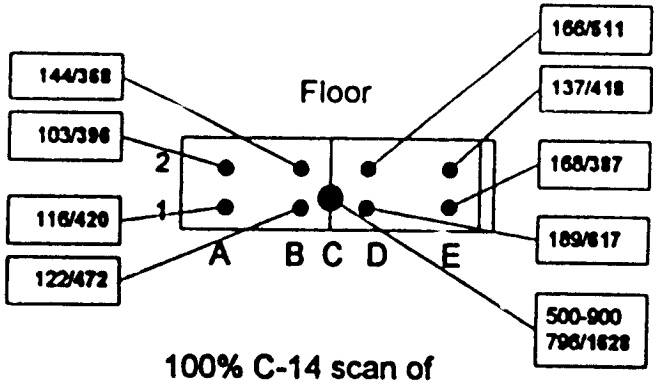


100% C-14 scan of
walls and plenum = 90-140









100% C-14 scan of
floor = 90-150

C-14: Date: 12/18/96
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 14.2 %
Background 147 CPM

C-14 Scan: Date: 12/18/96
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 14.2 %
Background 147 CPM

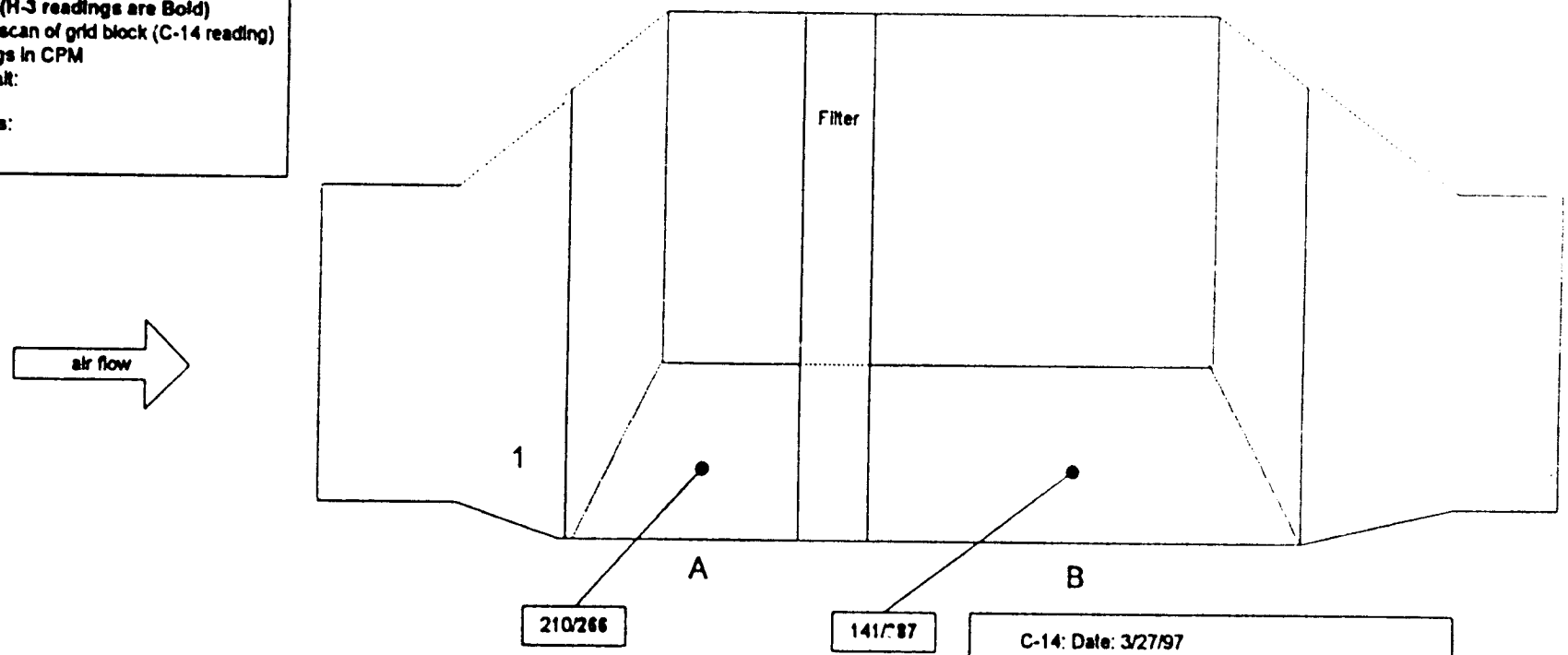
H-3: Date: 12/18/96
Model 44-110 #: 134889
Model 2221 #: 84458
Efficiency 30 %
Background 455 CPM

Not Drawn to Scale

● Data Measurement Point
○ Additional Measurement Point

Location: Chemical Hygiene Building
Room: Room 146 Vent
Classification: Affected
Technician's Name: Shonkwiler
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit:

Comments:



100 % C-14 Scans
Outlet & Inlet Sides of Duct: 40-240 CPM

C-14: Date: 3/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.7 %
Background 138 CPM

C-14 Scan: Date: 3/27/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.7 %
Background 138 CPM

H-3: Date: 3/27/97
Model 44-110 #: 123284
Model 2221 #: 126521
Efficiency 30 %
Background 374 CPM

Attachment 5

Post Decon data for exhaust hood & cabinet, CHB Room 146

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

Room: Room 146 Cabinet

Classification: Affected

Technician's Name: Shonkwiler

Legend:

C-14/H-3 (H-3 readings are Bold)

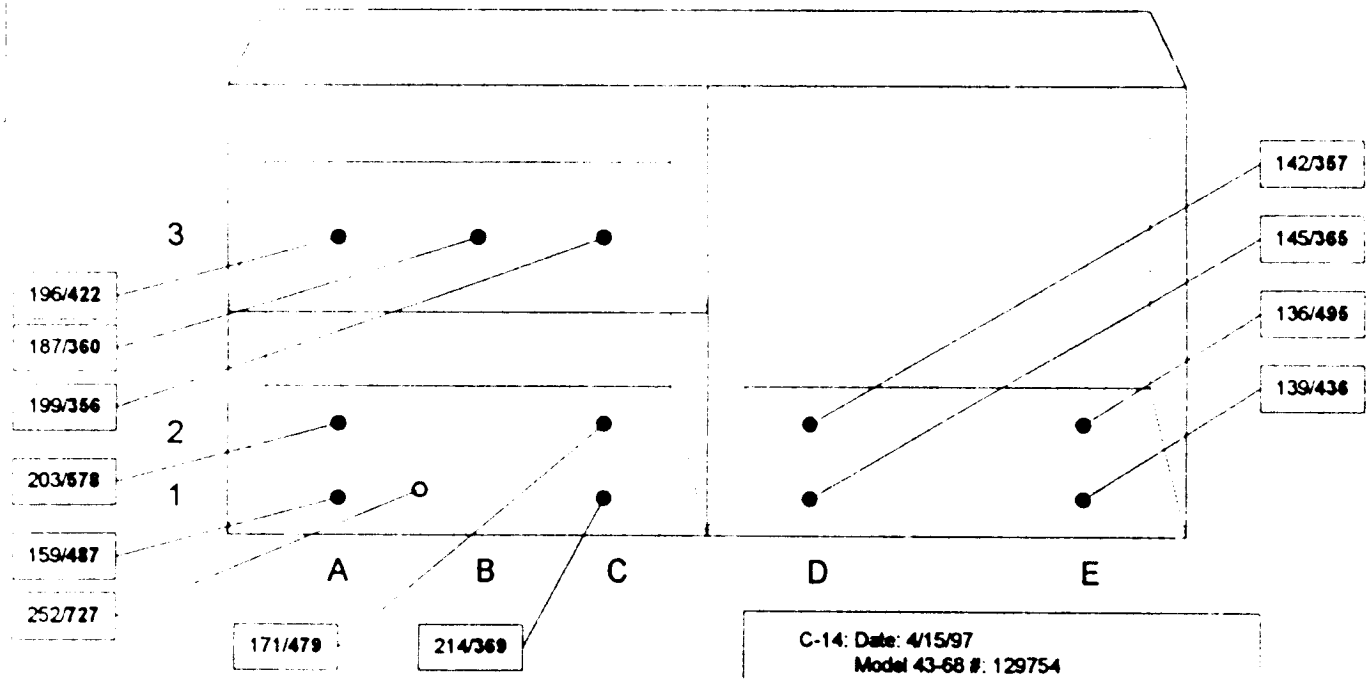
Z= 100% scan of grid block (C-14 reading)

All readings in CPM

Survey Unit: NA

Comments: Armored electric cable in left cabinet ≤ 800 CPM

100% C-14 Scans:
Floor = 120-220
Left Interior Walls = 200-400
Right Interior Walls = 140-240



C-14: Date: 4/15/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.4 %
Background 146 CPM

C-14 Scan: Date: 4/15/97
Model 43-68 #: 129754
Model 2221 #: 117366
Efficiency 12.4 %
Background 146 CPM

H-3: Date: 4/15/97
Model 44-110 #: 123284
Model 2221 #: 84458
Efficiency 30 %
Background 407 CPM

1 m x 1 m grid

● Data Measurement Point

○ Additional Measurement Point

Location: Chemical Hygiene Building

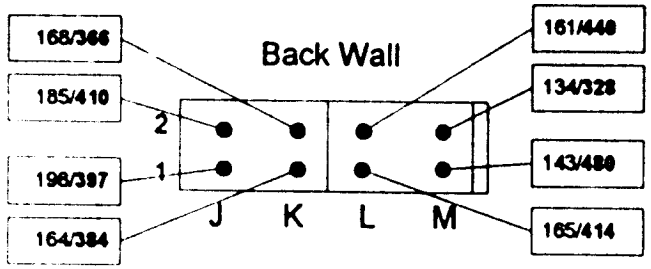
Room: Exhaust Hood 146

Classification: Affected

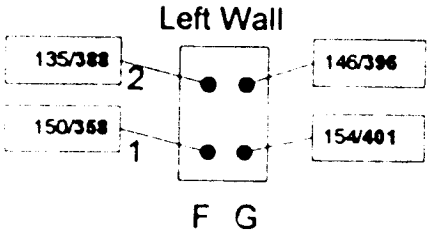
Technician's Name: Shonkwiler

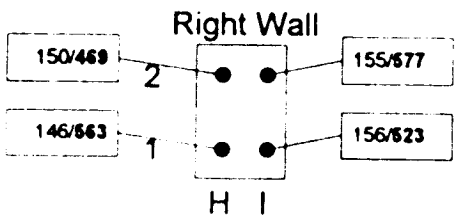
Legend:
C-14/H-3 (H-3 readings are Bold)
Z= 100% scan of grid block (C-14 reading)
All readings in CPM
Survey Unit: NA

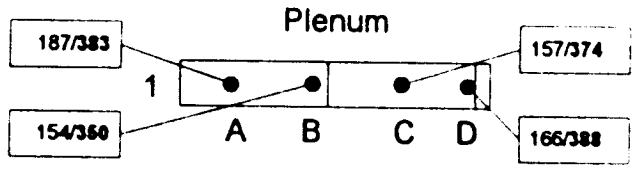
Comments:

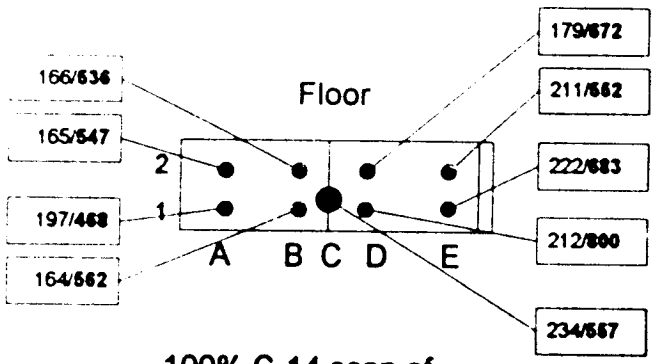


100% C-14 scan of
walls and plenum = 120-320









100% C-14 scan of
floor = 140-300

C-14: Date: 6/25/97
Model 43-68 #: 124497
Model 2221 #: 108881
Efficiency 13.2 %
Background 138 CPM

C-14 Scan: Date: 6/25/97
Model 43-68 #: 124497
Model 2221 #: 108881
Efficiency 13.2 %
Background 138 CPM

H-3: Date: 6/25/97
Model 44-110 #: 134896
Model 2221 #: 84458
Efficiency 30 %
Background 401 CPM

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