Katanic, Janine

From: Advanced Isotopes <nukedoses@gmail.com>
Sent: Monday, June 15, 2015 12:22 PM
To: Katanic, Janine
Subject: Re: Evaluation of Iodine Room at Advanced Isotopes
Attachments: NRC Inspection Response Revised (1).doc; Current I-131 Room Diagram.jpg; Anemometer.pdf; Biodex Hood.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Dr. Katanic,

Thank you for your patience with us. I have triple-checked the math in this revision and you were absolutely correct that points "A" and "B" were reversed - I have changed the document to match the figure and tried to address every point of concern in your previous emails.

We sincerely appreciate the time and effort you have spent with us to get us on the right track.

Sincerely,

Cathy and Nicki

On Tue, Jun 2, 2015 at 4:42 PM, Katanic, Janine <Janine.Katanic@nrc.gov> wrote:

Hi Cathy and Nicki,

Thanks for sending in the answers to my questions. I took a quick look at your documents and have some observations.

On page 2, it is noted that there is "a pipe with a diameter of 4 inches (area of pipe = 0.523 square foot)," However, I believe that a pipe with a 4 inch diameter is 0.087 square feet, not 0.523 square feet. Just at face value, it is not logical that a 4 inch

pipe is half a square foot area. If the pipe is indeed 4 inches diameter, the rest of the calculations need to be reviewed. Or maybe you can explain how you calculated 0.523 ft2. Maybe I just don't understand how you determined that value.

If we assume that the value is 0.087 ft2, for the outflow of air, if you redo the first calculation you get 107 cfm not 643 cfm. Then with the baffle removed/cleared you get 183 cfm not 1103.5 cfm. Therefore the total iodine out of room with hood fan off is 183 cfm.

For the inflow of air, thank you for patching the hole in the wall but I also noticed when I was there that there is a hole in the ceiling as well, where the air sampler lines lead into the room. For these calculations, there is a mathematical error in that 800 times 0.26 is 208 cfm not 180 cfm. As for the gaps in the door the value used was 0.869 ft2 but should be 0.072 ft2. It is not logical that the gaps in the door are almost a square foot area so I think this needs to be reevaluated. Using 0.072 ft2 makes the resultant value 7.88 cfm not 39.8 cfm.

Therefore the total inflow of air into the room with hood fan off is 208 + 7.88 = 216 cfm. As a comparison, the airflow out of the room is 183 vs into the room 216 (after baffle removal). Even with the baffle removal, there is indiscernible negative pressure as opposed to 5 times the inflow. When I was there with the baffle in place, it was likely even less discernable.

Based on this, I didn't review any of your further calculations because I think the math needs to be revisited (or more clearly explained) and then carried on to your Xe clearance calculation.

Another observation is that I'm not convinced that when the hood blower is on that there isn't backflow into the decay bin. Has this been examined or evaluated?

As for the gauge on the front of the hood blower, I noticed that it reads out in inches water column. I believe that this gauge therefore likely represents the difference in pressure across the filter and can be used as an indicator of the need for filter replacement rather than a direct indication of air flow.

If you want to reevaluate your calculations, you can. Additionally, I was wondering if A and B were correct on your drawing or if they are reversed. The text in your writeup would lead me to believe that either the drawing or the writeup perhaps are not correct or maybe I am misunderstanding the setup.

Also, please don't submit dose information with employee names. It is preferable to use designations such as Pharmacist 1, Pharmacist 2, etc.

Another thing to consider is that if you are going to replace the hood and not use a dose calibrator in the hood, you may need to review other procedures tied down to your license, such as the section on "Procedures for handling radioiodine" from license application dated 9/21/2005 and determine if any revisions are necessary. If so, those revisions to the procedures would also need to be submitted to NRC in the amendment request to change the hood.

Janine

Janine F. Katanic, PhD, CHP

Senior Health Physicist

US Nuclear Regulatory Commission

Region IV

Division of Nuclear Materials Safety

office: 817-200-1151

email: Janine.Katanic@nrc.gov

From: Advanced Isotopes [mailto:nukedoses@gmail.com]
Sent: Monday, June 01, 2015 5:57 PM
To: Katanic, Janine
Subject: Evaluation of Iodine Room at Advanced Isotopes

Hello Dr. Katanic,

I have attached several documents to this email. The first is the evaluation of the iodine room with a proposed solution (labeled "NRC Inspection Response").

The second is a diagram of the ventilation and air monitoring system for the I-131 room at Advanced Isotopes (labeled "Current I-131 Room Diagram) and the third is the calibration certificate for our anemometer (labeled "anemometer"). The fourth is the product information for the hood we are proposing to purchase.

If you have questions or concerns, please let me know. We look forward to your input.

Sincerely,

Cathy Heyneman and Nicki Chopski

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Chubbuck, ID 83202

(208) 237-9730

(208) 237-6878 (message line)

(208) 237-9432 (fax)

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June 15, 2015

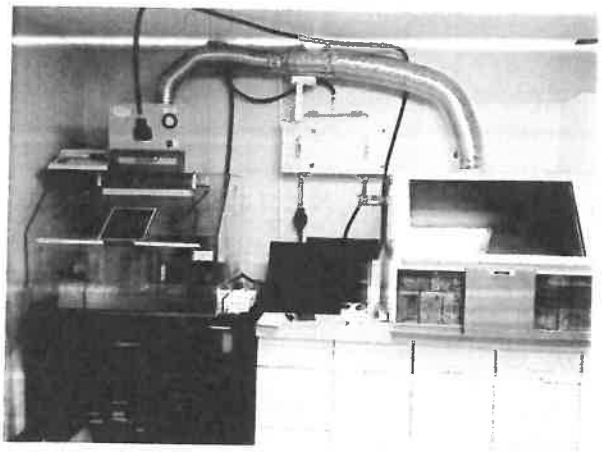
Dear Dr. Katanic,

We greatly appreciate the opportunity to address any potential items of concern found during your inspection of our pharmacy on May 18, 2015. I have attempted to address your concerns one by one below:

1. What is there on site currently is not what was submitted to NRC in the license application, so the facilities are not as described in the application.

There were modifications made by the previous RSO to allow for the incorporation of a dose calibrator into the I-131 hood, as well as a light fixture inside the hood. These modifications should have been reported, and the modifications were not made in a manner consistent with keeping exposures ALARA. When we asked our consultant to review the setup, he was unaware that this was not what was submitted to the NRC in the license application.

The current setup is diagrammed in the attachment labeled "Current I-131 Room Diagram." I have included a photo below for reference:



2. What is the current air volume through the system? It is indiscernible whether or not the room is under negative pressure. With the hole in the wall pushing air into the room, and the seemingly minimal flow through the hood/lexan glove box, it does not appear that the room is under continuous negative pressure.

Outflow of Air

There are three points of entry into the air outflow from the I-131 room – all being vented through the charcoal barrel filter:

1. Air return opening (point "F" in the diagram) measuring 9" x 3.25" (0.203 ft^2) that draws 340 linear ft of air/min out of the room:

340 ft/min x 0.203 ft squared = 69 cfm (cubic feet/min) on 6/14/15

2. The second entry is through the I-131 Hood (point "D" in the diagram).

3. The third entry point is a decay hood (point "E" in the diagram).

All of these converge and pass through point "B" in the diagram, a pipe with a diameter of 4 inches (Area of pipe = 0.0872 ft^2). On 3/2/15 a reading of 1230 linear feet/min, using Fisher Scientific Anemometer Model 1-241, serial #61603364 (calibration provided as an attachment to this document) was observed. The flow was calculated as follows:

1230 ft/min x 0.0872 ft^2 = 107.2 cfm (cubic feet/min) on 3/2/15

A baffle within the charcoal filtration barrel that acted as a barrier to prevent the charcoal from blowing out was found to be obstructing outflow (at point "A") and was cleared out on 5/29/15, and the airflow was adjusted to blow downward as it enters the charcoal to allow more surface area for contact on 6/13/15; an outflow reading taken at point "B" in the diagram on 6/14/15 was 2500 linear ft/min:

2500 ft/min x 0.0872 ft^2 = 218 cfm (cubic feet/min) on 6/14/15.

Therefore, the pump upstairs is currently drawing 218 cfm of air through the carbon filtration system.

Total air out of iodine room (with hood fan off) = 218 cfm as of 6/14/15

- **69 cfm is from the room ventilation**
- **When you subtract 69 cfm from the 218 cfm, this leaves 149 cfm from a combination of the I-131 hood and the decay hood**

Inflow of Air

On 5/23 and 6/13, respectively, the hole in the wall next to the I-131 hood and the hole in the ceiling where the air sampling hoses pass through into the room were patched and sealed.

Air in = flow through HVAC system vent measuring 11.5" x 3.25" (measured at 200 linear ft/min on 6/14/15 with the vent louvers shut):

200 ft/min x 0.26 ft^2 = 52 cfm (cubic feet/min) on 6/14/15

There is also a measurable 140 linear ft/min airflow entering from under the door into the iodine room. If this opening is estimated at 0.5" x 36" (0.125 ft^2) at the bottom and 1/8" x 83.5" on the side (0.072 ft^2), then:

140 ft/min x (0.125 ft^2+ 0.072 ft^2) = 27.6 cfm on 6/14/15

Total air into iodine room (with hood fan off) = 52 + 27.6 = 79.6 cfm

When you visited our facility there was little air entering the I-131 room through the doorway. Since then we have reduced the inflow from the HVAC by closing the louvers, and repairing/closing any obvious openings through the walls and ceiling.

At this point you can feel a significant amount of air entering through the doorway, and has been verified by the fact that we have seen the anemometer reading increase from 40 linear feet/min to 140 linear feet/min once the main air entry points were sealed. The anemometer reading of 140 linear feet/min is likely an underestimate because the anemometer could only assess a fraction of the airflow around the door (because of the relative size of the anemometer vs. the size of the cracks around the door) giving a lower estimate of what is truly occurring.

All air exiting this room goes through the charcoal filtration barrel, and this charcoal was not reading above background levels with survey meter A on 5/29/15.

3. The license application states that the ventilation for the iodine hood will be checked semi-annually to ensure adequate airflow and confirm negative pressure in the area around the hood. Do you have the results of this semi-annual test?

Airflows at point "B" have been measured semi-annually and documented in the annual reports.

	Exhaust airflow at point "B"
1/20/2014	227.5 cfm
5/30/2014	236.2 cfm
3/2/2015	643.7 cfm (after new pump installed 2/20/15)
5/29/2015	1103.5 cfm* (after baffle in carbon filtration drum cleared) (*incorrect value due to miscalculation of surface area)
6/15/2015	218 cfm (after air flow reworked to maximize surface area of contact with activated charcoal)

Once the decay hood was installed, we did verify that there was no backflow from the I-131 hood when the blower was on. If you place the anemometer in the opening of the decay hood, it reads 170 linear ft/min when the I-131 hood blower is off, and 60 linear ft/min when the blower is on. Therefore, uptake of air is reduced from the decay hood when the blower is on, but the pressure remains negative so there is no backflow.

4. The license application also says that the airflow through the hood will be confirmed before each use. What is the method that staff are supposed to be using to confirm this? My concern is that if the unit is not pulling enough air, and if I-131 was spilled in mCi quantities, due to the "modifications"

made to the hood/lexan glove box, there may be escape of material into the working zone resulting in uptakes and/or contamination.

The airflow through the hood should be confirmed by checking the flow meter on the front of the blower that sits just above the hood. Upon checking, this meter does not deflect appropriately when the blower is turned on. I have taped a small piece of paper towel from the inside ceiling of the hood near the blower, and all pharmacists have been instructed to make certain that the paper is sucked upwards by the blower to verify air movement prior to drawing any I-131.

I am proposing that we purchase a new system (Biodex Iodination Fume Hood #190-210 – see attachment labeled "Biodex Hood"). This system provides an adjustable blower that will be left on continuously on "low" and turned to "high" whenever the pharmacist is working in the hood. I propose that we utilize the anemometer to document air flow through the hood, with an appropriate action level to be determined once the hood is in place.

I understand your level of concern if there were to be an I-131 spill in the current hood, particularly given that it has been modified and not sealed properly. I propose that we will not place a dose calibrator in the new hood, since almost all of our capsule preparations are in the microcurie range and are measured more accurately with the Capintec 25R that is currently located in the east hood. That is the only dose calibrator that reads microcurie quantities of I-131 reliably without fluctuation. If we do not incorporate the dose calibrator into the new hood, no modifications of this hood would be necessary. The chances of an I-131 spill aerosolizing through this new system would be significantly reduced compared to our current setup.

5. As far as the spilled Xe gas clearance times, I would like to know where the air flow volume number came from. The anemometer can only read out in linear feet per minute, not cubic feet per minute, so how was this number determined to be used in the calculation. Basically I am trying to understand the numbers used in your calculation and where they came from. Also, for your most recent calculation, was this done before or after the ventilation system was modified?

The most recent calculation was done after the ventilation system was modified.

The air flow volume number was derived from the linear feet per minute (from the anemometer) and multiplied by the square footage of the 4" round vent:

Ventilation rate was calculated based on the following:

Room dimensions 14 ft x 14 ft x 8 ft = 1568 cubic feet.

Air flow measured by Fisher Scientific Anemometer Model 1-241, serial #61603364.

Exhaust airflow on 6/14/2015 at 2500 linear ft/min with a diameter of 4 inches (round), which converts to 0.0872 ft^2 in area.

2500 ft/min x 0.0872 ft^2 = 218 cfm (cubic feet/min) (this is the exhaust flow rate from the I-131 room)

218 cfm = 6.173×10^6 mL/min (total air exhaust conversion to metric)

Maximum amount of Xe-133 on hand at any one time per vial is 40 mCi.

Clearance time was calculated as follows:

$$-V/Q \times \ln (C \times V/A)$$

Where:
V = volume of the storage room in mL = 1568 cubic ft x 28320 mL/cubic ft = 4.44×10^7 mL
Q = total air exhaust in mL/min = 6.173×10^6 mL/min
C = MPC for Xe-133 in µCi/mL = 10^{-4}
A = highest activity of gas in a single container = 40 mCi = 40000 µCi

Substituting these values into the equation above yields:

$$-4.44 \times 10^7 \text{ mL}/6.173 \times 10^6 \text{ mL/min} \times \ln (10^{-4} \times 4.44 \times 10^7 \text{ mL} / 40000 \text{ µCi})$$

Where DAC (per NRC) is 0.0001 µCi/mL
1 cfm = 28316.8466 mL/min

Clearance Time = 15.8 minutes as of 6/14/2015

Please note that this has been changed on the posting outside the I-131 room as of 6/14/2015.

6. If you do replace or modify the system, the drawings and specifications need to be submitted to NRC in an amendment request. We can talk more about this after you and Nicki complete your evaluation.

After much discussion, we feel that the current setup has worked adequately from the perspective of low measured I-131 air concentrations both in the I-131 room and in the effluent as well as documentation of low bioassay values in 2014:

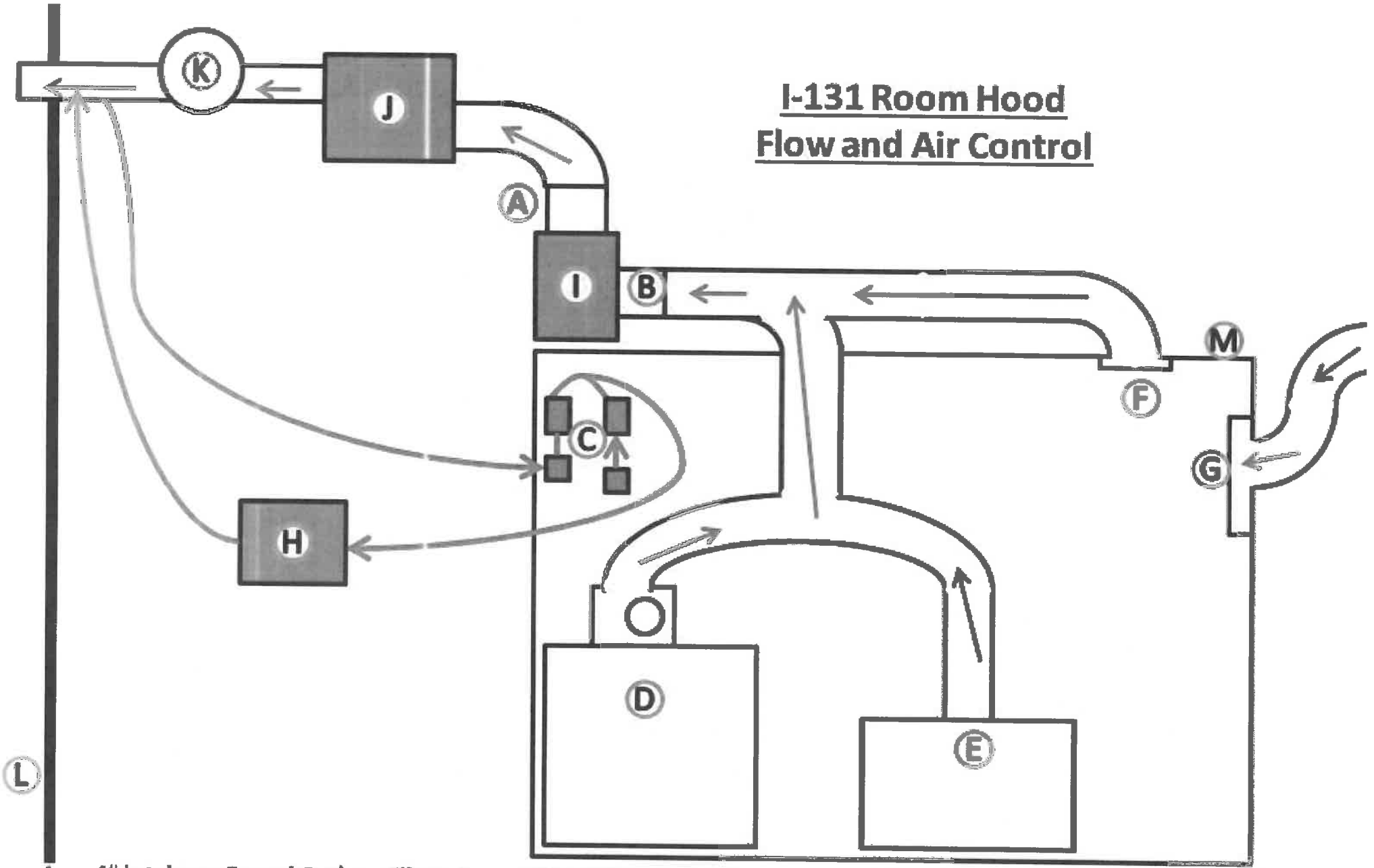
Employees Involved in Compounding I-131	Total I-131 Exposure Calculated for 2014
Pharmacist 1	0.00711 µCi
Pharmacist 2	0.00377 µCi
Pharmacist 3	0.00675 µCi

However, the potential for aerosolized I-131 to exit the current modified hood in the event of a millicurie spill or cracked vial is a significant concern – I have attached the operation manual of the Biodex Iodination Fume Hood that we are proposing to purchase to address this concern. Please let me know if this meets with your approval. If so I will proceed with a license amendment to this effect (including modifications to our procedures for handling radioiodine).

Sincerely,

Catherine Heyneman, ANP, RSO
Advanced Isotopes of Idaho

I-131 Room Hood
Flow and Air Control



A. 4" intake to Barrel Carbon Filter
B. Baffle/Screen
C. Carbon puck samples with individual air rate gauges
D. Hood
E. Decay Bin
F. Air Return (9"x3¼")
G. Heat & Cooling Vent (11½"x3¼")
H. Vacuum Pump
I. Barrel Carbon Filter
J. Carbon Trap
K. Exhaust Fan
L. Outside Wall
M. Ceiling

Calibration complies with ISO/IEC 17025 and ANSI/NCSL Z540-1

Cert. No.:4091-1297373

Traceable® Certificate of Calibration for Digital Anemometer/Thermometer

Instrument Identification:

Model: 01-241 S/N: 61603364 Manufacturer : Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Air Velocity Standard	40-01-02275	10/10/06	275-14008

Certificate Information:

Technician: 76 Procedure: CAL-4091 Cal Date: 3/31/06 **Cal Due: 3/30/08**

Test Conditions: 23.0°C 53.0 %RH 1016 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±uc	TUR
FPM		N.A.		400	41	Y	38	42	4	>4:1
FPM		N.A.		600	62	Y	58	62	4	>4:1
FPM		N.A.		785	80	Y	75	82	4	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full.

Wallace Berry

Wallace Berry, Technical Manager

Maintaining Accuracy:

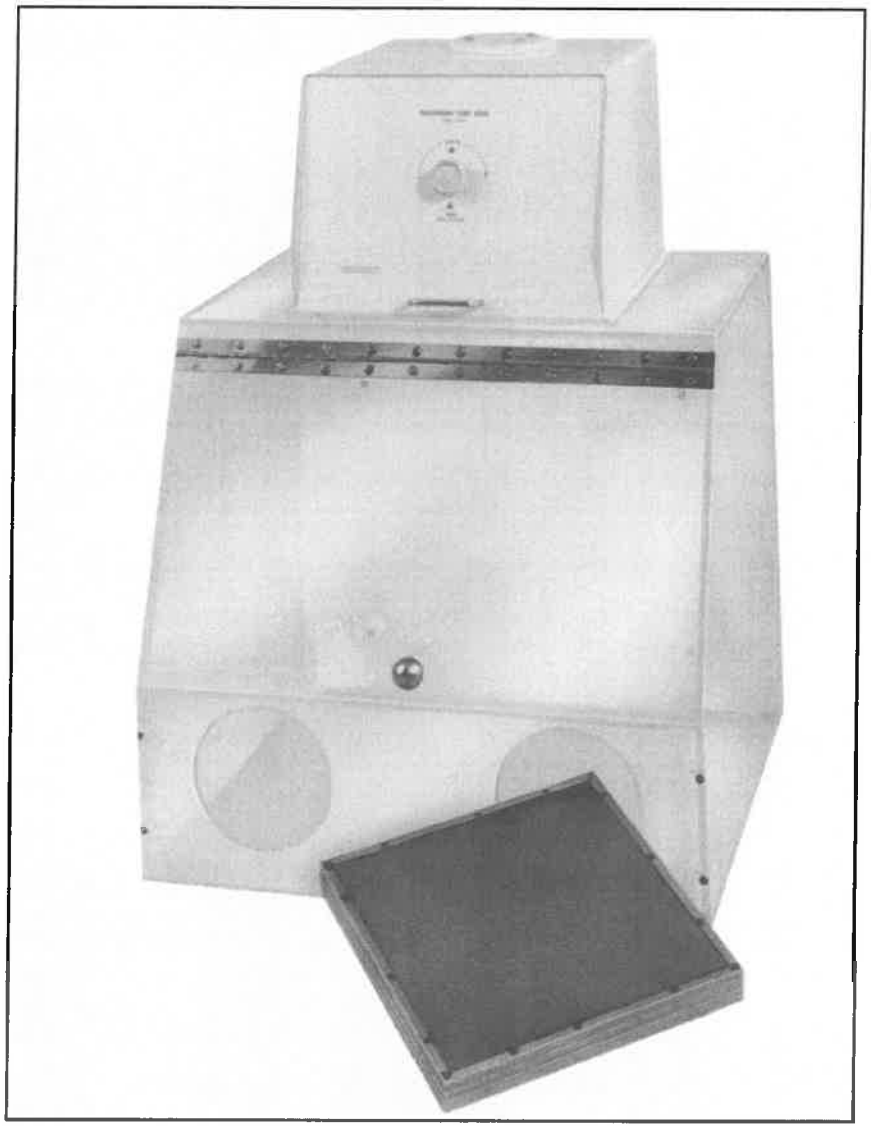
In our opinion once calibrated your Digital Anemometer/Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Anemometer/Thermometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

OPERATION MANUAL

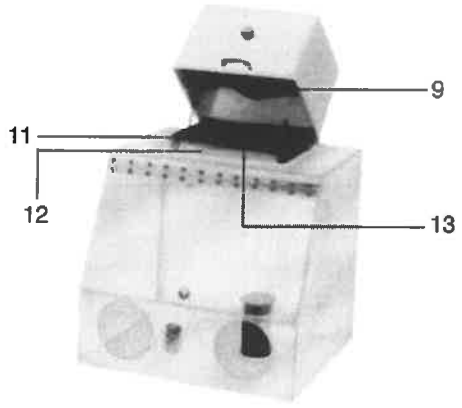


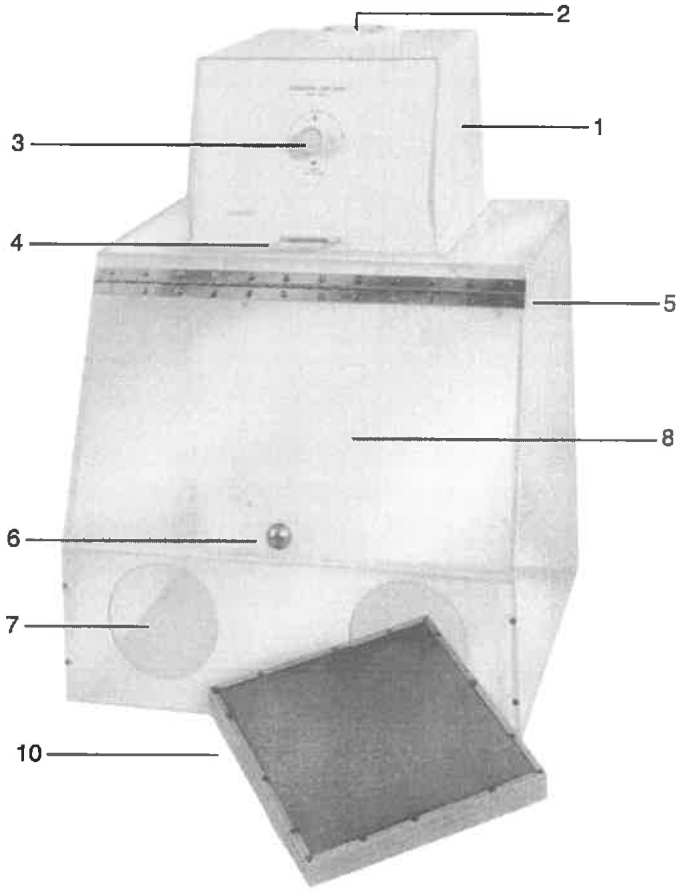
Iodination Fume Hood *(#190-210)*

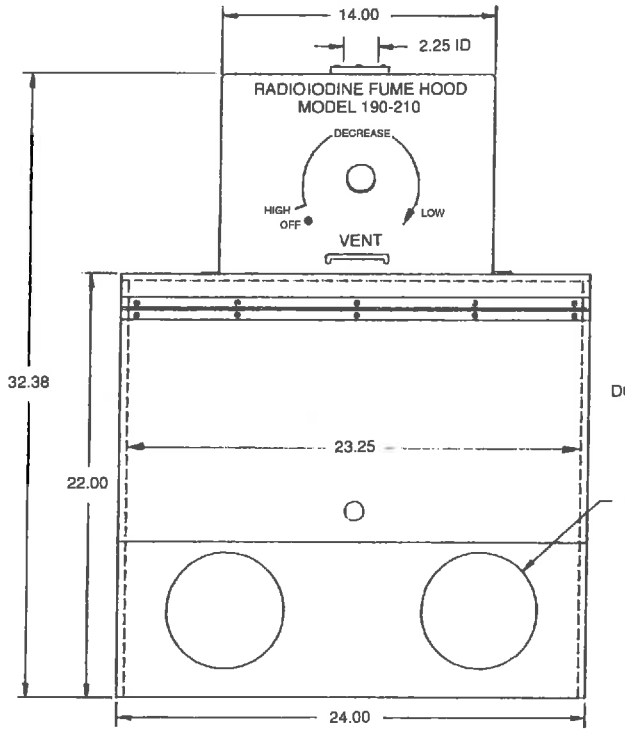
BIODEX
Biodex Medical Systems, Inc.
20 Ramsay Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 *(In NY and Int'l. call 631-924-9000)*. Fax: 631-924-9241, Email: sales@biodex.com, www.biodex.com

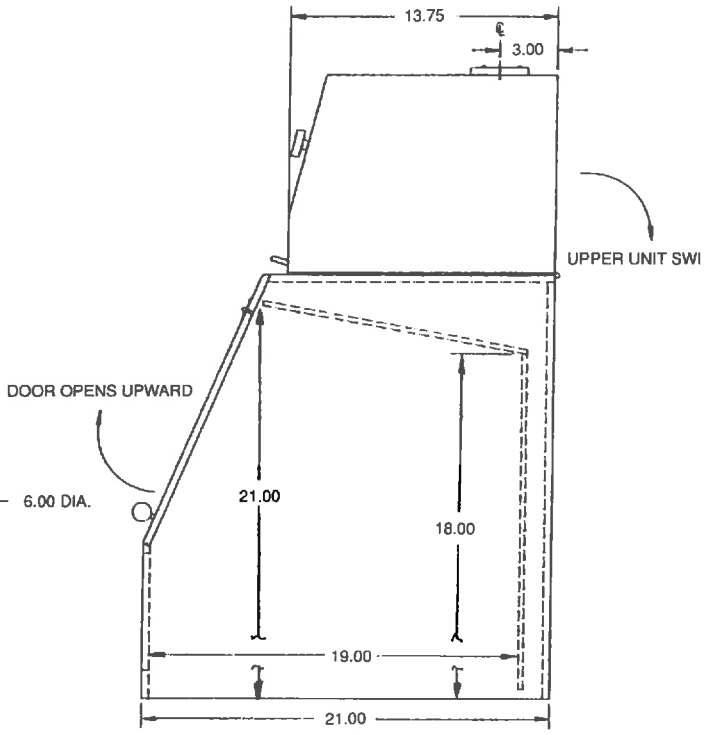
FN: 04-044 1/04

1. Metal Box Assembly Containing Motor and Filter
2. Exhaust Port
3. Air Flow Control
4. Handle to Raise Motor Housing
5. Air Baffle
6. Knob to Open Fume Hood
7. Hand Port
8. Door to Fume Hood
9. Motor
10. Top of Hood
11. Gasket
12. Flange
13. Filter









RADIOIODINE FUME HOOD
190-210

IODINATION FUME HOOD

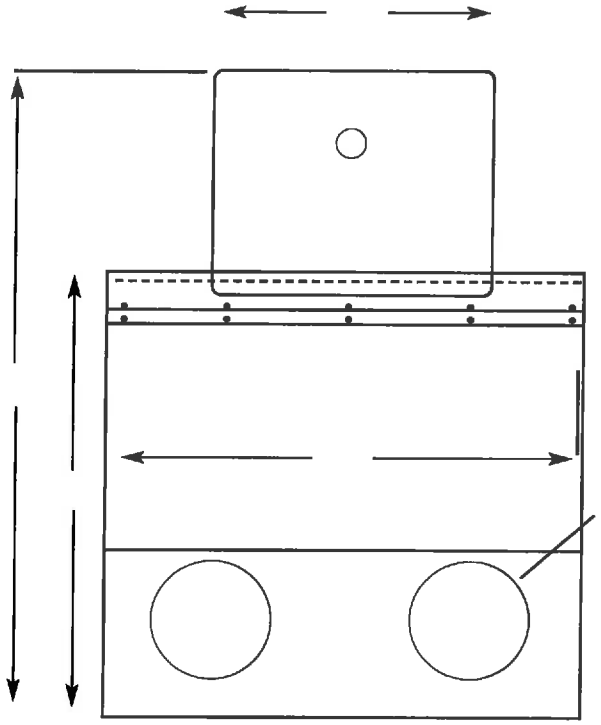
Set Up Procedures:

Save all packaging until installation is complete.

1. Remove packing from unit.
2. Securely place fume hood on work surface.
3. Inspect hood for cracks in plexiglass. If there is any damage to hood, report it to Biodex Medical Systems immediately. (Save all packing if unit is damaged.)
4. Remove knob from door to hood and reverse its position so the handle is on the outside.
5. The white metal cabinet on the top of the unit is the motor assembly. Open motor assembly by lifting up on handle on front of motor assembly.
6. Remove the filter model #112-036 from the plastic bag it is shipped and stored in. Place it snugly into the filter holder on front of motor assembly.

NOTE: Two filters can be used by setting one on top of the other.

7. Close motor assembly.
8. If desired, the elbow supplied with unit can be fitted on top of the motor assembly and a hose to an outside vent can be connected.
9. Plug into 110 volt or appropriate receptacle.
10. Turn power switch on and adjust the airflow control. If the motor does not run, check the fuses. If there is a problem, call Biodex Medical Systems Service Department.



Instructions for Use:

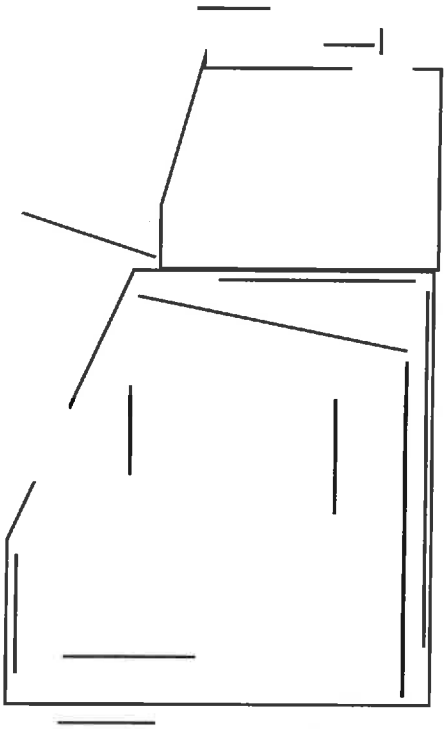
1. Turn the hood on.
2. Open the door on the front of the fume hood and place your containers and vials inside of hood.
3. Close the door.
4. To work with the hood, place your gloved hands into the hood through the hand ports on the front of the unit.

Maintenance:

1. When performing charcoal filter surveys, observe the fan motor. If dusty or dirty, clean with a dry cloth.
2. To ensure that the system is operating properly, a determination of linear flow at the arm ports, using an anemometer, should be taken quarterly. Compare this value to the baseline determination obtained at installation. If flow decreases 20% or more below the baseline values, change the filter(s).
3. Ensure that all the nuts and bolts are tight on the motor housing and hood.

Method to Survey and Change the Filter in a Two-Filter System

1. Disconnect exhaust pipe connector from fume hood.
2. Lift filter housing lid.
3. Put on disposable gloves.
4. Remove top filter. Survey with low level survey meter and pancake probe. Record mr/hr or CPM.
5. Set filter on absorbent pad used in standard laboratory fume hood.
6. Remove bottom filter and survey with low level survey meter. Record mr/hr or CPM



7. Calculate the ratio of the radiation level on the top filter to the radiation level of the bottom filter and express it as a percentage.

NOTE: When the radiation level is greater than or equal to 10% of the bottom filter radiation level, the bottom filter should be discarded into RAM waste storage (make sure you seal the charcoal filter in a plastic bag before discarding into RAM waste).

8. Replace old top charcoal filter in unit. This filter now becomes the bottom filter.
9. Place new (unused) filter into the top position. Close the baffle housing lid and reconnect unit to fume hood.

NOTE: The charcoal filters in this device are surveyed weekly. However the bottom filter is replaced as necessary only when the top filter indicates that the bottom filter allows greater than 10% of the I-131 to pass through it.

Katanic, Janine

From: Advanced Isotopes <nukedoses@gmail.com>
Sent: Thursday, June 04, 2015 12:39 PM
To: Katanic, Janine
Subject: Re: Evaluation of Iodine Room at Advanced Isotopes

Hello Dr. Katanic,

You are absolutely correct - I made some errors converting inches in diameter to area in square feet. I am working on correcting all the calculations that follow and have scheduled our maintenance guy to seal the holes in the ceiling at the end of next week.

Is it acceptable if we get that sealed and repeat this evaluation and associated calculations for submission to you on June 15?

I sincerely apologize that this is taking more of your time than it should,

Cathy

On Tue, Jun 2, 2015 at 4:42 PM, Katanic, Janine <Janine.Katanic@nrc.gov> wrote:

> Hi Cathy and Nicki,
>
> Thanks for sending in the answers to my questions. I took a quick look at your documents and have some observations.
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Therefore the total inflow of air into the room with hood fan off is 208 + 7.88 = 216 cfm. As a comparison, the airflow out of the room is 183 vs into the room 216 (after baffle removal). Even with the baffle removal, there is indiscernible negative pressure as opposed to 5 times the inflow. When I was there with the baffle in place, it was likely even less discernable.

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Another observation is that I'm not convinced that when the hood blower is on that there isn't backflow into the decay bin. Has this been examined or evaluated?

As for the gauge on the front of the hood blower, I noticed that it reads out in inches water column. I believe that this gauge therefore likely represents the difference in pressure across the filter and can be used as an indicator of the need for filter replacement rather than a direct indication of air flow.

If you want to reevaluate your calculations, you can. Additionally, I was wondering if A and B were correct on your drawing or if they are reversed. The text in your writeup would lead me to believe that either the drawing or the writeup perhaps are not correct or maybe I am misunderstanding the setup.

Also, please don't submit dose information with employee names. It is preferable to use designations such as Pharmacist 1, Pharmacist 2, etc.

Another thing to consider is that if you are going to replace the hood and not use a dose calibrator in the hood, you may need to review other procedures tied down to your license, such as the section on "Procedures for handling radioiodine" from license application dated 9/21/2005 and determine if any revisions are necessary. If so, those revisions to the procedures would also need to be submitted to NRC in the amendment request to change the hood.

Janine

Janine F. Katanic, PhD, CHP

Senior Health Physicist

US Nuclear Regulatory Commission

Region IV

Division of Nuclear Materials Safety

office: 817-200-1151

email: Janine.Katanic@nrc.gov

From: Advanced Isotopes [mailto:nukedoses@gmail.com]
Sent: Monday, June 01, 2015 5:57 PM
To: Katanic, Janine
Subject: Evaluation of Iodine Room at Advanced Isotopes

Hello Dr. Katanic,

I have attached several documents to this email. The first is the evaluation of the iodine room with a proposed solution (labeled "NRC Inspection Response").

The second is a diagram of the ventilation and air monitoring system for the I-131 room at Advanced Isotopes (labeled "Current I-131 Room Diagram) and the third is the calibration certificate for our anemometer (labeled "anemometer"). The fourth is the product information for the hood we are proposing to purchase.

If you have questions or concerns, please let me know. We look forward to your input.

Sincerely,

Cathy Heyneman and Nicki Chopski

--

Advanced Isotopes of Idaho

4968 Rainbow Lane

Chubbuck, ID 83202

(208) 237-9730

(208) 237-6878 (message line)

(208) 237-9432 (fax)

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Advanced Isotopes of Idaho
4968 Rainbow Lane
Chubbuck, ID 83202
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(208) 237-6878 (message line)
(208) 237-9432 (fax)

Katanic, Janine

From: Katanic, Janine
Sent: Tuesday, June 02, 2015 5:42 PM
To: Advanced Isotopes
Subject: RE: Evaluation of Iodine Room at Advanced Isotopes

Hi Cathy and Nicki,

Thanks for sending in the answers to my questions. I took a quick look at your documents and have some observations.

On page 2, it is noted that there is "a pipe with a diameter of 4 inches (area of pipe = 0.523 square foot)," However, I believe that a pipe with a 4 inch diameter is 0.087 square feet, not 0.523 square feet. Just at face value, it is not logical that a 4 inch pipe is half a square foot area. If the pipe is indeed 4 inches diameter, the rest of the calculations need to be reviewed. Or maybe you can explain how you calculated 0.523 ft2. Maybe I just don't understand how you determined that value.

If we assume that the value is 0.087 ft2, for the outflow of air, if you redo the first calculation you get 107 cfm not 643 cfm. Then with the baffle removed/cleared you get 183 cfm not 1103.5 cfm. Therefore the total iodine out of room with hood fan off is 183 cfm.

For the inflow of air, thank you for patching the hole in the wall but I also noticed when I was there that there is a hole in the ceiling as well, where the air sampler lines lead into the room. For these calculations, there is a mathematical error in that 800 times 0.26 is 208 cfm not 180 cfm. As for the gaps in the door the value used was 0.869 ft2 but should be 0.072 ft2. It is not logical that the gaps in the door are almost a square foot area so I think this needs to be reevaluated. Using 0.072 ft2 makes the resultant value 7.88 cfm not 39.8 cfm.

Therefore the total inflow of air into the room with hood fan off is 208 + 7.88 = 216 cfm. As a comparison, the airflow out of the room is 183 vs into the room 216 (after baffle removal). Even with the baffle removal, there is indiscernible negative pressure as opposed to 5 times the inflow. When I was there with the baffle in place, it was likely even less discernable.

Based on this, I didn't review any of your further calculations because I think the math needs to be revisited (or more clearly explained) and then carried on to your Xe clearance calculation.

Another observation is that I'm not convinced that when the hood blower is on that there isn't backflow into the decay bin. Has this been examined or evaluated?

As for the gauge on the front of the hood blower, I noticed that it reads out in inches water column. I believe that this gauge therefore likely represents the difference in pressure across the filter and can be used as an indicator of the need for filter replacement rather than a direct indication of air flow.

If you want to reevaluate your calculations, you can. Additionally, I was wondering if A and B were correct on your drawing or if they are reversed. The text in your writeup would lead me to believe that either the drawing or the writeup perhaps are not correct or maybe I am misunderstanding the setup.

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Another thing to consider is that if you are going to replace the hood and not use a dose calibrator in the hood, you may need to review other procedures tied down to your license, such as the section on "Procedures for handling radioiodine" from license

application dated 9/21/2005 and determine if any revisions are necessary. If so, those revisions to the procedures would also need to be submitted to NRC in the amendment request to change the hood.

Janine

Janine F. Katanic, PhD, CHP
Senior Health Physicist
US Nuclear Regulatory Commission
Region IV
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office: 817-200-1151
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From: Advanced Isotopes [mailto:nukedoses@gmail.com]
Sent: Monday, June 01, 2015 5:57 PM
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Subject: Evaluation of Iodine Room at Advanced Isotopes

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If you have questions or concerns, please let me know. We look forward to your input.

Sincerely,

Cathy Heyneman and Nicki Chopski

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4968 Rainbow Lane
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(208) 237-9730
(208) 237-6878 (message line)
(208) 237-9432 (fax)

Katanic, Janine

From: Advanced Isotopes <nukedoses@gmail.com>
Sent: Monday, June 01, 2015 5:57 PM
To: Katanic, Janine
Subject: Evaluation of Iodine Room at Advanced Isotopes
Attachments: Anemometer.pdf; NRC Inspection Response Letterhead.doc; Biodex Hood.pdf; Current I-131 Room Diagram.jpg

Hello Dr. Katanic,

I have attached several documents to this email. The first is the evaluation of the iodine room with a proposed solution (labeled "NRC Inspection Response").

The second is a diagram of the ventilation and air monitoring system for the I-131 room at Advanced Isotopes (labeled "Current I-131 Room Diagram) and the third is the calibration certificate for our anemometer (labeled "anemometer"). The fourth is the product information for the hood we are proposing to purchase.

If you have questions or concerns, please let me know. We look forward to your input.

Sincerely,

Cathy Heyneman and Nicki Chopski

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Advanced Isotopes of Idaho

4968 Rainbow Lane
Chubbuck, ID 83202
208.237.9730 voice
208.237.9432 fax
doses@advancedisotopes.com

May 29, 2015

Dear Dr. Katanic,

We greatly appreciate the opportunity to address any potential items of concern found during your inspection of our pharmacy on May 18, 2015. I have attempted to address your concerns one by one below:

1. What is there on site currently is not what was submitted to NRC in the license application, so the facilities are not as described in the application.

There were modifications made by the previous RSO to allow for the incorporation of a dose calibrator into the I-131 hood, as well as a light fixture inside the hood. These modifications should have been reported, and the modifications were not made in a manner consistent with keeping exposures ALARA. When we asked our consultant to review the setup, he was unaware that this was not what was submitted to the NRC in the license application.

The current setup is diagrammed in the attachment labeled "Current I-131 Room Diagram." I have included a photo below for reference:

2. What is the current air volume through the system? It is indiscernible whether or not the room is under negative pressure. With the hole in the wall pushing air into the room, and the seemingly minimal flow through the hood/lexan glove box, it does not appear that the room is under continuous negative pressure.

Outflow of Air

There are three points of entry into the air outflow from the I-131 room – all being vented through the charcoal barrel filter:

1. Air return opening of 9" x 3.25" (0.2 ft^2 foot) that draws 300 linear ft of air/min out of the room:

300 ft/min x 0.203 ft squared = 60.9 cfm (cubic feet/min) on 5/29/15

2. The second entry is through the I-131 Hood.

3. The third entry point is a decay bin.

All of these converge and pass through point "A" in the diagram, a pipe with a diameter of 4 inches (Area of pipe = 0.523 square foot). On 3/2/15 a reading of 1230 linear feet/min, using Fisher Scientific Anemometer Model 1-241, serial #61603364 (calibration provided as an attachment to this document) was observed. The flow was calculated as follows:

1230 ft/min x 0.523 ft squared = 643.7 cfm (cubic feet/min) on 3/2/15

A baffle within the charcoal filtration barrel that acted as a barrier to prevent the charcoal from blowing out was found to be obstructing outflow (at point "B") and was cleared out on 5/29/15, and an outflow reading taken at point "A" in the diagram at that time was 2110 ft/min:

2110 ft/min x 0.523 ft squared = 1103.5 cfm (cubic feet/min) on 5/29/15.

Therefore, the pump upstairs is drawing approximately 1100 cfm of air through the carbon filtration system.

Total air out of iodine room (with hood fan off) = 1103.5 cfm as of 5/29/15

Inflow of Air

Air in = leakage through hole in wall (patched on 5/23/15) + airflow in through HVAC system vent measuring 11.5" x 3.25" (measured at 800 linear ft/min on 5/29/15):

800 ft/min x 0.26 ft squared = 180.8 cfm (cubic feet/min) on 5/29/15

There is also a measurable 40 linear ft/min airflow entering from under the door into the iodine room. If this opening is estimated at 0.5" x 36" at the bottom and 1/8" x 83.5" on the side, then:

40 ft/min x (0.125 square feet + 0.869 square feet) = 39.8 cfm on 5/29/15

Total air into iodine room (with hood fan off) = 180.8 + 39.8 = 220.6 cfm

The outflow of air from the measured calculations appears to be almost 5X the inflow. However the inflows are very difficult to accurately measure because small cracks around doors, lights, electrical outlets, etc. allow air movement in but are not easily measurable. The anemometer could only assess a fraction of the airflow around the door (because of the relative size of the anemometer vs. the size of the cracks around the door) giving a lower estimate of what is truly occurring. I believe that negative pressure was not obvious during your visit because of the significant passive inflows through the hole in the wall from the old venting as well as from the HVAC providing air conditioning into that room. The hole next to the hood has since been patched and the inflow of air around the door is now more obvious, particularly when the air conditioning is turned off. See below for a photo of the patch:

All air exiting this room goes through the charcoal filtration barrel, and this charcoal was not reading above background levels with survey meter A on 5/29/15.

3. The license application states that the ventilation for the iodine hood will be checked semi-annually to ensure adequate airflow and confirm negative pressure in the area around the hood. Do you have the results of this semi-annual test?

Airflows at point "A" have been measured semi-annually and documented in the annual reports.

	Exhaust airflow at point "A"
1/20/2014	227.5 cfm
5/30/2014	236.2 cfm
3/2/2015	643.7 cfm (after new pump installed 2/20/15)
5/29/2015	1103.5 cfm (after baffle in carbon filtration drum cleared)

4. The license application also says that the airflow through the hood will be confirmed before each use. What is the method that staff are supposed to be using to confirm this? My concern is that if the unit is not pulling enough air, and if I-131 was spilled in mCi quantities, due to the "modifications" made to the hood/lexan glove box, there may be escape of material into the working zone resulting in uptakes and/or contamination.

The airflow through the hood should be confirmed by checking the flow meter on the front of the blower that sits just above the hood. Upon checking, this meter does not deflect appropriately when the blower is turned on.

I am proposing that we purchase a new system (Biodex Iodination Fume Hood #190-210 – see attachment labeled "Biodex Hood"). This system provides an adjustable blower that will be left on continuously on "low" and turned to "high" whenever the pharmacist is working in the hood. I propose that we utilize the anemometer to document air flow through the hood, with an appropriate action level to be determined once the hood is in place.

I understand your level of concern if there were to be an I-131 spill in the current hood, particularly given that it has been modified and not sealed properly. I propose that we will not place a dose calibrator in the new hood, since almost all of our capsule preparations are in the microcurie range and are measured more accurately with the Capintec 25R that is currently located in the east hood. That is the only dose calibrator that reads microcurie quantities of I-131 reliably without fluctuation. If we do not incorporate the dose calibrator into the new hood, no modifications of this hood would be necessary. The chances of an I-131 spill aerosolizing through this new system would be significantly reduced compared to our current setup.

5. As far as the spilled Xe gas clearance times, I would like to know where the air flow volume number came from. The anemometer can only read out in linear feet per minute, not cubic feet per minute, so how was this number determined to be used in the calculation. Basically I am trying to understand the numbers used in your calculation and where they came from. Also, for your most recent calculation, was this done before or after the ventilation system was modified?

The most recent calculation was done after the ventilation system was modified.

The air flow volume number was derived from the linear feet per minute (from the anemometer) and multiplied by the square footage of the 4" round vent:

Ventilation rate was calculated based on the following:

Room dimensions 14 ft x 14 ft x 8 ft = 1568 cubic feet.

Air flow measured by Fisher Scientific Anemometer Model 1-241, serial #61603364.

Exhaust airflow on 3/2/2015 at 1230 linear ft/min with an opening size of 4 inches (round)

Area of 4" pipe = 0.523 square foot

1230 ft/min x 0.523 ft^2= 643.7 cfm (this is the exhaust flow rate from the I-131 room)

643.7 cfm = 1.8227×10^7 mL/min (total air exhaust conversion to metric)

Maximum amount of Xe-133 on hand at any one time per vial is 40 mCi.

Clearance time was calculated as follows:

$$-V/Q \times \ln (C \times V/A)$$

Where:
V = volume of the storage room in mL = 1568 cubic ft x 28320 mL/cubic ft = 4.44×10^7 mL
Q = total air exhaust in mL/min = 1.8227×10^7 mL/min
C = MPC for Xe-133 in uCi/mL = 10^{-4}
A = highest activity of gas in a single container = 40 mCi = 40000 uCi

Substituting these values into the equation above yields:

$$-4.44 \times 10^7 \text{ mL}/1.8227 \times 10^7 \text{ mL/min} \times \ln (10^{-4} \times 4.44 \times 10^7 \text{ mL} / 40000 \text{ uCi})$$

Where DAC (per NRC) is 0.0001 uCi/mL
1 cfm = 28316.8466 mL/min

Clearance Time = 5.35 minutes as of 3/2/15

6. If you do replace or modify the system, the drawings and specifications need to be submitted to NRC in an amendment request. We can talk more about this after you and Nicki complete your evaluation.

After much discussion, we feel that the current setup has worked adequately from the perspective of low measured I-131 air concentrations both in the I-131 room and in the effluent as well as documentation of low bioassay values in 2014:

redacted

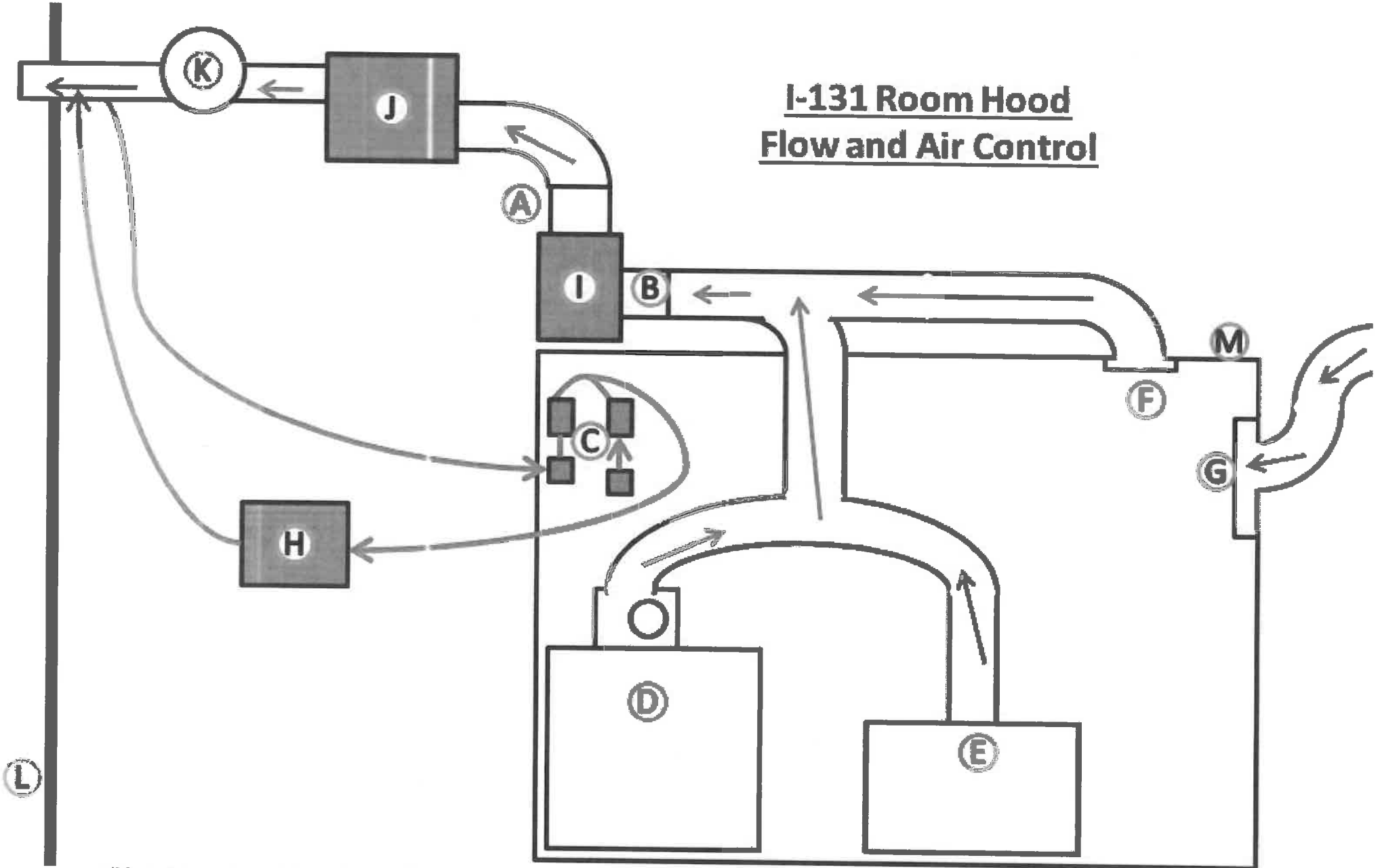
Employees Involved in Compounding I-131	Total I-131 Exposure Calculated for 2014
[redacted]	0.00711 uCi
[redacted]	0.00377 uCi
[redacted]	0.00675 uCi

However, our current negative flow indicator appears broken and the potential for aerosolized I-131 to exit the current modified hood in the event of a millicurie spill or cracked vial is a significant concern – I have attached the operation manual of the Biodex Iodination Fume Hood that we are proposing to purchase to address this concern. Please let me know if this meets with your approval. If so I will proceed with a license amendment to this effect.

Sincerely,

Catherine Heyneman, ANP, RSO
Advanced Isotopes of Idaho

I-131 Room Hood
Flow and Air Control



A. 4" intake to Barrel Carbon Filter
B. Baffle/Screen
C. Carbon puck samples with individual air rate gauges
D. Hood
E. Decay Bin
F. Air Return (9"x3¼")
G. Heat & Cooling Vent (11½"x3¼")
H. Vacuum Pump
I. Barrel Carbon Filter
J. Carbon Trap
K. Exhaust Fan
L. Outside Wall
M. Ceiling

Calibration complies with ISO/IEC 17025 and ANSI/NCSL Z540-1

Cert. No.:4091-1297373

Traceable® Certificate of Calibration for Digital Anemometer/Thermometer

Instrument Identification:

Model: 01-241 S/N: 61603364 Manufacturer : Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Air Velocity Standard	40-01-02275	10/10/06	275-14008

Certificate Information:

Technician: 76 Procedure: CAL-4091 Cal Date: 3/31/06 **Cal Due: 3/30/08**

Test Conditions: 23.0°C 53.0 %RH 1016 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±uc	TUR
FPM		N.A.		400	41	Y	38	42	4	>4:1
FPM		N.A.		600	62	Y	58	62	4	>4:1
FPM		N.A.		785	80	Y	75	82	4	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full.

Wallace Berry

Wallace Berry, Technical Manager

Maintaining Accuracy:

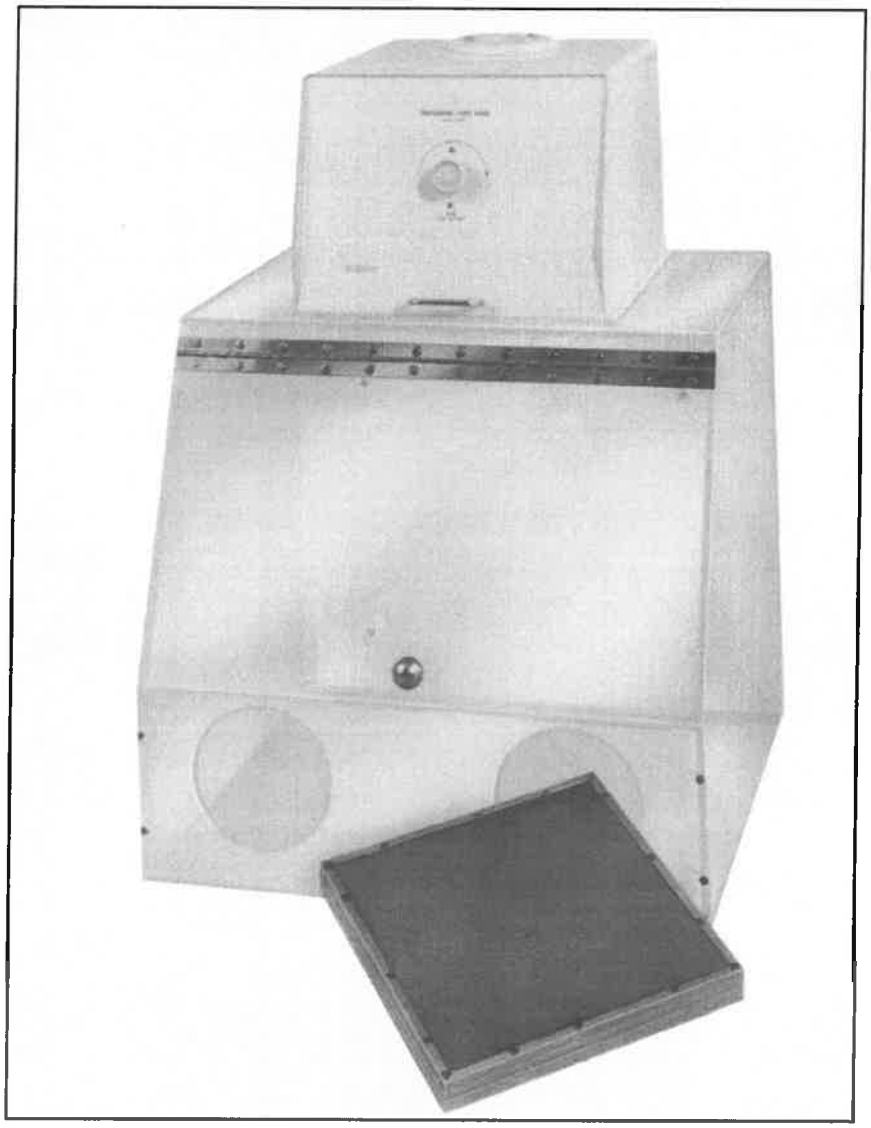
In our opinion once calibrated your Digital Anemometer/Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Anemometer/Thermometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

OPERATION MANUAL

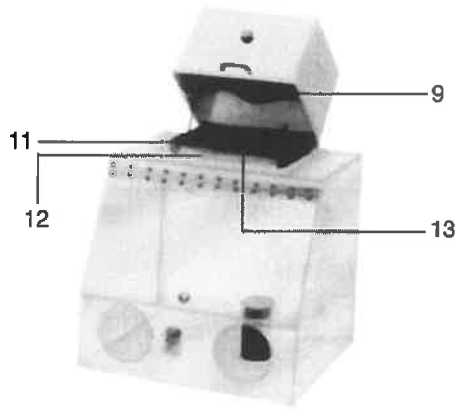


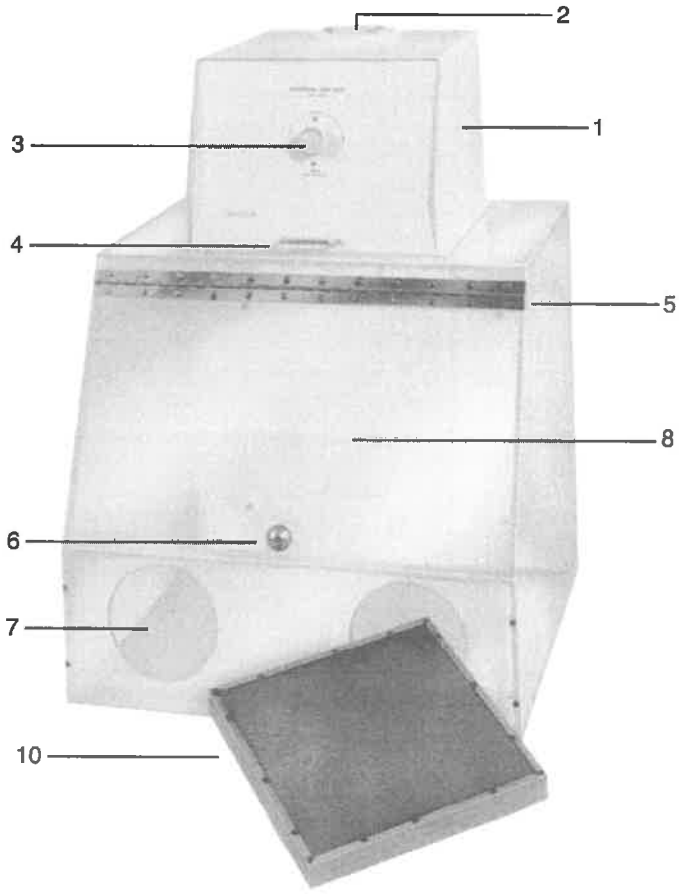
Iodination Fume Hood *(#190-210)*

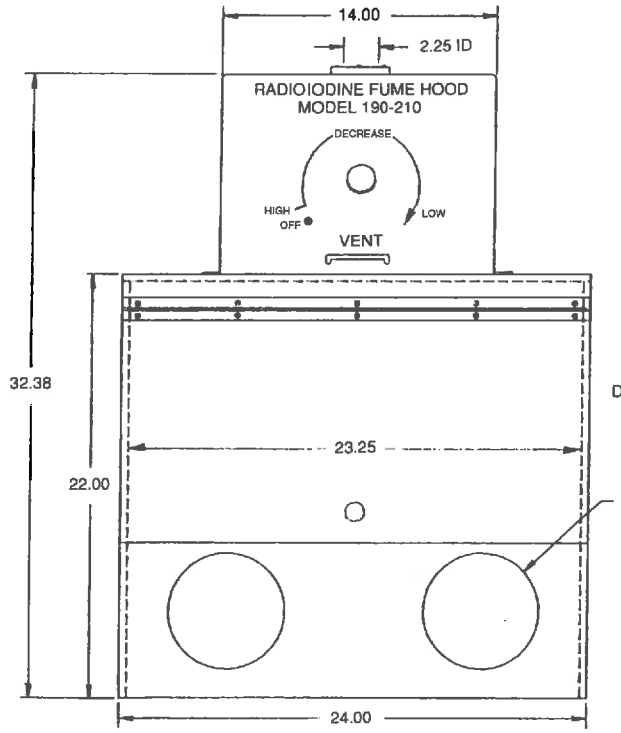
BIODEX
Biodex Medical Systems, Inc.
20 Ramsay Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 *(In NY and Int'l. call 631-924-9000).* Fax: 631-924-9241, Email: sales@biodex.com, www.biodex.com

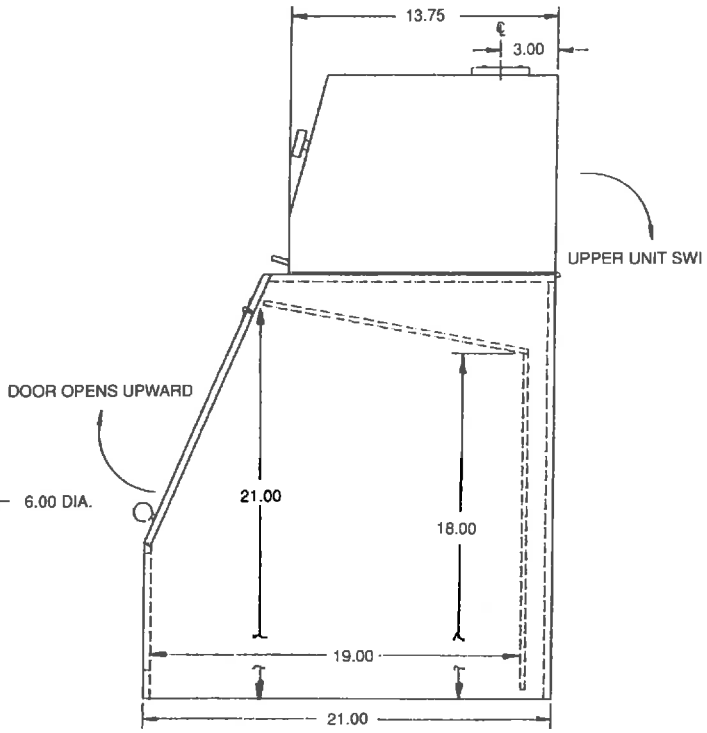
FN: 04-044 1/04

1. Metal Box Assembly Containing Motor and Filter
2. Exhaust Port
3. Air Flow Control
4. Handle to Raise Motor Housing
5. Air Baffle
6. Knob to Open Fume Hood
7. Hand Port
8. Door to Fume Hood
9. Motor
10. Top of Hood
11. Gasket
12. Flange
13. Filter









RADIOIODINE FUME HOOD
190-210

IODINATION FUME HOOD

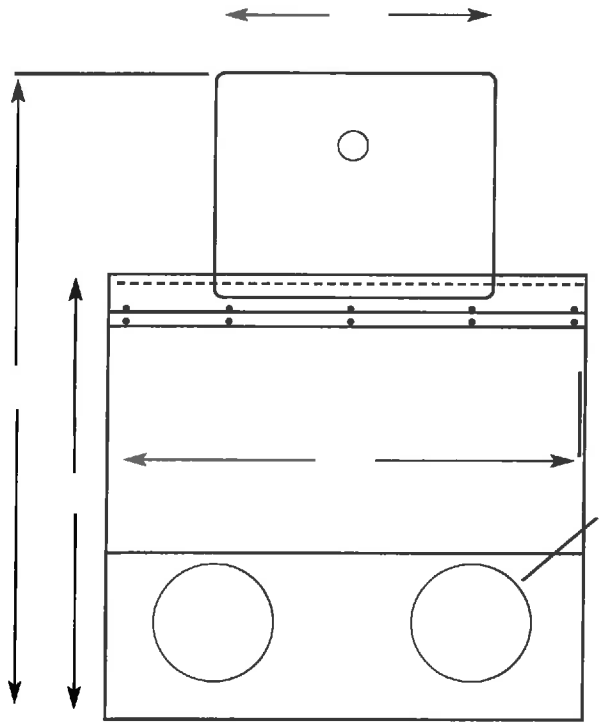
Set Up Procedures:

Save all packaging until installation is complete.

1. Remove packing from unit.
2. Securely place fume hood on work surface.
3. Inspect hood for cracks in plexiglass. If there is any damage to hood, report it to Biodex Medical Systems immediately. (Save all packing if unit is damaged.)
4. Remove knob from door to hood and reverse its position so the handle is on the outside.
5. The white metal cabinet on the top of the unit is the motor assembly. Open motor assembly by lifting up on handle on front of motor assembly.
6. Remove the filter model #112-036 from the plastic bag it is shipped and stored in. Place it snugly into the filter holder on front of motor assembly.

NOTE: Two filters can be used by setting one on top of the other.

7. Close motor assembly.
8. If desired, the elbow supplied with unit can be fitted on top of the motor assembly and a hose to an outside vent can be connected.
9. Plug into 110 volt or appropriate receptacle.
10. Turn power switch on and adjust the airflow control. If the motor does not run, check the fuses. If there is a problem, call Biodex Medical Systems Service Department.



Instructions for Use:

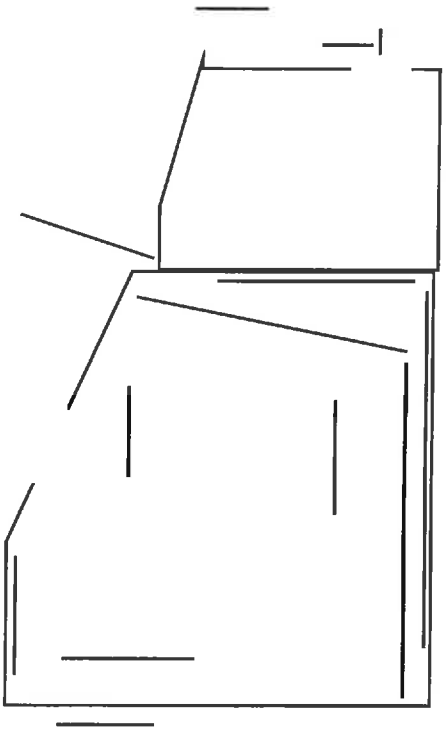
1. Turn the hood on.
2. Open the door on the front of the fume hood and place your containers and vials inside of hood.
3. Close the door.
4. To work with the hood, place your gloved hands into the hood through the hand ports on the front of the unit.

Maintenance:

1. When performing charcoal filter surveys, observe the fan motor. If dusty or dirty, clean with a dry cloth.
2. To ensure that the system is operating properly, a determination of linear flow at the arm ports, using an anemometer, should be taken quarterly. Compare this value to the baseline determination obtained at installation. If flow decreases 20% or more below the baseline values, change the filter(s).
3. Ensure that all the nuts and bolts are tight on the motor housing and hood.

Method to Survey and Change the Filter in a Two-Filter System

1. Disconnect exhaust pipe connector from fume hood.
2. Lift filter housing lid.
3. Put on disposable gloves.
4. Remove top filter. Survey with low level survey meter and pancake probe. Record mr/hr or CPM.
5. Set filter on absorbent pad used in standard laboratory fume hood.
6. Remove bottom filter and survey with low level survey meter. Record mr/hr or CPM



7. Calculate the ratio of the radiation level on the top filter to the radiation level of the bottom filter and express it as a percentage.

NOTE: When the radiation level is greater than or equal to 10% of the bottom filter radiation level, the bottom filter should be discarded into RAM waste storage (make sure you seal the charcoal filter in a plastic bag before discarding into RAM waste).

8. Replace old top charcoal filter in unit. This filter now becomes the bottom filter.
9. Place new (unused) filter into the top position. Close the baffle housing lid and reconnect unit to fume hood.

NOTE: The charcoal filters in this device are surveyed weekly. However the bottom filter is replaced as necessary only when the top filter indicates that the bottom filter allows greater than 10% of the I-131 to pass through it.

Katanic, Janine

From: Katanic, Janine
Sent: Thursday, May 28, 2015 4:02 PM
To: Advanced Isotopes
Subject: RE: Advanced Isotopes of Idaho Followup

Hi Cathy,

Your proposal to evaluate the concerns by June 1 is acceptable.

To address the current setup: 1. What is there on site currently is not what was submitted to NRC in the license application, so the facilities are not as described in the application. 2. What is the current air volume through the system? It is indiscernible whether or not the room is under negative pressure. With the hole in the wall pushing air into the room, and the seemingly minimal flow through the hood/lexan glove box, it does not appear that the room is under continuous negative pressure. The license application states that the ventilation for the iodine hood will be checked semi-annually to ensure adequate airflow and confirm negative pressure in the area around the hood. Do you have the results of this semi-annual test? The license application also says that the airflow through the hood will be confirmed before each use. What is the method that staff are supposed to be using to confirm this? My concern is that if the unit is not pulling enough air, and if I-131 was spilled in mCi quantities, due to the "modifications" made to the hood/lexan glove box, there may be escape of material into the working zone resulting in uptakes and/or contamination.

As far as the spilled Xe gas clearance times, I would like to know where the air flow volume number came from. The anemometer can only read out in linear feet per minute, not cubic feet per minute, so how was this number determined to be used in the calculation. Basically I am trying to understand the numbers used in your calculation and where they came from. Also, for your most recent calculation, was this done before or after the ventilation system was modified?

If you do replace or modify the system, the drawings and specifications need to be submitted to NRC in an amendment request. We can talk more about this after you and Nicki complete your evaluation.

Also, I wanted to note that your license application contains a bioassay procedure (license commitment) and it says that the thyroid will be counted for 2 minutes. Gloria was doing 3 min, you were using 1 min, turns out the average is what you committed to doing.

Regards,
Janine

From: Advanced Isotopes [mailto:nukedoses@gmail.com]
Sent: Tuesday, May 26, 2015 7:35 PM
To: Katanic, Janine
Subject: Advanced Isotopes of Idaho Followup

Dear Dr. Katanic,

We greatly appreciate the opportunity to address any potential items of concern found during your inspection of our pharmacy on May 18, 2015.

Please find attached the list of action items identified by our consultant Dan Schmitz during his visit Jan 18-20 of 2014. This is in "google doc" format so we could better track follow-through. As you can see, both Nicki and I have actively focused on issues that were brought to our attention. There are several items on this list that involved the I-131 room. Mr. Schmitz's greatest concern was the clutter and lack of appropriate air flow in the hood. We have added the I-131 storage/waste area, purchased a new lead-lined storage container specifically for I-131 waste and replaced the air pump upstairs.

Nicki and I are currently in the process of reevaluating the air flows and hood setup, as well as requesting quotes from vendors to purchase a new hood/pump setup. I hope to have a plan ready for your review no later than Monday, June 1.

Is this time frame acceptable?

Thank you,

Cathy

--
Advanced Isotopes of Idaho
4968 Rainbow Lane
Chubbuck, ID 83202
(208) 237-9730
(208) 237-6878 (message line)
(208) 237-9432 (fax)

Katanic, Janine

From: Advanced Isotopes <nukedoses@gmail.com>
Sent: Tuesday, May 26, 2015 7:35 PM
To: Katanic, Janine
Subject: Advanced Isotopes of Idaho Followup
Attachments: Consultant Action Items 2014.pdf

Dear Dr. Katanic,

We greatly appreciate the opportunity to address any potential items of concern found during your inspection of our pharmacy on May 18, 2015.

Please find attached the list of action items identified by our consultant Dan Schmitz during his visit Jan 18-20 of 2014. This is in "google doc" format so we could better track follow-through. As you can see, both Nicki and I have actively focused on issues that were brought to our attention. There are several items on this list that involved the I-131 room. Mr. Schmitz's greatest concern was the clutter and lack of appropriate air flow in the hood. We have added the I-131 storage/waste area, purchased a new lead-lined storage container specifically for I-131 waste and replaced the air pump upstairs.

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Action Items identified by consultant Dan Schmitz during visit 1/18-20/2014

#	Who ?	Task	Priority	Status
1	C	Once amendment received to name CH as RSO for Advanced Isotopes, we can submit the NRC paperwork to remove Mark with our renewal application	Med	Notice submitted by CH via email 2/3/14. Confirmation received - amendment removing Mark in progress. Amendment received in mail 3/15/14
2	C	Print out email acknowledgment that RSO change is in progress from NRC and put with the RAM license		Done 1/21/14
3	C	Create a Decommissioning/Incident File		Done 1/21/14
4	C	Begin License Renewal Paperwork (use form 313)	Med	In progress
5	C	Order cartridges (pucks) for air monitoring.		Ordered 1/21/14
6	C	Call RadQual [redacted] and order a Ba-133 source that is shaped like cartridge (puck) for better geometry with I-131 monitoring		Contacted Eckert & Ziegler [redacted] Ordered and received.
7	C	Buy plastic tabs so we can easily access Certificates of Calibration for sealed sources	Low	Using strips of sticky notes - working well.
8	C	Buy new Co-57 (E-vial) source SOON before our current source drops to 1 mCi		Ordered 2/15. Received and entered into inventory. Currently in use.
9	C	Buy new square filters for I-131 hood		Ordered 1/21/14. Received 2/14

20	C	Post action level signs by well counters	Med	Done 3/20/14
21	C	Fix "how to" instructions so that action level reads 2x on both shipping and pig wiping.	Med	Done 3/20/14
22	C	Post out front where current RAM license is found	Med	Done 3/20/14
23	C	Move RAM license and related NRC materials to separate binder		Done 1/22/14
24	C	Finish and file annual radiation safety audit		Done 2/25/14
25	C	Change arrows on can rotation	Low	Arrows and signs redone 1/19/2014
26	C	Post out front where policies and procedures are found	Med	Done 3/20/14
27	N	Review policies and procedures, revise and approve in partner meeting		Nicki will begin. Done 2/25/2014
28	C	Include part 49 in postings out front and create binder with this in it	Med	Done 2/6/14
29	N	Review bioassay protocol - do we want weekly?		Done 2/25/14 Decided to keep weekly
39	C and N	Remove concrete "crypt" decay area and replace w/ new lead-lined containers	Med	Done 9/15/14 - refinished and repainted whole area for decay
40	N	Contact each customer for "have you amended your license in the last year?"	Med	Bingham done St Lukes done Rest in progress
41	C	Create memo to file re: CH as new RSO (see orange marker)		Done 2/25/14
42	N	Update landlord agreement (updated letter with Brandi)	Med	Done 2/25/14 and placed in RSO Binder
43	C	Purchase North American Emergency Response Guidebook and keep on hand	Med	Ordered 2/6/14. Received 3/10/14 and placed in pharmacy

		constancies daily, not just weekdays		
55	C	Update emergency spill procedures and post prominently		Done 2/20/14
56	C	Do two efficiencies per quarter, not just one	Med	Determined one sufficient in partner mtg Feb 2014
57	C	Create outgoing lead record with surveys done at surface of each bucket	Med	Done 2/6/14