American Radiolabeled Chemicals, Inc.

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6 March 2012

U.S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4351

LICENSE No: 24-21362-01

CONTROL No.576320

ATTN: Kevin Null

SUBJECT: Request for Additional Information (RFAI) dated2/23/12

Gentlemen:

American Radiolabeled Chemicals, Inc (ARC) presents the attached information in response to your request dated 2/23/12.

Also submitted at this time is a revision of the calculation of effective stack height.

If there are any questions, contact mew directly at the above numbers.

Sincerely

AMERICAN RADIOLABELLED CHEMICALS, INC

Regis A. Greenwood, CHP, FHPS
Radiation Safety Offficer
American Radiolabeled Chemicals

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Reply to RFAI in Conv Rec 2/23/12

1. ***Describe the "closed systems" that will be used within the fume hoods during purification and analysis processes***

   After discussion with the chemists who will be doing the work, the following description fits both analysis and purification.
   The material to be purified and/or analyzed is injected into the HPLC system. It is separated by rate of travel along the column, and fractions are removed at various time intervals corresponding to travel rate. The fractions are discharged into vials which are then capped. The system is open only during the filling of the vials. This lab is intended for only low volatility Tritium compounds.(> than 90%) Carbon compounds will remain in Building 100.

2. ***In the event a "closed system" leaks, describe the expected amount that will be exhausted to the roof for each nuclide and provide an expected concentration that will be released at the release point. Finally, submit a calculation of the expected contribution to public dose due to a leak from each nuclide***

   A leak of approximately 1 per cent of the injected content would be a maximum of 1 millicuirie of Tritium (Tritium being more than 90% of the activity to be handled in this lab)

   It is assumed that a leak would be detected and repaired. That is work with that instrument would be stopped until the leak was repaired. Of the four instruments to be placed in the Annex, it is assumed that only one would leak at any given time. The assumption of four leaks per month seems reasonable. That is 4 leaks/ month x 1000 microcurie/leak x 12 months per year = 48000 microcuries/ year.

   Airflow through the exhaust system is 3000 cubic feet /minute x 525600 minutes/ year x 28,316 cc/cubic foot = 4.46×10^{13} ml

   Concentration = 48000 microcuries / 4.46×10^{13} ml = 1.08×10^{-9} μCi/ml

   Appendix B to 10CFR20 gives the Effluent limit for Tritium as 1.0×10^{-7} this is the concentration which would give the annual limit of 50 mrem. In order obtain the constraint value of 10 mrem in a year this value must be reduced by a factor of five giving 2.0×10^{-8}. The concentration divided by the reduced limit is then 0.054. Multiplying this by the constraint value of 10 mrem in a year gives 0.54 mrem in a year.

   As this is an industrial park, the dose is further reduced by a factor of 40/168, yielding 0.13 mrem in a year.

   As can be seen, exhaust activity concentration can be increased by a factor of 10 before it becomes a significant contributor to public dose.

3 **Describe the air effluent monitoring equipment. that will be installed to monitor air effluent from licensed operations in Building 300 Annex**

The monitoring system presently used of Building 400 is now redundant as COMPLY is used to determine dose from Buildings 100/200/300. This system will be used to determine concentration discharged, and the results processed using COMPLY.

A sketch of the monitoring system is attached.

4. *Describe the building height of 300 Annex*

Height from ground to peak of roof 5.1 meters

Based on physical measurements and use of name plate data instead of measurements from drawings, some changes are necessary in the previously submitted calculation of effective stack height.

Effective Stack Height

To simplify the treatment of dispersion, it is convenient to assume that dispersion begins from a fictitious height above the actual source. This fictitious height is called the "effective stack height" symbolized by $\mathbf{h_{eff}}$. This is the sum of the actual stack height, $\mathbf{h_s}$ and the rise of the plume after emission, Δ**h,** all in meters

Dealing, with only the momentum contribution to plume rise,

If $\mathbf{V_s}$**,** the stack exit velocity in meter/sec, is greater than the **mean** wind speed, $\bar{\mu}$, in meters/sec, then

$$\Delta h = D\left(\frac{V_s}{\bar{\mu}}\right)^{1.4}$$

where D is the stack diameter in meters. This equation is valid for all stability classes.

V_s = 22.4 m/sec

h = 9.6 m

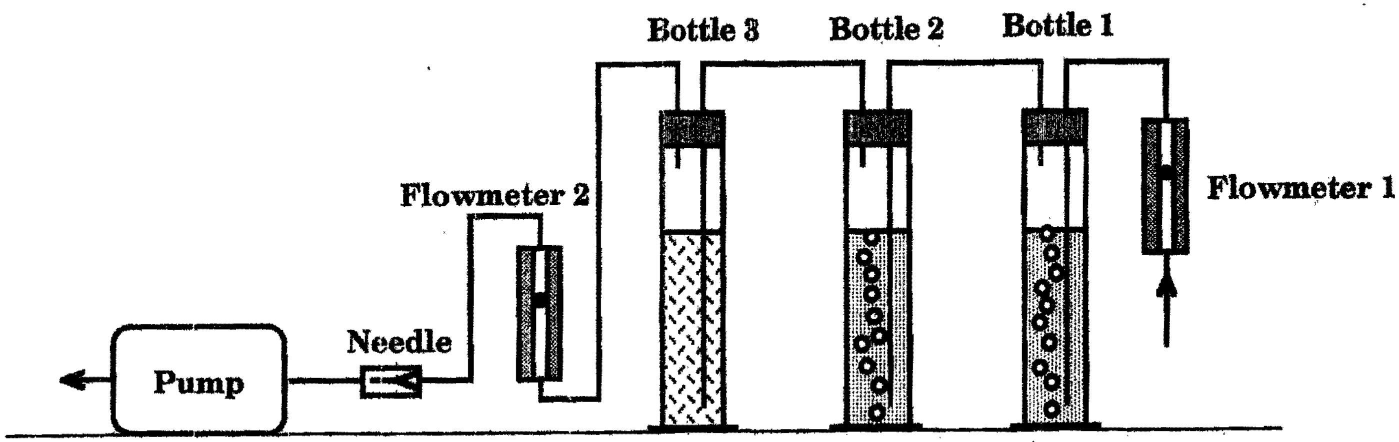
D = 0.254 m

μ = 2.53 m/sec Mean wind speed

Δh = 5.38 m

And, h_{eff} = 14.98 meters

AIR SAMPLING TRAIN



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