Craffey, Ryan

From: Cindy Morgan <CMorgan@hchc.com>
Sent: Wednesday, April 03, 2013 4:11 AM
To: Craffey, Ryan
Cc: Cheryl Schultz
Subject: RE:

Hillsdale Community Health Center will notify the NRC Region III (800-522-3025) and the final delivery carrier if the following conditions apply:

- Removable radioactive surface contamination exceeds the limits of 10 CFR 71.87(i), or
- External radiation levels exceed the limits of 10 CFR 71.47

Based on Hazard Communications for Class 7 (Radioactive) Materials - Package and Vehicle Contamination Limits (49 CFR 173.443), Table 11,
Hillsdale's action level for notification of non-fixed (removable) radioactive contamination on the external surfaces of each package offered for shipment is 6,600 dpm/ 300 cm^2

Best wishes,

Cindy Morgan

Hillsdale Community Health Center
Radiology Manager
Phone: (517) 437.5153
Fax:(517) 437.5156

From: Craffey, Ryan [mailto:Ryan.Craffey@nrc.gov]
Sent: Tuesday, April 02, 2013 9:34 AM
To: Cindy Morgan
Subject: RE:

Thanks again Cindy. I agree that both the gamma camera and the Bicron GM do appear to be sensitive enough to detect below the DOT limits for removable contamination.

One last question. When you analyze the wipe with the gamma camera, what is your action level for notifying the radiopharmacy / NRC / etc.?

Ryan Craffey
Health Physicist
US Nuclear Regulatory Commission
Materials Inspection Branch, Region III
(630) 829-9655

From: Cindy Morgan [mailto:CMorgan@hchc.com]
Sent: Tuesday, April 02, 2013 4:05 AM
To: Craffey, Ryan
Cc: Cheryl Schultz
Subject: RE:

On the Bicron 2000 side window GM, the background count rate is usually less than 30 cpm (<0.025 mR/hr on the mR/hr scale). The surface area that we wipe for our packages is 300 cm^2. The GM detection efficiency is 1% for gamma and x-rays. The source or surface efficiency, i.e., the fraction of decays within the sample that result in a photon leaving the sample is about 95% for Tc-99m. Any wipe that exceeds 2 times background would be further analyzed by counting it on the gamma scintillation camera as described earlier.

$A_s = R_{s+b} - R_b/E_i \times E_s \times$ surface area covered by the sample, where
A_s = dpm/cm^2 limit = 22 dpm/cm^2
R_b = background count rate = 30 cpm
E_i = 1%
E_s = 95%
Surface area = 300 cm^2
R_{s+b} = gross count on the GM

For example: 60 – 30/0.01 x 0.95 x 300 = 10 dpm/cm2

Based on this, we believe that the Bicron GM is sensitive enough to meet the DOT limits for removable contamination. In the future, the package wipe will be recorded in cpm instead of mR/hr.

Cindy Morgan
Hillsdale Community Health Center
Radiology Manager
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From: Craffey, Ryan [mailto:Ryan.Craffey@nrc.gov]
Sent: Monday, April 01, 2013 11:00 AM
To: Cindy Morgan
Subject: RE:

I need to determine whether the surveys you were performing up to this point were adequate to detect the DOT limits of removable contamination. I am concerned that the survey meter might not have been sensitive enough.

Ryan Craffey
Health Physicist
US Nuclear Regulatory Commission
Materials Inspection Branch, Region III
(630) 829-9655

From: Cindy Morgan [mailto:CMorgan@hchc.com]
Sent: Monday, April 01, 2013 8:54 AM
To: Craffey, Ryan
Subject: RE:

Per Cheryl, we are ALWAYS going to use the gamma camera for package wipes if there is reason to suspect contamination.

She feels it is the most accurate procedure we can currently perform.

Cindy Morgan
Hillsdale Community Health Center
Radiology Manager
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Fax:(517) 437.5156

From: Craffey, Ryan [mailto:Ryan.Craffey@nrc.gov]
Sent: Monday, April 01, 2013 9:41 AM
To: Cindy Morgan
Subject: RE:

Good morning Cindy

Thanks for the response. Would you be able to provide a similar evaluation for using the Bicron survey meter to measure removable contamination?

Ryan Craffey
Health Physicist
US Nuclear Regulatory Commission
Materials Inspection Branch, Region III
(630) 829-9655

From: Cindy Morgan [mailto:CMorgan@hchc.com]
Sent: Monday, April 01, 2013 4:02 AM
To: Craffey, Ryan
Subject:

Dear Ryan,
After consultation with our medical physicist, Cheryl Culver Schultz, this is the response to your e-mail received on March 27, 2013.

With regard to our package wipe surveys required by 10 CFR 20.1906, we follow the NUREG - 1556, Vol. 9, Rev. 2, Appendix P, Model Procedure for Safely Opening Packages Containing Radioactive Material. If there is any reason to suspect contamination, we wipe the external surface of the final source container and remove the wipe sample to a low-background area. We assay the wipe sample to determine if there is any removable radioactivity. The wipe tests are counted on the gamma scintillation camera, peaked for Tc-99m, collimator removed, and a background count taken with each series. With a background count from 6,000 to 10,000 cpm; sample and background count times of 4 minutes, the MDA is as follows.

The minimum detectable activity of the gamma camera is 27 - 35 Bq.
$3(R_b/t)^{1/2} = 3\ (10{,}000\ \text{cpm}/4)^{1/2} = 150$
MDA = 150 cpm/157,400 cpm/microcurie = 0.00095 microcurie = 35 Bq

If the background count exceeds 10,000 cpm, then the counting times will be increased above 4 minutes as follows:

Bkg cpm	Counting time (both sample and background wipes)
10,100 - 13,000	5 minutes
13,100 - 16,000	6 minutes

16,000 - 19,000	7 minutes

The gross counts from the camera are translated into dpm as follows:
Any sample that exceeds zero net cpm is further analyzed as follows.

- Use this table to determine the necessary counting time for the sample wipe and background.

Bkg cpm	Counting time (both sample and background wipes)
0 – 10,000	4 minutes
10,100 - 13,000	5 minutes
13,100 - 16,000	6 minutes
16,000 - 19,000	7 minutes

- Recount the background wipe for the counting time required in the table above.
- Recount the sample wipe for the same counting time as background.
- Divide the total counts by counting time in minutes and record the net cpm as follows:
    - Net cpm = wipe sample cpm – background cpm
- Divide Net cpm by 0.07 to obtain dpm/100 cm^2

Please let me know if this response is satisfactory. Then we will include this in our revised policy and procedure manual.

Best wishes,

Cindy Morgan

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