



**ECS MID-ATLANTIC, LLC**

**Geotechnical • Construction Materials • Environmental • Facilities**

Revised  
August 31, 2010

Mr. Scott Wilson  
U.S. Nuclear Regulatory Commission  
Region 1  
475 Allendale Road  
King of Prussia, Pennsylvania 19406-1415

RE: Authorized storage location- Andrews Air Force Base SPDF  
US NRC License Number 37-30921-01

Dear Mr. Wilson,

ECS Mid-Atlantic, LLC (ECS) is providing this letter in response to your request for public dose calculations for the Nuclear Density Gauge stored at our authorized storage location at Andrews Air Force Base SPDF, Maryland.

**BACKGROUND:**

The Nuclear Density Gauge known as ECS Gauge #73 is a manufactured by [REDACTED] the model # is [REDACTED] and the serial # [REDACTED]. Mr. [REDACTED] the Quality Control Manager for the Manhattan Construction Company ([REDACTED]) is the individual whose workstation is 8 feet away from the device storage area. [REDACTED] remains at his workstation approximately 4 to 5 hours a day, 5 days a week while the gauge is present. I have conservatively used 5 hours per day in our calculation to arrive at the dose limit. A conservative 2 feet distance from the device storage area was also used in the calculations as the maximum distance to any unrestricted area outside the gauge storage site.

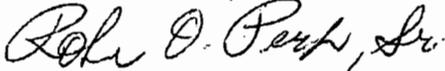
Based on our calculations for the period of storage at the site, an exposure potential of 0.45 mrem/hour and 17.5 mrem/6 mth dose rate to the individual member of the public likely to receive the highest dose from the gauge in storage was found.

**CORRECTIVE STEPS TO BE TAKEN:**

Upon the date of storage at the authorized storage location, Public Dose Calculations and Area Dosimetry Badges will be posted where appropriate in close proximity to the workstation of the individual most likely to receive the highest dose from the stored gauge. The date of full compliance will be September 1, 2010, pending receipt of area badges from our vendor.

Respectfully Submitted,

ECS Mid-Atlantic, LLC



Rohan O. Perch, Sr.

Radiation Safety Officer

Attachment: Public Dose Calculation Sheet

## APPENDIX G PUBLIC DOSE CALCULATION WORKSHEET

To demonstrate compliance, you must show that the maximum dose to any *member of the public* will be less 100 millirem in a year and that the maximum dose in any *unrestricted area* will be less than 2 millirem in any one hour. The typical limiting case involves the storage of gauges. Several simplifying and conservative assumptions are made in this calculation method:

- ◆ No shielding other than the shielding in the gauge is assumed to be present.
- ◆ All gauges are assumed to be at the same distance as the closest gauge.
- ◆ Sources are assumed to remain in the shielded position within the gauge.
- ◆ Each gauge is assumed to be a point source and dose rates are assumed to decrease with the inverse square of distance from the gauge.
- ◆ Gauges are assumed to be in storage all of the time.

More realistic assumptions can be made or actual measured dose rates can be used if necessary to demonstrate compliance.

Step	Instruction	Result
<b>DOSE TO MEMBER OF PUBLIC IN ONE YEAR</b>		
1	Identify the individual member of the public likely to receive the highest dose from gauges in storage. This will be the person who spends the most time in the vicinity of the stored gauges or who is closest to the gauges. This individual will be the focus of the calculation.	[REDACTED]
2	Determine the maximum dose rate in mrem/hr at a distance of three feet (1 meter) for each gauge kept in the storage location. This value may be obtained from the radiation profile in the gauge operation manual, from the manufacturer, or from Transport Index on the Yellow II label on the transport case. Calculate the sum of the dose rate values for all of the gauges that may be stored at this location and enter the result. Remember to include both gamma and neutron dose.	0.2 Determined by Survey meter
3	Enter the distance in feet from the position occupied by the person identified in step 1 to the nearest gauge in the storage area.	8'
4	Calculate the square of the distance from step 3 and enter the result.	64 ft <sup>2</sup>
5	Divide the value from step 4 by 9 and enter the result. This is a factor that accounts for the difference between the dose rate at 3 feet and the dose rate at the distance at which the person is located.	7.11
6	Divide the dose rate (mrem/hr) from step 2 by the result from step 5 and enter the result.	0.028
7	Enter the number of hours in a year that the individual will be present in the vicinity of the gauges. For example, an individual working full-time near the gauges, would be present approximately 2000 hrs in a year (8 hrs per day x 5 days per week x 50 weeks per year).	5 hrs 58 days x 25 wk = 625
8	Multiply the result from step 6 by the result from step 7 and enter the result. This is the maximum dose in mrem the individual could receive in one calendar year. If this value is less than 100 mrem, the annual dose limit is met; continue with step 9 to determine if the unrestricted area dose rate limit is met.	17.5 mrem/6 mos

DOSE IN UNRESTRICTED AREAS IN ONE HOUR		
9	Determine the minimum distance in feet to any unrestricted area outside the gauge storage area and record the value. This could be an area above, below, or adjacent to the storage area that is unrestricted for the purpose of radiation control. The area need not be occupied, just accessible to members of the public, which may include company employees.	2'
10	Calculate the square of the distance from step 9 and enter the result.	4 ft <sup>2</sup>
11	Divide the value from step 10 by 9 and enter the result. This is a factor that accounts for the difference between the dose rate at 3 feet and the dose rate at the distance in step 9.	0.44
12	Divide the dose rate (mrem/hr) from step 2 by the result from step 11 and enter the result. This is the maximum dose in mrem that could be received in one hour in the closest unrestricted area. If this value is less than 2 mrem, the dose limit for unrestricted areas is met.	0.45 MRcm/hr
Calculations performed by <i>Rohan Perch</i>		Date <i>8/31/2010</i>

If either dose limit is exceeded, you should either recalculate that dose using more realistic assumptions and data or take steps to reduce the dose received by members of the public using the principles of time, distance, and shielding.

- ◆ Limit the time personnel spend in the vicinity of the gauges
- ◆ Increase the distance between the gauges and personnel
- ◆ Add shielding to reduce the dose rate

## OCCUPANCY FACTORS

The following occupancy data may be used when data for specific personnel are not available:

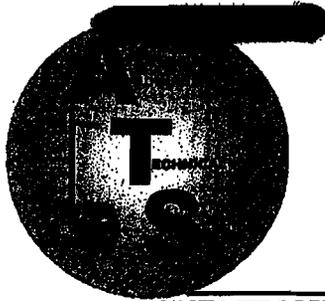
Area	Occupancy Factor (T)
Work areas such as offices, laboratories, shops, wards, nurses' stations; living quarters; children's play areas; and occupied space in nearby buildings.	Full Occupancy (T=1)
Corridors, rest rooms, elevators using operators, unattended parking lots.	Partial Occupancy (T=1/4)
Waiting rooms, toilets, stairways, unattended elevators, janitor's closets, outside areas used only for pedestrians or vehicular traffic.	Occasional Occupancy (T=1/16)

**Reference:** NCRP Report No. 49, *Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies Up to 10 MeV*, 1976

## SHIELDING HALF-VALUES\*

Material	Cs-137 Gamma Radiation	Am-Be Neutron Radiation
Lead	¼ in.	N/A
Concrete	2 in.	4 in.

\* The half-value is the thickness of material that will reduce the dose rate by one-half.



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 Aguinaga Technical Services  
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*Where Customer Service is a Priority!*

## SURVEY METER CERTIFICATE OF CALIBRATION

Doug Simms  
 North East Technical Services, Inc.  
 75 Alleron Ct., Suite 4  
 Westminster MD 21157

### INSTRUMENT

Manufacturer: **SE International**  
 Meter Model No.: **Monitor 4** Probe Model No.: **N/A**  
 Meter Serial Number: **65786** Probe Serial Number: **N/A**

### CALIBRATION DATA

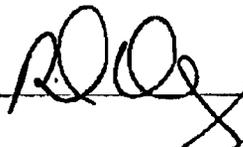
SCALE	UPPER			LOWER		
	Exposure Rate (mR/hr)	Instrument Reading (mR/hr)	Corr Factor	Exposure Rate (mR/hr)	Instrument Reading (mR/hr)	Corr Factor
X1	.4	.4	0	.1	.1	0
X10	4	4	0	1	1	0
X100	40	40	0	10	10	0

Comments: Instrument(s) were found to be within  / out of  manufacturers specified tolerance levels.

Battery Check:  Good  Replace

This is certify that the above referenced survey meter was calibrated with a N.I.S.T. certified point calibration source at Aguinaga Technical Services, Inc. The unit was found to perform within required tolerances at 20 percent and 80 percent of full scale for each range setting as indicated in the summary above. All data listed above apply to this instrument only.

Wisconsin License No. : 117-1005-01

Calibrated by:  Date Calibrated: 19-Mar-10