These few pages are excerpts from
the RRI Rad Calc User's Guide. For
more information, please contact us.

RRI
Rad
Calc

Rev 1a

The User's Guide

Table of Contents

Chapter 1: Introduction & Installation

A. Introduction

Thank you for selecting *RRI Rad Calc* as your radioactive materials shipping aide. *RRI Rad Calc* is copyright protected by Regulatory Resources, Inc., Kennewick, Washington. No portion or part of this program may be copied or reproduced without the express written permission of Regulatory Resources, Inc.

RRI Rad Calc is a spreadsheet program, using Microsoft™ Excel®, that performs the calculations necessary to determine the applicability of the U.S. Department of Transportation (DOT) Hazardous Materials Regulations (HMR) to the radioactive materials classification and categorization.   This program looks at the following, based on user input:

- Definition of Class 7 radioactive materials for both exempt values and surface contamination;
- A_1 and A_2 activity determinations;
- Low Specific Activity (LSA) determinations;
- Surface Contaminated Objects (SCO) determinations, including the allowed SCO-II shortcut determination process authorized in NUREG-1608 (RAMREG-003);
- Fissile exception determination, including the specific paragraph for which exception applies;
- Fissile mass determination;
- Top 95% of nuclide contribution (for labels and shipping paper descriptions);
- Reportable quantity (RQ) determinations;
- Class 7 label categorization, including Transport Index (TI);
- Dose rate assessments for packages and vehicles;
- Contamination level assessments for packages and vehicles;
- ...and more.

Two worksheets comprise the user's portion of the program: Summary Worksheet and Entries Worksheet (see Appendix B). The Entries Worksheet is the main worksheet for entering the radioactive material specific data. Isotopic activity can be entered in units of TeraBecquerel (TBq), Curies, or grams. Once all necessary data is entered the user 'runs' the program by activating a program macro. The results are consolidated on the Summary Worksheet which can be saved to file and/or printed. Entry cells are also provided on the Summary Worksheet for the user to include information specific to the package for which the results are applicable.

All user entry cells are blue in color. Cells that are not entry cells are protected from inadvertent changes.

Macros have been written for the aid of the user and to initiate necessary actions. A custom toolbar will appear the first time the program is opened. The *RRI Rad Calc* toolbar initiates most of the frequently used functions and includes: a function box for access to macro operations and a "jump to" feature; an icon to initiate the calculation macro; an erase feature that clears all entry cells with a single click; a save to file option for the Summary Worksheet; a Summary Worksheet print option; and a save and exit program icon.

At times, error messages or informational messages may appear in either a Message Box or in a cell adjacent to a data entry cell. These messages may inform the user when an entry is made that is inconsistent with the cell question, or let the user know that additional information is requested.

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Quality assurance (QA) has been performed on the program functions and calculations. The methodology used was two-fold:

(1) Activity levels and mass entries were adjusted one at a time at 1 Bq, or 1 nanogram or 1 gram (as applicable) increments above and below an exact limit. For example: If a randomly selected A_2 value is 0.002 TBq, one Bq was added to verify the program recognized the change and made the appropriate activity determination; if a fissile excepted limit is 2 grams then 1 nanogram (1E-9 gram) was added to verify the program will capture the adjustment. This process was used to validate both lower and upper limit thresholds.

(2) Macro and program operations were tested using known, existing packaging examples taken from previous and current RRI's Advanced Radioactive Materials Packaging and Transport Workshop materials. These examples have been proven numerous times by a multitude of class participants.

The outcome of the tests are recorded and filed. The results provide evidence of the program's accuracy and usability.

B. System Requirements

The program is built in Microsoft® Office Excel 2003. Any system with Microsoft® Office Excel installed can run this program.

   NOTE: RRI does not guarantee this program will run on older or newer versions of Microsoft® Office Excel.

C. Installation

Installation of this program is quick and simple. The program consists of a single CD-Rom disk. To install, simply insert the disk in the appropriate CD-Rom drive and copy the folder to the file location of your choice. The *"RRI Rad Calc Program"* folder contains the *RRI Rad Calc* program, the User's Guide and the QA test documentation file.

> NOTE: Unless specifically stated otherwise, all isotopic activity presented in the examples used throughout this User's Guide were entered in TBq units.

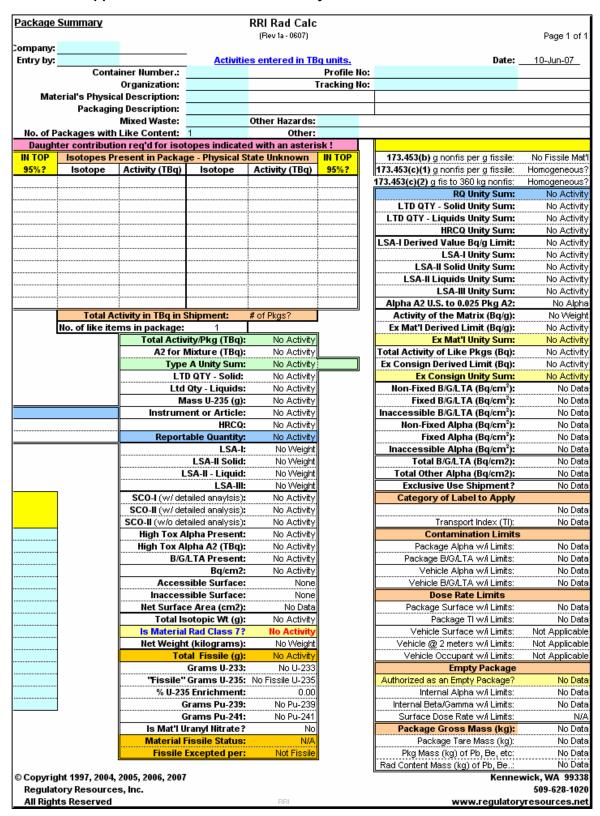## Appendix B. Full Views of Summary and Entries Worksheets

Package Summary			RRI Rad Calc (Rev 1a - 0607)			Page 1 of 1

Company:

Entry by: — Activities entered in TBq units. — Date: 10-Jun-07

Container Number.:		Profile No:	
Organization:		Tracking No:	
Material's Physical Description:			
Packaging Description:			
Mixed Waste:		Other Hazards:	
No. of Packages with Like Content:	1	Other:	

Daughter contribution req'd for isotopes indicated with an asterisk !

IN TOP 95%?	Isotopes Present in Package - Physical State Unknown				IN TOP 95%?
	Isotope	Activity (TBq)	Isotope	Activity (TBq)	

173.453(b) g nonfis per g fissile:	No Fissile Mat'l
173.453(c)(1) g nonfis per g fissile:	Homogeneous?
173.453(c)(2) g fis to 360 kg nonfis:	Homogeneous?
RQ Unity Sum:	No Activity
LTD QTY - Solid Unity Sum:	No Activity
LTD QTY - Liquids Unity Sum:	No Activity
HRCQ Unity Sum:	No Activity
LSA-I Derived Value Bq/g Limit:	No Activity
LSA-I Unity Sum:	No Activity
LSA-II Solid Unity Sum:	No Activity
LSA-II Liquids Unity Sum:	No Activity
LSA-III Unity Sum:	No Activity
Alpha A2 U.S. to 0.025 Pkg A2:	No Alpha
Activity of the Matrix (Bq/g):	No Weight
Ex Mat'l Derived Limit (Bq/g):	No Activity
Ex Mat'l Unity Sum:	No Activity
Total Activity of Like Pkgs (Bq):	No Activity
Ex Consign Derived Limit (Bq):	No Activity
Ex Consign Unity Sum:	No Activity

Total Activity in TBq in Shipment:	# of Pkgs?
No. of like items in package:	1

Total Activity/Pkg (TBq):	No Activity
A2 for Mixture (TBq):	No Activity
Type A Unity Sum:	No Activity
LTD QTY - Solid:	No Activity
Ltd Qty - Liquids:	No Activity
Mass U-235 (g):	No Activity
Instrument or Article:	No Activity
HRCQ:	No Activity
Reportable Quantity:	No Activity
LSA-I:	No Weight
LSA-II Solid:	No Weight
LSA-II - Liquid:	No Weight
LSA-III:	No Weight
SCO-I (w/ detailed anaylsis):	No Activity
SCO-II (w/ detailed analysis):	No Activity
SCO-II (w/o detailed analysis):	No Activity
High Tox Alpha Present:	No Activity
High Tox Alpha A2 (TBq):	No Activity
B/G/LTA Present:	No Activity
Bq/cm2:	No Activity
Accessible Surface:	None
Inaccessible Surface:	None
Net Surface Area (cm2):	No Data
Total Isotopic Wt (g):	No Activity
Is Material Rad Class 7?	No Activity
Net Weight (kilograms):	No Weight
Total Fissile (g):	No Activity
Grams U-233:	No U-233
"Fissile" Grams U-235:	No Fissile U-235
% U-235 Enrichment:	0.00
Grams Pu-239:	No Pu-239
Grams Pu-241:	No Pu-241
Is Mat'l Uranyl Nitrate?	No
Material Fissile Status:	N/A
Fissile Excepted per:	Not Fissile

Non-Fixed B/G/LTA (Bq/cm²):	No Data
Fixed B/G/LTA (Bq/cm²):	No Data
Inaccessible B/G/LTA (Bq/cm²):	No Data
Non-Fixed Alpha (Bq/cm²):	No Data
Fixed Alpha (Bq/cm²):	No Data
Inaccessible Alpha (Bq/cm²):	No Data
Total B/G/LTA (Bq/cm2):	No Data
Total Other Alpha (Bq/cm2):	No Data
Exclusive Use Shipment?	No Data
Category of Label to Apply	
	No Data
Transport Index (TI):	No Data
Contamination Limits	
Package Alpha w/i Limits:	No Data
Package B/G/LTA w/i Limits:	No Data
Vehicle Alpha w/i Limits:	No Data
Vehicle B/G/LTA w/i Limits:	No Data
Dose Rate Limits	
Package Surface w/i Limits:	No Data
Package TI w/i Limits:	No Data
Vehicle Surface w/i Limits:	Not Applicable
Vehicle @ 2 meters w/i Limits:	Not Applicable
Vehicle Occupant w/i Limits:	Not Applicable
Empty Package	
Authorized as an Empty Package?	No Data
Internal Alpha w/i Limits:	No Data
Internal Beta/Gamma w/i Limits:	No Data
Surface Dose Rate w/i Limits:	N/A
Package Gross Mass (kg):	No Data
Package Tare Mass (kg):	No Data
Pkg Mass (kg) of Pb, Be, etc:	No Data
Rad Content Mass (kg) of Pb, Be..:	No Data

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Kennewick, WA 99338
509-628-1020
www.regulatoryresources.net

Figure B-1. Full view of the Summary Worksheet, Page 1

Figure B-2. Entries Worksheet Cell Range A1:Q113

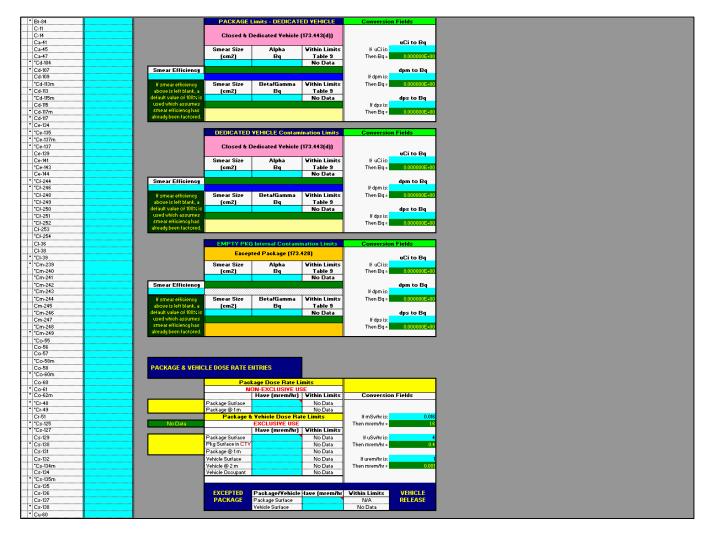Regulatory Resources, Inc.
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Figure B-3. Entries Worksheet, Cell Range A114:Q185

Figure B-4. Entries Worksheet, Cell Range A770:Q787