

## Junod, Rebecca

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**From:** gfenton <gfenton@fentonartglass.com>  
**Sent:** Wednesday, May 18, 2016 5:43 PM  
**To:** Lawyer, Dennis  
**Subject:** [External\_Sender] FW: Revised FSS- Fenton Glass  
**Attachments:** RSP 018 - Surveillance UNCONTROLLED.pdf

J-6

SUB-491  
04003149

Dennis,  
Here is a copy of the information you requested. And the consultants' availability for Friday.  
George

**From:** Bill Thomas [mailto:bill.thomas@plexsci.com]  
**Sent:** Wednesday, May 18, 2016 5:09 PM  
**To:** gfenton <gfenton@fentonartglass.com>  
**Subject:** RE: Revised FSS- Fenton Glass

Yes. Jeff and I would be glad to talk to Mr Lawyer. Tomorrow is full but Friday is good, after 10 am.

Thanks

Bill T

**From:** gfenton [mailto:gfenton@fentonartglass.com]  
**Sent:** Wednesday, May 18, 2016 5:02 PM  
**To:** Bill Thomas <bill.thomas@plexsci.com>  
**Subject:** FW: Revised FSS- Fenton Glass

Bill,  
See response below. Can you provide the information he is requesting?  
Thanks,  
George

**From:** Lawyer, Dennis [mailto:Dennis.Lawyer@nrc.gov]  
**Sent:** Wednesday, May 18, 2016 3:04 PM  
**To:** gfenton <gfenton@fentonartglass.com>  
**Subject:** RE: Revised FSS- Fenton Glass

Mr. Fenton,

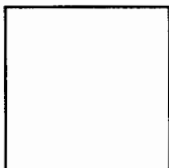
Thanks for your response. I have spent most of today reviewing the response. I would like to have a discussion with your consultant as I am still not clear on the way they are progressing on a couple of points and I don't think sending another set of questions will get a proper answer without a discussion. I would however, like to get a copy of RSP-018 before discussing the response. Can you send me a copy or just the sections associated with alpha surveys?

Thank You,

Dennis Lawyer

**From:** gfenton [mailto:gfenton@fentonartglass.com]  
**Sent:** Friday, May 13, 2016 10:11 AM  
**To:** Lawyer, Dennis <Dennis.Lawyer@nrc.gov>  
**Cc:** 'Bill Thomas' <bill.thomas@plexsci.com>  
**Subject:** [External\_Sender] Revised FSS- Fenton Glass

Dear Dennis,  
Please find attached transmittal letter and revised Final Status Survey.  
Best regards,  
George Fenton



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# Plexus Scientific Corporation

	SURVEILLANCE	Procedure: RSP-018	Revision No.: 007
		Page: 1 of 15	Date: March 16, 2016
		Approved by (RSO):	
		Approved by (Vice President):	

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THIS DOCUMENT IS A CONTROLLED COPY IF SIGNED IN RED BELOW (SEE RSP-003)

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Printed by Bill Thomas

May 18, 2016

## RADIATION SAFETY PROCEDURE

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## 1 PURPOSE

This Radiation Safety Procedure (RSP) describes the methodologies and requirements for radiation surveys performed by Plexus Scientific Corporation (Plexus) employees and project personnel.

## 2 SCOPE

This RSP applies to all radiological surveys conducted by Plexus employees and project personnel for radiation protection purposes. Surveillance activities performed for other than radiological protection reasons are exempt from the provisions of this RSP.

## 3 REFERENCES

- 3.1 U.S. NRC Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable".
- 3.2 U.S. NRC Regulatory Guide 8.21, "Health Physics Surveys for Byproduct Material at NRC-Licensed Processing and Manufacturing Plants".
- 3.3 MARSSIM - U. S. Nuclear Regulatory Commission, "Multi-Agency Radiation Survey and Site Investigation Manual", NUREG-1575, 1997.
- 3.4 Plexus Radiation Safety Procedure No. RSP-004, "Radiation Protection Records".
- 3.5 Plexus Radiation Safety Procedure No. RSP-006, "Training and Qualifications of Radiation Protection Personnel".
- 3.6 Plexus Radiation Safety Procedure No. RSP-008, "Instrumentation".
- 3.7 Plexus Radiation Safety Procedure No. RSP-019, "Smear Counting".
- 3.8 Plexus Radiation Safety Procedure No. RSP-022, "Air Sampling".
- 3.9 Plexus Standard Operating Procedure No. SOP-013, "Field Project Management".

## 4 DEFINITIONS

The definition of terms used in this RSP that may not be commonly understood shall be found in RSP-002, "Definitions".

## 5 PROCEDURE

### 5.1 Responsibilities

- 5.1.1 The Vice President, Nuclear Solutions Division (Vice President), shall supply adequate resources to ensure compliance with this procedure.
- 5.1.2 The Radiation Safety Officer (RSO) shall:
  - 5.1.2.1 Assure the adequacy of the radiation survey program.
  - 5.1.2.2 Assure that all radiological surveillance is performed pursuant to this procedure.

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5.1.2.3 Assure that all Health Physics Technicians are properly trained in the provisions of this procedure.

5.1.2.4 Verify compliance with this procedure during planned and periodic audits of the radiation protection program.

#### 5.1.3 Health Physics Technicians shall:

5.1.3.1 Follow this procedure when performing radiological surveillance activities.

5.1.3.2 Confirm the survey approach and action level (if any) prior to the start of the survey.

5.1.3.3 Perform instrument pre-operational checks as required in RSP-008 prior to the start of the survey.

5.1.3.4 Complete a Radiological Survey Form (Attachment 8.1 or 8.2) or FSS Workbook (Attachment 8.3), as applicable, for each survey.

5.1.3.5 Periodically review this procedure.

#### 5.2 Survey Program

##### 5.2.1 Radiation surveys shall be performed, as necessary, to evaluate:

5.2.1.1 The magnitude of radiation exposures to personnel performing routine operations, maintenance, and/or research and development.

5.2.1.2 Fixed and removable contamination on equipment and materials to be released from the project location.

5.2.1.3 The radiological status of the project location with respect to applicable federal, state or license requirements.

5.2.1.4 Radiological conditions in the event of non-routine circumstances (e.g., spills, decontamination efforts, special activities).

5.2.2 Radiation surveys for official purposes shall be performed by Health Physics Technicians who are qualified in accordance with RSP-006.

5.2.3 All official radiation surveys shall be documented on a Radiological Survey Form (Attachment 8.1 or 8.2) or in a FSS Workbook (Attachment 8.3).

5.2.4 All entry fields on a Radiological Survey Form or in a FSS Workbook shall be completed or marked as "NA" (not applicable).

#### 5.3 Surveillance Planning

##### 5.3.1 Each survey shall be planned in regard to:

5.3.1.1 Specific radiation types

5.3.1.2 Predetermined radiation levels

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- 5.3.1.3 Locations where the radiation is expected
- 5.3.1.4 Special conditions for the survey (e.g., special locations)
- 5.3.1.5 The minimum detection sensitivity for each survey pursuant to MARSSIM, Section 6.
- 5.3.1.6 The action level for the survey.

**Note:** For example, if the purpose of the survey is to release equipment, with a release criterion of 200 dpm/100 cm<sup>2</sup>, and if the instrument to be used for the survey reads out in counts per minute (cpm), and has a detector efficiency of 25% (0.25 cpm/dpm), a surface efficiency of 25% for alpha activity, and if the "surface to detector" distance is 0.1 cm, the action level for the survey is  $200 \times 0.25 \times 0.25 \times 0.80 = 10$  cpm above background.

5.3.2 Survey plans should be documented in a work plan, a project plan or a Field Project Authorization (see SOP-013).

#### 5.4 Survey Methods for Determining Ambient Gamma (General Area) Exposure Rates

- 5.4.1 Surveys shall be performed with a portable radiation survey instrument that is sensitive to gamma radiation (e.g., sodium iodide detector, microR meter, microrem meter, ionization chamber).
- 5.4.2 The instrument shall be turned on and permitted to stabilize for a minimum of 30 seconds before proceeding further.
- 5.4.3 Pre-operational checks as described in RSP-008 shall be completed before proceeding further.
- 5.4.4 Surveys shall be conducted by walking slowly over the area of interest with the detector held at a height of approximately one meter above the ground (waist high).
  - 5.4.4.1 An increase in the audible response or in the needle/indicator movement may indicate the presence of radioactivity.
  - 5.4.4.2 The instrument shall be held stationary in the locations where the increased response is noted.
- 5.4.5 Readings shall be recorded as *read* on a Radiological Survey Form (Attachment 8.1 or 8.2) or in a FSS Workbook (Attachment 8.3).

**Note:** Do not record "background" or censor the "as read" measurement in any way.

**Note:** Carefully evaluate the position of the range selector switch when observing the meter reading.

- 5.4.5.1 Any comments and notations that may be necessary for interpretation of results should be recorded on a Radiological Survey Form (Attachment 8.1 or 8.2) or a FSS Workbook (Attachment 8.3).

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5.4.5.2 Extraneous remarks or comments shall not be recorded on a Radiological Survey Form or FSS Workbook.

5.4.5.3 The individual performing the survey shall sign and date the completed Radiological Survey Form, or initial the FSS Workbook page, as applicable.

#### 5.5 Survey Methods for Determining Contact Exposure Rates on Equipment Surfaces

5.5.1 Surveys shall be performed with a portable radiation survey instrument that is sensitive to gamma radiation (e.g., sodium iodide detector, microR meter, microrem meter).

5.5.2 The instrument shall be turned on and permitted to stabilize for a minimum of 30 seconds before proceeding further.

5.5.3 Pre-operational checks as described in RSP-008 shall be completed before proceeding further.

5.5.4 Surveys shall be conducted by holding the instrument stationary with the detector end of the instrument approximately 0.25 inch from the surface of the item being evaluated.

*Caution: Do not touch the item or surface being surveyed with the instrument.*

5.5.5 Readings shall be recorded as read on a Radiological Survey Form or FSS Workbook page.

**Note: Do not record “background” or censor the “as read” measurement in any way.**

**Note: Carefully evaluate the position of the range selector switch when observing the meter reading.**

5.5.5.1 Any comments and notations that may be necessary for interpretation of the results should be recorded on a Radiological Survey Form, FSS Workbook or raw data capture sheet (Attachment 8.5).

5.5.5.2 Extraneous remarks or comments shall not be recorded on a Radiological Survey Form or FSS Workbook.

5.5.5.3 The individual performing the survey shall sign and date the completed Radiological Survey Form, or initial the FSS Workbook, as applicable.

#### 5.6 Survey Methods for Determining the Extent of Total Contamination on Surfaces

5.6.1 Total (fixed plus removable) contamination shall be measured by direct survey with portable radiation survey instruments sensitive to beta/gamma radiation (e.g., pancake Geiger-Mueller detector, or equivalent) or alpha radiation (e.g., alpha scintillation detector), or equivalent).

5.6.2 The instrument shall be turned on and permitted to stabilize for a minimum of 30 seconds) before proceeding further.

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- 5.6.3 Pre-operational checks as described in Procedure RSP-008 shall be completed before proceeding further.
- 5.6.4 Scanning surveys shall be conducted by moving the detector at a pre-determined rate and within 0.5 centimeters of the surface of the surface with the "alpha + beta" mode selected on the rate meter.

*Caution: Do not touch the item or surface being surveyed with the instrument.*

**Note: Scan speeds necessary to achieve the detection objective should be determined pursuant to MARSSIM and documented. Similarly, any adjustments to instrument response to account for surface coatings should be documented.**

*Caution: Pinholes or tears in the mylar window of contamination detectors will result in unreliable readings in both the alpha and beta channels. The beta channel will show a significant increase in count rate that drops only when the window is covered to prevent light from entering. The alpha channel, on the other hand, will saturate, causing the meter indicator to read "zero". As a result, residual alpha activity may be missed during scans. To ensure light leaks are promptly detected, surveyors should enable the audio mode and the "alpha + beta" channel selection on the ratemeter during scans.*

- 5.6.4.1 An increase in the audible response or in the needle/indicator movement may indicate the presence of radioactivity.

**Note: There is a time delay between detector response and meter read-out. However, the delay between detector response and audible signal is significantly less. In areas where the noise levels do not permit ready monitoring of audible signals, the use of headphones may be necessary.**

- 5.6.4.2 The detector shall be held stationary over the areas where the increased response was noted.
- 5.6.4.3 Any changes in the surface structure that may affect instrument response shall be documented on a Radiological Survey Form or FSS Workbook.
- 5.6.5 Survey points with the highest count rates shall be identified and recorded as read on a Radiological Survey Form or FSS Workbook page, along with an estimate of the physical dimensions of the area with elevated readings.

**Note: Do not record "background" or censor the "as read" measurement in any way.**

- 5.6.5.1 Any comments and notations that may be necessary for interpretation of the results should be recorded on a Radiological Survey Form or FSS Workbook page.
- 5.6.5.2 Extraneous remarks or comments shall not be recorded on a Radiological Survey Form or FSS Workbook.



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- 5.6.5.3 The individual performing the survey shall sign and date the completed Radiological Survey Form, or initial the FSS Workbook, as applicable.

**Note: Carefully evaluate the position of the range selector switch when observing the meter reading.**

- 5.6.6 Static or stationary surveys shall be conducted by placing the detector face on contact with the surface being assessed.

*Caution: Care shall be taken to prevent contamination of the detector face during the performance of stationary measurements. Do not touch the item or surface being surveyed to the instrument window.*

**Note: Count times necessary to achieve the detection objective should be determined pursuant to MARSSIM and documented.**

*Caution: Pinholes or tears in the mylar window of contamination detectors will result in unreliable readings in both the alpha and beta channels (see Caution in 5.6.4, above).*

- 5.6.7 Surface radioactivity from measured count rates should be determined as follows:

$$\text{Net counts per minute (cpm)} = \frac{\text{Unshielded gross counts}}{T_{S+B}} - \frac{\text{Shielded gross counts}}{T_B}$$

$$\text{Net dpm/100cm}^2 = \frac{\text{Net cpm}}{E_i \times E_s \times E_d \times PA} - \text{Material Specific Background}$$

Where TS+B = Count time, sample and background, TB = Count time, ambient background,  $E_i$  = Instrument efficiency (2 $\pi$ ),  $E_s$  = Surface (Source) efficiency (i.e., default values of 0.25 for alpha and 0.5 for beta),  $E_d$  = Source-to-detector distance correction (see RSP-018), and PA = Probe Area factor (i.e., probe area (cm<sup>2</sup>)  $\div$  100 (cm<sup>2</sup>)).

**Note: Material Specific Backgrounds should be used if available. If not, that variable may be either "zero" or the instrument daily background value.**

**Note: The source-to-detector distance correction for static or stationary measurements is one (1).**

## 5.7 Survey Methods for Determining the Extent of Loose Contamination on Surfaces

- 5.7.1 Loose contamination shall be measured with numbered dry disc smears wiped over a surface area of at least 100 cm<sup>2</sup>, with the unnumbered side in contact with the surface.

**Note: If the item/area to be smeared is less than 100 cm<sup>2</sup>, the smear results shall be recorded as "per smear", with the size of the smeared area noted on a Radiological Survey Form or FSS Workbook page.**

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**Note: Smears for  $^3\text{H}$  and  $^{14}\text{C}$  shall be collected using polyfoam media and counted by the methodology of liquid scintillation.**

- 5.7.1.1 A filter paper disc (unnumbered side down) shall be placed on the surface to be smeared.
  - 5.7.1.2 The disc shall be moved over an "S"-shaped area using moderate pressure, covering approximately 100 square centimeters (16 square inches), or about 16 inches in length, or the entire surface, if it is less than 100 cm<sup>2</sup> in area.
  - 5.7.1.3 The disc smear shall be placed in a sample holder such that individual smears are separated from each other to prevent cross contamination.
  - 5.7.1.4 A sample number that uniquely identifies the smear shall be documented on the sample holder and on a Radiological Survey Form or FSS Workbook page.
- 5.7.2 Each smear may be submitted to an analytical laboratory for determination of gross alpha and/or gross beta activity (disintegrations per minute) or may be counted in-house pursuant to RSP-019.

*Caution: Counting results from this RSP are not typically corrected for sample self-absorption or embedded activity.*

#### 5.8 Survey Methods for Determining Airborne Radioactivity

Airborne radioactivity shall be determined using an air pump connected to a filter cartridge in accordance with RSP-022.

#### 5.9 Analysis of Samples by an Analytical Laboratory

- 5.9.1 A chain-of-custody record (Attachment 8.4) shall be initiated by the individual collecting or overseeing the collection of samples.
- 5.9.2 A copy of the chain-of-custody record shall accompany the samples throughout transportation and analyses; any break in custody or evidence of tampering shall be documented.
- 5.9.3 Sample custody shall be assigned to one individual at a time in order to prevent confusion of responsibility.

**Note: Custody is maintained when (1) the sample is under direct surveillance by the assigned individual, (2) the sample is maintained in a tamper-free or tamper-evident container, or (3) the sample is within a controlled-access facility.**

- 5.9.4 Samples that are submitted to a radioanalytical laboratory shall be accompanied by a "Request for Analysis" form used by the laboratory.

**Note: Prior to shipment of the samples, the Health Physics Technician should contact the laboratory to ensure all necessary pre-shipment steps are accomplished.**

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- 5.9.5 The samples shall be packaged and shipped to the laboratory by overnight carrier in order to demonstrate chain of custody.

**Note: The request for analysis and chain of custody record (Attachment 8.4) should accompany the shipment, with only a copy maintained for the project file.**

- 5.9.6 The radioanalytical laboratory shall have written procedures that document the laboratory's analytical capabilities for the request analysis and a QA/QC program which assures the validity of the analytical results.

## 6 EXEMPTION PROVISIONS

Variances and exceptions to the requirements of this RSP shall be permitted pursuant to the written authorization of the RSO and the Vice President.

## 7 DOCUMENTATION

- 7.1 All records pertinent to this procedure shall be maintained pursuant to RSP-004.
- 7.2 The following records shall be maintained:
- 7.2.1 Pre-operational instrument check forms.
  - 7.2.2 Radiological Survey Forms (Attachment 8.1 or 8.2)
  - 7.2.3 FSS Workbooks (Attachment 8.3)
  - 7.2.4 Smear Counting Results
  - 7.2.5 Chain-of-Custody Forms (Attachment 8.4)
  - 7.2.6 Project logs and work plans
  - 7.2.7 Raw data capture sheets (Attachment 8.5), field notes and records

## 8 ATTACHMENTS

- 8.1 Radiological Survey Form (A)
- 8.2 Radiological Survey Form (B)
- 8.3 FSS Workbook
- 8.4 Analysis Request and Chain-of-Custody Form
- 8.5 Raw Data Capture Sheet

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**ATTACHMENT 8.1**  
**RADIOLOGICAL SURVEY FORM(A)**  
*(Full-page version on the server)*

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### **ATTACHMENT 8.2** **RADIOLOGICAL SURVEY FORM(B)** *(Functional version on the server)*

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### **ATTACHMENT 8.3** **FSS WORKBOOK** *(Functional version on the server)*

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### **ATTACHMENT 8.4** **ANALYSIS REQUEST AND CHAIN-OF-CUSTODY RECORD** *(Full-page version on the server)*

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**ATTACHMENT 8.5**  
**RAW DATA CAPTURE SHEET**  
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