On the following pages is an excerpt from the “Information needed for Registration of SABIA X1-XP Materials Analyzer” taken from your letter of June 19, 2013. In each section, I have repeated the question or comment, and have attempted to provide the required information beneath each section.

SABIA Inc 's Application dated March 29. 2013
Information Needed for
Registration of SABIA X1.XP Materials Analyzer

SABIA Inc.'s application dated March 29, 2013, contained insufficient information as required by 10 CFR 32,210 and described in the relevant guidance document NUREG·1556 Vol. 3, titled ”Applications for Sealed Source and Device Evaluation and Registration," Specific deficiencies Include:

1. Description/Construction

1.1 Please submit full set of engineering drawings and a detailed description of the construction of the device. The design and data should be sufficient to allow the reviewer to fully understand the Construction, operations of the product and its components and safety features and to allow the evaluation of the product's safety, security and integrity.

You should include as a minimum, complete annotated engineering design and/or construction drawings showing location and mounting of the sources, please provide details of source holder, dimensions, shield assembly and beam geometry. Specific and special attention should be paid to the details associated with and the Integrity of the sealed sources in the product.

All engineering drawings have been submitted under separate submittal. These drawings are considered as proprietary by SABIA, Inc. and are submitted under provisions of 10CFR2.390.

1.2 Source Holder/Source:

1.2.1 The drawing provided on Page 16 does not indicate how the source will be secured in the source holder Please provide a detailed engineering drawing for the source holder and specify how the source will be mounted.

The details of the source holder are shown on SABIA drawing 1002993. The details of the source housing are shown on SABIA drawing 1004480. This included details of the internal shielding and the stainless steel hasp for securing the source holders in the source housing.

Additional details are provided in the attached color photos, showing details of the source holder, source housing, locking mechanism, and security lock.

1.2.2 Provide drawings that illustrate how four individual sources are to be mounted in the source holder (Page 4, Paragraph 1).

Please see attached color photos, illustrating the mounting of four individual source holders in the source housing.

1.2.3 Provide further information regarding the statement (Page 7, Paragraph 4) that "the source holder is plugged and welded."

The details of the source holder, including the materials and welding callouts are included on SABIA drawing 1002993.

1.2.4 Clarify the reference to source manufacturer FSUE (Page 4, Paragraph 1).

FSUE, refers to FSUE Scientific Research Center of Russia

1.3 Please clarify the references to the 'conveyor belt." The application refers to conveyor belt repeatedly, for example or Paragraph 1 of Page 1. Paragraph 1 of Page 8, Paragraph 3 of Page 9, Operation and Maintenance Manual Section 2 9.

My apologies for the miscommunication. The SABIA model X-1 analyzer was designed to be mounted on the structure of an existing conveyor system. As such, the shielding has been designed to minimize radiation streaming from the ends of the device in the direction of the conveyor belt. In a similar manner, identical shielding methods have been used to minimize radiation streaming from the ends of the SABIA X1-XP analyzer in the direction of the slurry pipe. I have corrected the entries in the device safety summary and in the Operation and Maintenance Manual.

1.4 Please confirm that the Model X1·XP will only be designed for use on a pipe of 10 inches diameter, If the Model X1-XP is to be modified for use on other pipe sizes, the current application is not adequate for such variations. If your Intent is to distribute the device for different size variations, please provide detailed engineering drawings for each and address shielding issues.

The SABIA model X1-XP analyzer has been designed to fit around pipes ranging from 8 inch pipe to 12 inch pipe. Two sets of mechanical drawings are included in the drawing submittal. The one is designed for a pipe size of 10 inches, but will fit pipes from 8 inch to 10 inches. The second is slightly larger, and is designed for a pipe of 12 inch diameter.

There are two radiation surveys attached, which include a complete radiation survey for two separate devices. The one survey was performed with a device containing an 8 inch pipe and the second was performed with a device containing a 12 inch pipe.

1.5 Device Mounting and Installation

1.5.1 Please provide specifications for Installation and the structural requirements for mounting the device on the floor support Structure (Page 3, Paragraph 5). Please delineate how the structural requirements were determined e. g., structural analysis, test data.

The attached photos show the device with the floor support mounting installed. The structural design and mounting was determined by structural analysis.

1.5.2 Please provide information, including drawings and components, on how the device is mounted on the pipe.

The details of mounting and support are provided on SABIA drawing 1004520.

1.6 Provide a drawing to show the location and the design for mounting of the padlock (Page 3, Paragraph 6).

The details of the lock are shown on drawing 1004480 and are also illustrated in the attached color photos.

1.7 Please provide further clarification on the statement that the 'Source housing is an integral part of the overall shielding (Page 3, Paragraph 8).

The details of the source housing are shown on SABIA drawing 1004480. The device assembly is shown on SABIA drawing 1004572, which includes the source housing integral with the overall shielding.

1.8 Provide information that the shielding material, HDPE (Page 11, Materials subsection) Will maintain its shielding properties in a radiation environment. You may provide the copy of the reference document which we were not be able to obtain.

A copy of the Californium shielding guide is attached for your reference.

1.9 Please provide information how the equivalency of alternate shielding materials, i. e, "equivalent plastic" will be determined (Page 11 Materials subsection).

HDPE refers to High Density Polyethylene. There are various terminology associated with that loose definition, including differences in color, surface finish, or wear characteristics, which do not change the chemical or shielding properties of the material. Equivalent plastic does not mean that SABIA expects to substitute other plastics, but does allow for changes in color or surface finish of materials with appropriate engineering approvals.

2. Labeling

2 1 Please state the label location

The device label will be attached to the device near the source access.

2 2 Please clarify, on the label, that the manufacturer's/distributor's licensing address is in Idaho Falls, ID instead of San Diego, CA

The wording of the device label has been corrected to reflect the manufacturing address of Idaho Falls, ID.

2.3 Please clarify 1he reference to "permanently attached" regarding the label mounting (Page 5).

The device label is attached using stainless steel screws to the device at a location near to or adjacent to the source access.

3. Conditions of Use

3 1 Specify the estimated working life of the device.

The normal working life of the device is 25 years, with replacement or replenishment of the Cf-252 sources every two to three years, as required for statistical accuracy and performance of the electronics.

3.2 Vibration.

3.2.1 Please clarify the statement that the device "was mounted directly to an existing conveyor system" (Page 11).

The prototype SABIA X-1 belt analyzer was mounted directly to an existing conveyor system, some vibration is transmitted through the structure to the materials analyzer. This vibration is estimated to cover the frequency range of 10Hz to 40Hz at an amplitude of 0.03 inches over a time period of 8 months. The maximum vibration experienced in the flow of slurry through a pipe has not been quantified, but is not as severe as that experienced with operation near a loaded conveyor belt.

3.2.2 Please provide Information that the vibration parameters in the application are representative for the operating environment expected for slurry pipes.

The normal vibration experienced in the operation of the X1-XP slurry analyzer has been verified by physical contact with the various components in the slurry operation. The level of vibration are not as severe as experienced in operation on or near a loaded, operating conveyor system.

3.2.3 Please provide information that the device will maintain its Integrity within the vibration parameters which were “estimated" for conditions of use.

The vibration on the pipes and structure in a slurry pipe cover the frequency range of 10 Hz to 40 Hz, but do not approach the amplitude of 0.03 inch, experienced with a loaded conveyor system.

3.3 The application states that the 'powder coated steel structure· is suitable for the environment, please address the issue how welding of the components has been taken into consideration for corrosion,

The steel frame is shown on the various SABIA drawings, including the welding of various frame members. Following welding and drilling and tapping of the various holes, the frame is cleaned, bead blasted, and powder-coated with a coating identical to that used on the SABIA Model X-1 analyzer. This coating has demonstrated excellent stability in outdoor industrial environment.

4. Prototype Testing

4.1 The application listed the classification ANSI·24·142-142-R1 (in accordance with ANSI 43.8-2008) for the boundaries of the environments or conditions (Page 6, Paragraph 3). Provide supporting documentation on how the classification was achieved

Complete radiation surveys are attached for two devices, one including an 8 inch pipe and one including a 12 inch pipe.

4.2 Clarify the discrepancy of device classification between ANSI-24-142-142-R1 (Page 7) and ANSI-24-143-143-R1 (Page 10),

The listing on page 11, ANSI-24-143-143-R1 was a typographical error.

4.3 Provide information that verifies that the product design will maintain its integrity when subjected to conditions of normal use and likely accident conditions, Normal use and likely accident conditions should include those experienced during installation, use, handling. maintenance and storage. Specifically delineate the compatibility of the Model X1-XP to the Model X-1 and XL-Series. Preferably, please provide information In a table format to display the similarities In design of components and the overall performance of the devices under normal use and likely accident conditions such as fire

The SABIA model X1-XP is constructed with identical materials using identical fasteners on structural frames. The framed are constructed with identical materials to the SABIA X-1 analyzer and SABIA XL-Series analyzers. All shielding materials are identical to those materials used in the SABIA X-1 and XL-Series analyzers. The thickness of HDPE shielding is identical to that used on the SABIA Models X-1 and XL-Series analyzers. The SABIA Models X-1 and XL-Series analyzers have proven performance in harsh outdoor environments, subject to environmental conditions listed in this application.

5. Radiation Profiles

5.1 Please address how radiation scattering between the pipe surface (circumference) and the device were considered.

The measurement of radiation external to the device included 4 measurement points on each end of the device, with a normal pipe installed. There is no excessive radiation scattering or "streaming" from the area near the pipe.

5 2 The application provides the maximum radiation levels at 30 centimeters and 1 meter distances around the device However the maximum reading locations were not provided. In addition, please provide the isodistance readings in accordance with ANSI-N43.8-2008, or equivalent information regarding dose rates in terms of location around the device.

The normal procedure written for radiation surveys of SABIA devices points to various locations on the top, sides, and bottom of the device. It is a guide, and the actual measurement includes the maximum radiation exposure levels at each face. The radiation surveys include the required information in accordance with ANSI-N43.8-2008.

5.3 Provide information for the survey instrument which was used, the dates of the readings and the calibration dales for the instrument

The information on radiation survey instruments used, dates, calibration information, etc. is included on the attached radiation surveys.

6. Quality Assurance

6.1 On Page 7, you stated that SABIA's Quality Assurance (QA) program in on file for the NRC review. Please provide confirmation that all provisions of that QA program will be applied for the construction of the Model X1-XP device.

All provisions of the SABIA Quality Assurance program are applied to all devices designed and manufactured by SABIA, Inc.

7. Installation/Operation and Maintenance Manual

7.1 The application contained only an abstract of this document. The NRC cannot accept abstracts or drafts of an operation manual because such document could be subject lo change. Please provide a final copy of the Operation and maintenance manual.

Final copy of the radiation protection sections of the Operations and Maintenance manual attached.

7 2 Issues in the abstract of the manual which need clarification:

7.2 1 Section 2.4 Indicates that during normal operations of the analyzer, safe operation is maintained for workers walking along the catwalk. Please clarify what a "catwalk" is in the context of this device. Please also clarify what "safe operation is maintained" means in the context of this device

Typically, in industrial areas, personnel passageways are referred as catwalks, mainly because they are not always spacious. There are no mechanical moving parts associated with the SABIA model X1-XP analyzer, and the radiation fields near the device are safe for personnel walking near the device. These are the main characteristics referenced by the statement "safe operation is maintained"

7.2.2 Section 2,6 refers to a term "areas of either side of the main shield between the hinged shield wings," Please clarify the statement or provide illustration for the operators,

The wordings have been corrected in the final draft of this Operations and Maintenance Manual.

7.2.3 Section 2.9 refers to "performing maintenance on the conveyor belt or conveyor components (e. g. lubrication of conveyor idlers) ,.' Please clarify the relevance of this statement.

The wordings have been corrected in the final draft of this Operations and Maintenance Manual.

7.2.4 Sec1ion 2.10, Subsection Fire on or Around Nuclear Gage, refers to "remove electric power from the radiation gage .. " Please clarify the relevance of this statement.

In any industrial environment, in case of fire or serious conditions, power is normally removed from all unnecessary equipment, except if required for safety purposes. The statement is an indication that power is not required to this device for safety considerations.

7.2.5 Section 2.10, Subsection Damage to Radiation Gage, refers to 'remove power from the radiation gage,.,' please clarify the relevance of this statement.

In any industrial environment, in case of fire or serious conditions, power is normally removed from all unnecessary equipment, except if required for safety purposes. The statement is an indication that power is not required to this device for safety considerations.

7.2.6 Appendix B refers to 10 CFR 35.75 and 10 CFR 35, please delineate the applicability of these parts of the regulations for registration of your device.

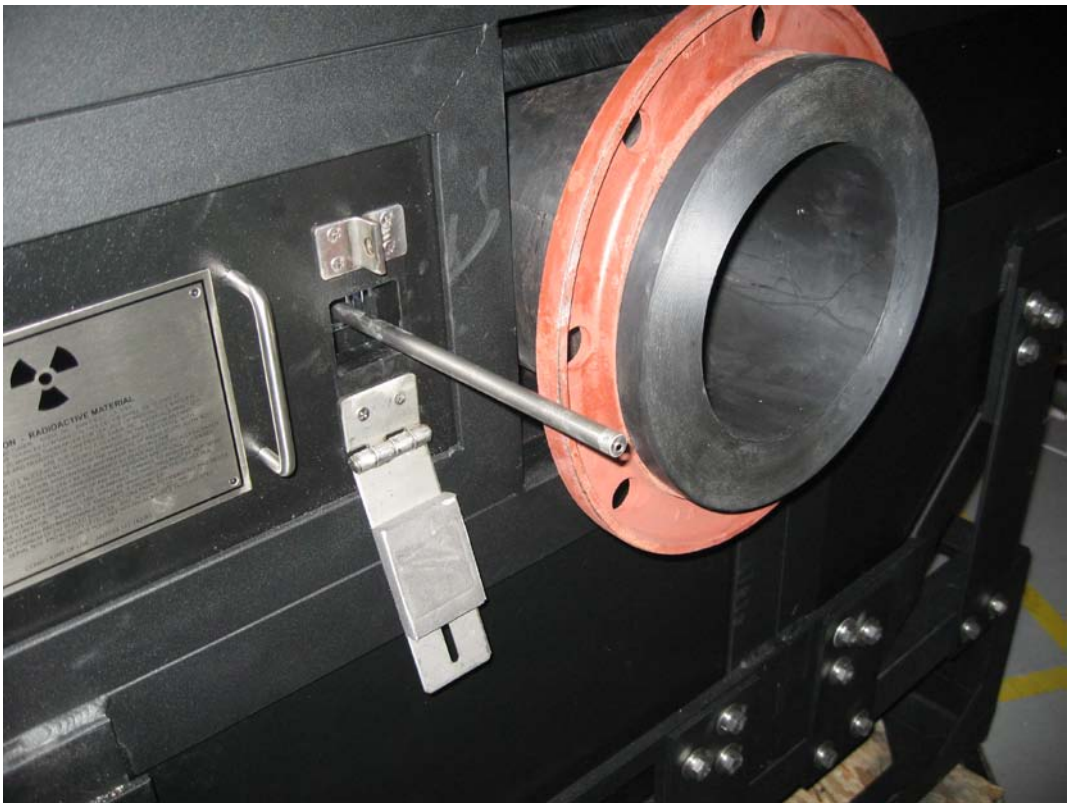
Appendix B is a copy of the NRC regulation 10CFR20.1301. The reference to 10 CFR 35.75 and 10CFR 35 a part of this section of the NRC regulations.

Photo showing a typical SABIA X1 analyzer. This unit is normally mounted on the rails of a conveyor belt. This specific device is used at SABIA for testing of electronics and for testing of materials.

Detail photo of the source housing for the SABIA X-1 analyzer, showing locked source access for two source locations. Not shown in this photo is the Radiation sign, above, and the stainless steel device label, which is placed to the left of the source access locations. The details for the SABIA X1-XP slurry analyzer are similar, with identical locks and locking details.

Detail photo of source access for SABIA X-1 analyzer, with locks open, ready for installation of source holders into two source locations. The source accesss for the SABIA model X1-XP is similar in design, utilizing identical components for the internal guide tube, locking hasps, and source holders.

Detail photo of source housing of SABIA X-1 analyzer, showing source holders installed into one source location.



View of the source access for the SABIA X1-XP analyzer, showing the source access open with one source holder partially inserted into the source housing.

View of the SABIA X1-XP analyzer, showing the source access closed and locked. This unit was designed for operation with an 8 inch pipe (installed)

Partial view of the top of the SABIA X1-XP analyzer, showing the hasp of the source access below the pipe. This unit was designed for operation in a vertical orientation with a 12 inch pipe (installed)

Detail view of source holder, with source.

Internal components of source holder, showing stainless steel source holder housing, source ID tag, polyethylene rod (moderator and shielding for neutrons), bismuth (shield for source gamma radiation, and source. Assembly is performed by SABIA, including inserting source into stainless steel source holder housing, followed by bismuth shield, polyethylene rod, and then wire seal and source ID tag. Engineering drawing of the source holder is shown on SABIA drawing 1002993, Revision C.

Illustration of the X1-XP device designed and mounted to a floor support structure. This support frame is designed to be bolted to the floor support underneath the existing pipe. This device contains an 8 inch pipe.

The device containing an 8 inch pipe. This illustration shows the lifting „tabs“ designed for hoisting the device for installation.