Hand delivered - 11/21/95

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SSD # 95-31

November 20, 1995

Mr. Douglas A. Broaddus
Mechanical Engineer
Nuclear Regulatory Commission
Sealed Source Safety Section
Source Containment ar vices Branch
Division of Industrial a dical Nuclear Safety, NMSS

Dear Doug:

This letter is in response to the most recent communication requesting additional information to facilitate continued evaluation of the device registration for the IMS Model 5321. IMS is pleased to provide the following information as requested under items 1 - 15 of your letter.

Introductory Paragraph

We wish to clarify our statement regarding the similarity of this Model 5321 to our Model 5301. As we stated in our application *"This gauge is very similar to the gauge registered [...] that is., **same operating environment, same measuring application.** The difference is in a change in the source housing configuration. The source housing construction materials are the same as the already approved gauge design."*

We agree that the source housing design is quite dissimilar and did not state nor imply that the design was similar. We reaffirm, however, that the evaluation of this device registration application can rely extensively on the approved device (Model 5301) for operating environment, measuring application, and source housing construction material information.

IMS Inc. Response to Item 1

Item 1 will be discussed on 1995 Nov. 20. IMS has prepared a partial response to this item as presented below. Addition information will follow, based upon discussions with the NRC.

Item 1a: Material Specifications
IMS has deliberately not specified the composition of the steels and stainless steels used in the construction of the gauge because:

a. the cost and availability of these materials varies and IMS needs the freedom to select materials that are available and affordable.

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b. the specific alloy used in most cases does not effect the radiation safety of the device. IMS intends to specify exact compositions only where the safety of the device significantly depends upon the material alloy composition. With respect to the measurement frame construction, for example, any grade of commercially available carbon, alloy, or stainless steel could be used in the construction of a safe installation.

In cases where material composition is essential to the device safety (e.g. the radiation source shielding material) IMS has specified the material type in detail.

Item 1b: 10 CFR 2.790 Requirements
IMS is not aware of any unmet 10 CFR 2.790 requirements. We would be grateful if the NRC could specify what points need to be addressed.

IMS Inc. Response to Item 2

Item 2a: Lock Out Valve:
The air lock-out valve depressurizes the compressed-air lines supplying the shutter actuators when it is closed. The shutters cannot remain open when the compressed air supply is removed. The valve is equipped with a clevis, where workers can hang their personal safety lock or safety tag before entering the controlled access area. Use of the lock-out valve should be specified in the site license.

Item 2b: Annual Dose Calculation:
The radiation flux at the perimeter of the controlled access area is less than 0.25 mR/hr. Under a worst case scenario, a worker is assumed to spend no more than an average of one hour per day at the controlled access area perimeter when the shutters are open. Assuming a standard 250 work days per year, the worker would receive less than 0.1 rem per year.

It is not anticipated that any members of the public will linger near the gauge. The gauge is installed in a steel-making environment where members of the public are generally forbidden. The workers around the gauge are not considered to be members of the public. Members of the public would have to spend 400 hours with their bodies pressed against the controlled access area boundary to accumulate a 0.1 rem dose. We feel that this is not likely to occur.

IMS Inc Response to Item 3

Item 3a: Gauge Layout (Location of Central Station, Gauger's Office, etc.)
The location of the Central Station will vary from one installation to another. This is a site license issue. The end user is responsible for positioning the Central Station and the gauger's office. Drawing 94-02-06-91 depicts a typical arrangement only. Other installations of this device will differ. In most cases there will be no gauger's office. The end user is required by virtue of their site license to ensure that employees and other individuals are protected as required by 10 CFR 20. IMS will verify that the Central Station and any gauge operator stations (e.g. a gauger's office, if present) are clearly outside the 0.25 mR/hr controlled access area.

In cases where individuals are likely to linger near the controlled access area, these individuals are not considered to be members of the public.

In the sample installation shown in drawing 94-02-006-91, the anticipated radiation field at the Central Station is less than 0.1 mR/hr above background.

Item 3b: No Access to the Measuring Gap:
Access to the measuring gap is limited by the controlled access area. The controlled access area (and therefore controlled access to the measuring gap) is maintained by the site licensee as required by 10 CFR 20. A shutter lock-out valve is provided to protect individuals in the infrequent cases where entry of the controlled access is necessary. This is provided to prevent access to the measuring gap when no process material is in the gap.

Hot metal and/or rapidly moving production equipment present precludes access to the measuring gap during production. In the event of a production stoppage, where process material is in the gauge, the material itself will block access to the measuring gap.

Item 3c: Automatic Source Shutter Closure when Process Material in Absent
The radiation source shutters automatically close within 5 minutes after the process material to be measured leaves the measuring gap.

Item 3d: Lingering in the vicinity of the gauge
The gauge user is required by their site license and maintain controlled access to a high radiation area. The enforcement of the controlled access area requirement will prevent persons from lingering in the vicinity of the gauge.

IMS Inc. Response to Item 4

Will follow under separate cover.

IMS Inc. Response to Item 5

The ANSI N538 test results and classification have been sent under separate cover.

The safety related components have been subjected to the environmental extremes listed in the application. The prototype for this gauge has been operating in a hot seamless tube mill since 1988 without incident. IMS has enclosed photographs of this prototype installation for reference.

The cooling and pneumatic systems for this gauge have also operated in the prototype installation without incident since 1988. Moreover, the same cooling system components have been used in other NRC registered devices such as the IMS Model 5245.

The source shutter springs are rated for infinite life (greater than 1,000,000) cycles for the temperature range 0 - 100 C. IMS experience with the prototype device is consistent with this rating. This prototype has been in continuous operation since installation in 1988. The shutters have been actuated an average of < 200 times daily for 7 years, amounting to a more than 500,000 cycles without failure.

IMS Inc. Response to Item 6

SM-18 (Sintered Tungsten) Properties:
The physical and mechanical properties for the SM-18 material are listed below for reference. This is the same material used in the IMS Model 5301 and Model 5245. IMS has used this material in hundreds of Cs 137 source holders around the world and has not experienced any SM-18 material failures. It should be noted that Tungsten is a common material and has been used for light bulb filaments for decades because of its high temperature and strength properties.

SM-18 (Sintered Tungsten) Properties:

Half Value Thickness for Cs 137 Radiation:	< 5.5 mm
Modulus of Elasticity:	380 kN/mm^2
Modulus of Rigidity:	150 kN/mm^2
Hardness	HB 285
Tensile Strength:	850 N/mm^2
Minimum Yield Strength (0.2 %)	520 N/mm^2
Elongation	16 %
Compressive Strength	3950 N/mm^2
Thermal Expansion Coeff 20 - 200 C	5.5 10^{-6}/K
Specific Density:	18
Melting Temperature:	> 1000 C. (the mech. strength at 1000 C is 260 N/mm^2)

IMS Inc. Response to Item 7

Item 7a: Label Location:
Label location is variable, depending upon site conditions. In general, labels will be placed such that they are visible to individuals approaching the gauge. Where feasible, labels will be located at near eye level, e.g. at +/- 30 degrees to the horizon for an individual located 5 meters from the measurement frame.

Labels will be installed by IMS personnel or by individuals authorized by IMS before the radiation sources are installed in the gauge.

Item 7b: Protected Environment:
A protected environment is any space that is protected from a harsh production environment. The inside of the measurement frame, for example, qualifies as a protected environment because it is kept cool and free of contaminants.

The minimum lettering size (1.5 mm) corresponds to 11 point font (the font used to print this document). This small size is used because some of the labels are necessarily small. The labels attached to the source holders, for example, are only large enough to accommodate 1.5 mm lettering. In a protected environment it is anticipated that 1.5 mm print would be legible, just as this letter is legible.

Item 7c: Durable Metal:
The criteria used for selecting a durable metal for the label is as follows

melting point:	> 500 F
thickness:	> 20 gauge
yield strength:	> 5 kpsi
elongation:	< 65 %

The metal will be corrosion resistant, e.g. stainless steel, aluminum alloy, brass, or bronze.

Galvanic Cell Effects:

The labels will be located where they will remain dry most of the time. In the absence of extreme moisture, galvanic effects are not expected. The labels are constructed of materials that typically do not corrode. IMS does not expect galvanic effects to be a problem with this device because none were observed on the prototype installation after six years of operation in a production environment.

Item 7d: Equivalent Permanent Lettering Process:
Any lettering process that causes the lettering to be formed in the base metal is an "equivalent permanent process." Some label manufacturers use lasers, for example, to remove material from the base metal in the shape of lettering. This would be viewed as an equivalent process. Some coatings would also qualify as an equivalent permanent process because they cannot be readily removed. Examples would include powder coating and baked enamel. Colors are used as indicated in the requirements found in 10 CFR 20.

Item 7e: Manufacturer's Identification:
The manufacturer in this case is the gauge manufacturer. A sample label is attached for reference.

IMS Inc. Response to Item 8

The radiation levels at distances of 5, 30, and 100 cm are included in the ANSI N538 test report.

The measured 0.25 mR/hr isodose curve for the nine source gauge is enclosed for reference (IMS Drawing 5321-02 I1) This curve is for the "least shielding possible" condition.

To expedite processing of the model 5321 device registration, IMS has dropped all variations of this model except the 9-channel configuration. IMS will seek approval for the model 5321 as a nine-channel gauge instead of a series of gauges with up to 13 channels at this time.

These drawings have been de-classified and do not need to be treated as proprietary.

IMS Inc. Response to Item 9

IMS has dropped its request to seek approval of this device as a series. At this time IMS requests approval of the Model 5321 as a nine-channel gauge only.

Worst Case Scenario

The worst case scenario for the conditions of use would be the prototype installation at Mannesmann in Muelheim, Germany. This prototype is installed immediately at the exit of a rotary sizing tube mill behind a piercer. The ambient temperature at this site frequently exceeds 150 F. The process material temperature routinely exceed 2000 F. Relative humidity around the gauge installation is typically 100 % because water is used to cool the production equipment.

The worst case scenario for the radiation profile is depicted in the enclosed isodose curve for the 13 source gauge.

The prototype testing is relevant to the other gauges in the series because
- the prototype has a perfect safety record
- it has operated without incident in harsh conditions
- it is representative of the other gauges in the series, as it is constructed using the same components and material.

IMS Inc. Response to Item 10

The device measuring frame is designed to survive collisions with process material. The frame is constructed of ca. 10 mm thick steel walls, which would not be penetrated by moving process material in a collision. The most likely outcome of such a collision is that the process material would be deflected backwards, away from the measuring frame. It is possible that the frame may be knocked over through a collision, in which case the compressed air supply to the shutters would be disrupted and the shutters would close. It is reasonable to assume that the site license holder will take steps to minimize the likelihood of a collision to avoid costly production delays and repair costs.

IMS Inc. Response to Item 11

The Amersham Model CDC.38210 Capsule X.38/4 is also known and registered as CDC711M. The Sealed Source Registration Number is NR-136-S-232-S.

IMS Inc. Response to Items 12 -14

The IMS Inc. response to these items will follow under separate cover.

IMS Inc. Response to Item 15

Even though the IMS location has not changed, IMS Inc. got a new mailing address in 1995 when a new post office was established in Cranberry Twp, PA. The old address (Mars, PA) will still be valid under a post office grace period for several months. For the record, however, the new address for IMS Inc. is:

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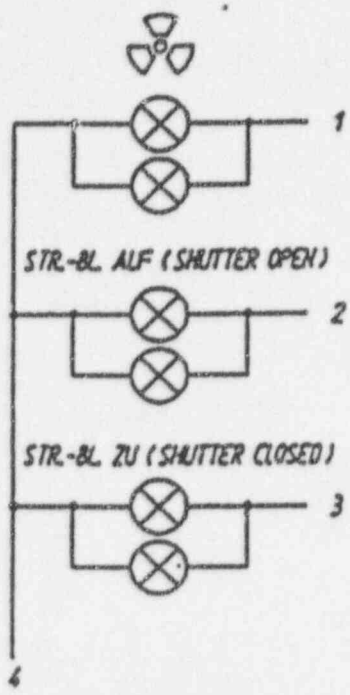
USA

tel: 412 776 9586
fax: 412 776 2700

We hope this information will be helpful, and look forward to working together with the NRC to ensure a safe and timely introduction of the Model 5321 in the USA.

Best Rega ds,

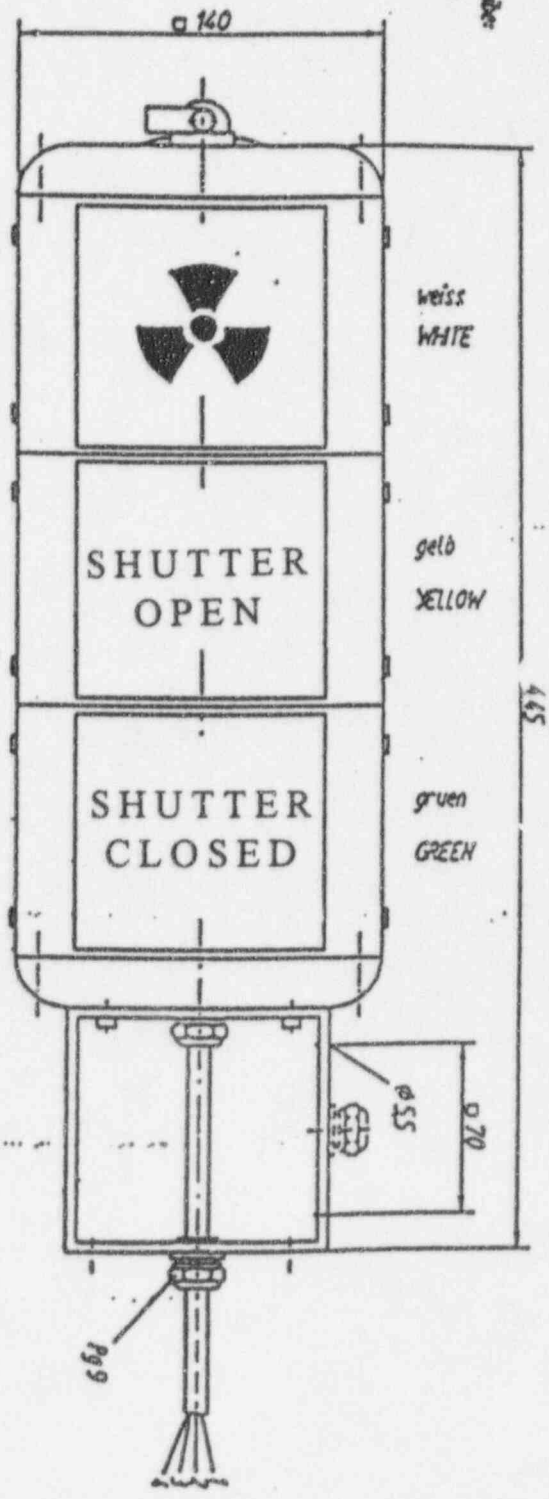
George Burnet, VI
General Manager, IMS Inc.



Lampenfassung: E14

LAMP SOCKET: E14

Farbe der Frontglasscheibe:
COLOR OF FRONT GLASS:



SHUTTER OPEN

SHUTTER CLOSED

IR-Leistung: 24V/5W oder 220V/5W

POWER SUPPLY: OR

Gewicht ca. 2kg

WEIGHT "

Signalampel
SIGNAL LAMP

5954-03 M1 (3)

Shutter Status Indication Lamp