NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
DIVISION OF FUEL CYCLE SAFETY AND SAFEGUARDS
REGULATORY AND INTERNATIONAL SAFEGUARDS BRANCH

DATE: December 9, 1996

FAX TO:	FAX #	TEL #
Al Thompson	804-522-5922	522-5978

FROM:

Brian Horn	301-415-5390	415-8128

Al:

Attached is a copy of a letter we are putting in the mail today for Mike Suwala. Attached to the letter is a few pages of information describing a personal dosemeter that the IAEA uses while on official business. Thought you might like an advance view of the letter.

Brian

cc: Joe Stainback 522-6039

B/14

DEC - 9 1996

Babcock & Wilcox Co.
Naval Nuclear Fuel Division
ATTN: Mr.Matthew Suwala
P.O. Box 785
Lynchburg, VA 24505-0785

Dear Mr. Suwala:

Attached is a copy of select pages describing the SIEMENS model dosemeter that most of the employees of the International Atomic Energy Agency (IAEA) utilize during visits to nuclear sites around the world. This personal dosemeter is an IAEA issued/owned instrument that IAEA staff are issued for official business. I understand that this device is not normally encountered by employees of the Babcock & Wilcox (B&W) plant. In this regard I ask that you share the attached information, on the SIEMENS dosemeter that the IAEA is authorized to utilize during inspections at the B&W plant, with appropriate B&W staff.

Additional information on IAEA equipment being brought onto the B&W site will be forwarded to you as received.

If you need any furthe assistance or clarification, please contact me at (301)415-7836 or Brian Horn (301)415-8128.

Sincerely,

/S/

C. W. (Chuck) Emeigh, Section Chief
International Safeguards Section
Regulatory and International Safeguards Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

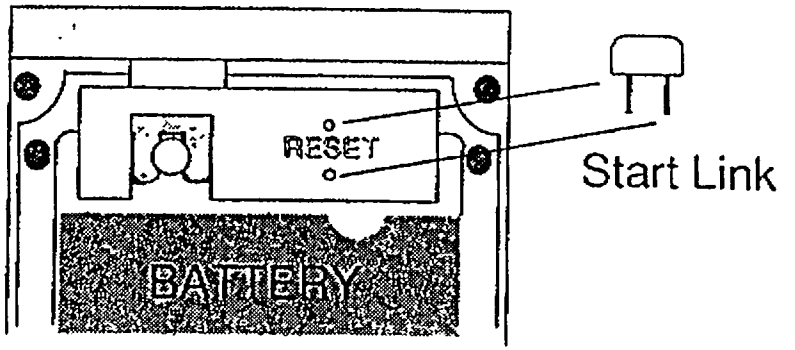
The old battery should be disposed of by insulating the contacts and placing the used battery in a sealed polythene bag and passed to the appropriate authority for safe disposal.

The new battery should be checked for leakage and mechanical damage prior to being removed from its polythene bag. Check the date of manufacture (D.O.M) stamp. Lithium batteries have a shelf life of 10 years, but will lose up to 10% capacity in this period.

Insert the battery into the contact housing as shown in the diagram overleaf. Care must be exercised when fitting the battery. Ensure that the contacts are correctly located on the battery terminal. Using firm pressure ensure that the battery is fully located in the contact housing. There should be less than 1mm gap at the top of the contact assembly between the battery stud and the back of this contact (see diagram overleaf).

5.4.1 Starting The Dosemeter

Insert the starting link and observe the display, which, within two seconds, will start to display all the LCD segments and exercise the LED and buzzer.



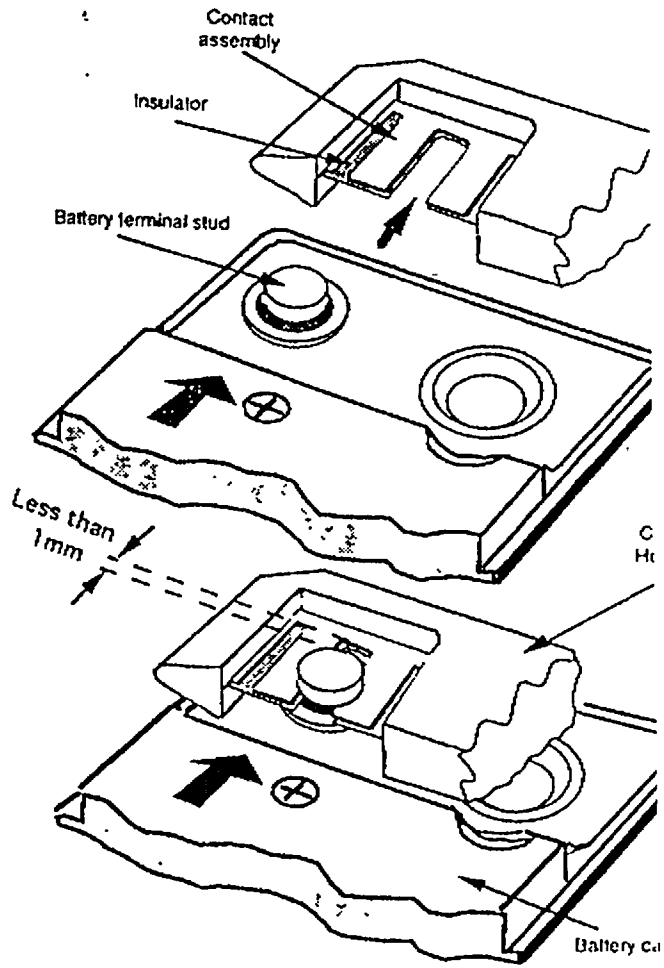
If the display does not appear check that the battery has been fitted correctly. If the battery feels warm remove it immediately as it may have been short circuited. This battery should be replaced in the Polythene bag from where it came and allowed to cool in a safe place.

When the LCD has been seen to display all the segments, the battery cover can be replaced on the Dosemeter using the screws provided.

When closing the battery cover do not use excessive force. This will not be necessary if the battery is correctly positioned (see diagram overleaf), and the rubber seal around the battery compartment is correctly in place Insert the pocket clip just before final closure and insertion of the two screws.

Do not leave a battery in a Dosemeter which has failed to start

Less than 15 minutes of dose data will be lost by powering down the Dosemeter (i.e. removing the battery), changing the battery, and restarting it.



BATTERY REPLACEMENT

Appendix A. Radiological Specifications

All radiological responses at +20°C

Dose Ranges

Hp(10)	Display	0µSv to 9999µSv	10.0mSv - 999 9mSv (auto ranging)
	Store	0µSv to 16 Sv	resolution 1 µSv
Hs(0.07)	Display	0µSv to 999.9mSv	10.0mSv - 999.9mSv (auto ranging)
	Store	0µSv to 16 Sv	resolution 1 µSv

Dose Rate Ranges

Display	Ḣp(10)	0µSv/h to 9900µSv/h
	Resolution	2 significant figures
	Ḣs(0.07)	0.00mSv/h to 99 00mSv/h
	Resolution	2 significant figures
Alarm	Ḣp(10)	7.0µSv/h upwards
Thresholds	Ḣs(0 07)	0.10mSv/h upwards

Linearity of response with dose rate

Hp(10)	^{137}Cs	0 Sv/h to 0.5Sv/h	±10%
		0 5Sv/h to 1Sv/h	±20%
		1 Sv/h to 2 Sv/h	±30%
		2 Sv/h to 4 Sv/h	±50%
		4 Sv/h to 50 Sv/h	continues to accumulate dose at a rate greater than 4 Sv/h
Hs(0.07)	^{90}Sr/^{90}Y	0µSv/h to 1Sv/h	±20%
		1 Sv/h to 50 Sv/h	continues to accumulate dose at a rate greater than 1 Sv/h

Repeatability

Better than ±5 % for 100µSv Hp(10) dose at 5mSv/h

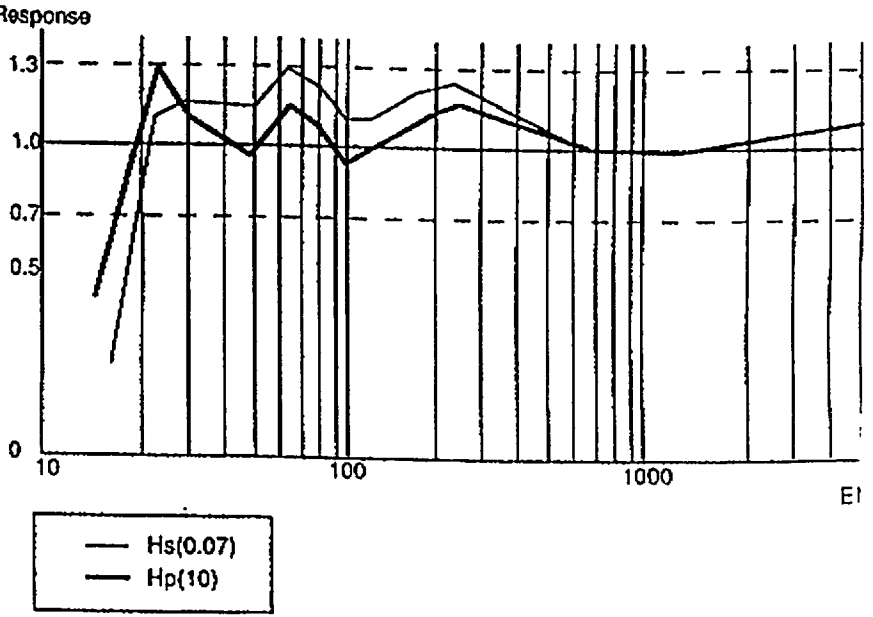
Calibration Accuracy

Hp(10)	^{137}Cs	100 µSv at 5 mSv/h	±10 %
Hs(0.07)	^{90}Sr/^{90}Y	100 µSv at 5 mSv/h	±20 %

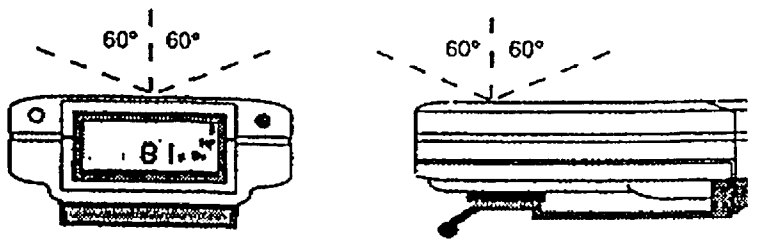
Annual check of calibration is recommended

Energy Response

Typical Hp(10) & Hs(0.07) response normalised against response to 660keV.



Combined angular and Energy response



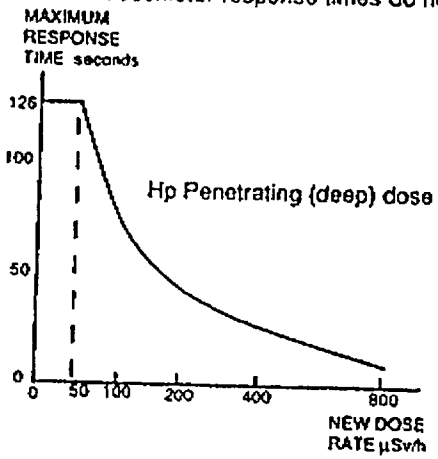
Hp	Photons	20keV - 1.5 MeV	Accuracy ± 30%
		1.5MeV - 10MeV	Accuracy ± 50%
Hs	Averaged Beta Energy	250keV - 1.5MeV	Accuracy ± 30%

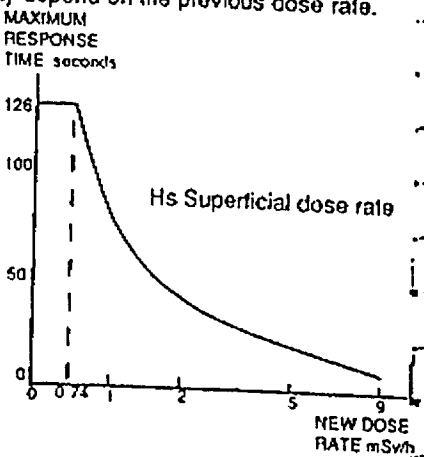
Neutron Response
Less than 2 % of true neutron dose.

Radon Response
No significant response to alpha emissions of radon and its progeny.

Dose Rate Response Times
Due to dose rate averaging, the Dosemeter has a finite response time to changes in dose rate.

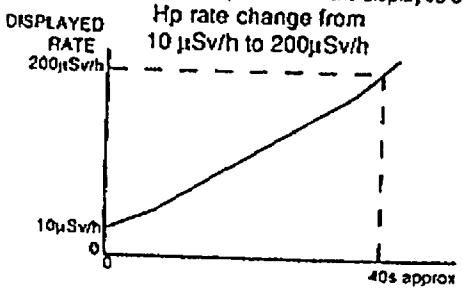
These graphs show the maximum time the Dosemeter will typically take to respond fully to new rates. Precise response times depend on detector sensitivities, and hence on the calibration parameters for the Dosemeter. They will also be affected by statistical variations, particularly at low dose rates. The Dosemeter response times do not in any way depend on the previous dose rate.

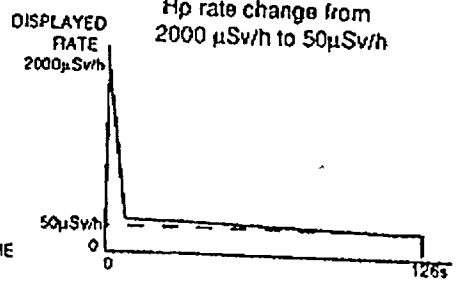




e.g. if the Hp rate changes to 50 µSv/h, the maximum time the Dosemeter takes to respond fully to this change is 126 seconds. The calculated rate changes roughly linearly towards the correct rate over this time period except when a large fall in rate is seen. In this case the response is rapid at first, before becoming roughly linear.

Typical examples of how the displayed dose rate changes following a step change in dose rate





Appendix B. Environmental Specifications

Temperature and Humidity Range

- Operating Temperature Range -10°C to +40°C
- Humidity up to 90% RH non condensing (tested in accordance with IEC 468(Secretariat)107 (Draft Ap
- Storage Temperature 25°C to +70°C

Over the Operating Temperature and Humidity Range specified above

- A Dosemeter's response to background radiation will not inc more than 0.2µSv/h from its measured performance at 20°C
- A Dosemeter's responce to ^{137}Cs at 7.5µSv/h will not vary than ±20% from its measured performance at 20°C

Appendix C. Electromagnetic Compatibility

The Dosemeter will perform within 10% of its normal response in the following:

Electric Field E=25 V/m 10kHz to 250kHz rms
E=50 V/m 250kHz to 1 GHz rms

Magnetic Field H=60 A/m 50Hz to 60Hz rms
H=1.5 A/m 10kHz to 250kHz rms

B=10mT Static

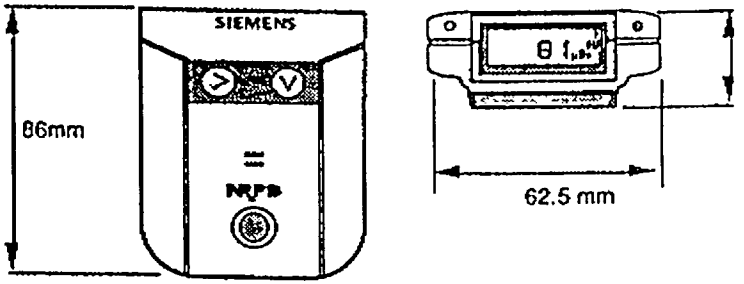
Electro-Static Discharge 6kV @ 2mJ

Radar - Owing to the sensitivity of the circuitry of the device, the EPD is not suitable for use at establishments where high power radar may be in use. (e.g. airports, dockyards etc).

Appendix D. Mechanical And Miscellaneous Specifications

Impact
A special detector will trigger special processing to take place to co effect of physical impact.

Dimensions



Weight
The unit weighs approx 170g

Case
Magnesium Alloy with polyester coating
Colour : yellow
Designed to facilitate decontamination (see Appendix F).

Battery Connection
Push-clip

Battery Type
Lithium Thionyl Chloride 5 Ah

Battery Life
Typically 12 months in continuous operation at an average dose rat with the alarm sounding less than 20 hours per year.

Operation
Two rubber push buttons

Display
Custom 7 segment 4 digit Liquid Crystal Display

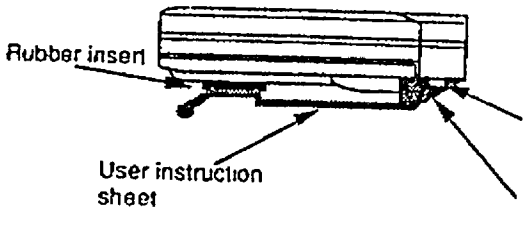
Beta Window
Aluminised polyimide film.

Alarm sounder
2kHz, typically 80 dBA at 30cm, fully sealed.

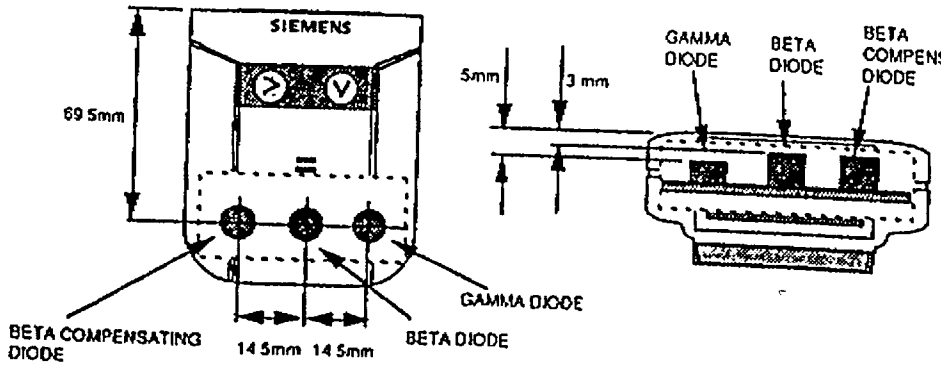
Three sounding modes , continuous ——————
slow intermittent — — — — — —
fast intermittent -- -- -- -- --

These are sounded during the confidence test

Clip
High impact plastic - renewable

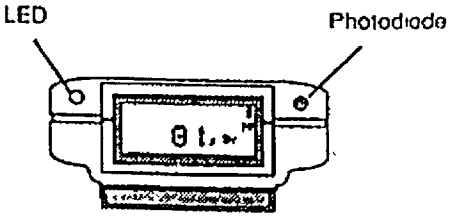


Detectors
Multiple silicon PIN diodes



Appendix E. Communication Link

The EPD communicates optically to a special Reader unit which connected to a PC running a data system. It does this via an LE photodiode.



The Reader to EPD optical link operates at 900 - 1000 nm (infra - red
The EPD to Reader optical link operates at 600 - 700 nm (visible rec

The optical link is capable of running at two different transmission speeds

Slow	128 bits / sec
Fast	3906.25 bits / sec

The Reader unit receptacle ensures that correct alignment is achieved excess ambient light does not affect reliable operation even in well ill environments.

A unique communication protocol is used to restrict tampering

Appendix F. Cleaning and Decontamination

The EPD should be cleaned by wiping it over periodically with a cloth lightly dampened with a solution of water and up to 5% of a neutral water based detergent.

Do not use solvents or other cleaners. Avoid excess visible water.

If radiological deposits are present the unit should be decontaminated by carefully wiping it over using a disposable cloth or tissue dampened with a detergent solution as described above, or alternatively by using a disposable 'sticky wipe rag'. The unit should afterwards be checked with a sensitive radiation monitor to ensure satisfactory decontamination has been achieved.

The EPD is water resistant but it should not be immersed in water or other solvents. If it is accidentally subjected to excessive wetting the unit should be quickly wiped dry and used with caution, observing its performance and comparing it with another EPD or an independent radiation monitor over the next 24 hours

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