

CONF-9007106--16

APPLICATION OR REMOVAL OF SAFEGUARDS SEALS BY FACILITY OPERATORS

SAND--90-0770C

F J Walford, UK Atomic Energy Authority

DE90 013841

C S Scamier, D L Mangan, D D Drayer, Sandia National Laboratories

1. INTRODUCTION

1.1 In this paper we identify the procedural requirements which would have to be met in order that facility operators could complete some of the seal procedures normally performed by an inspector, thereby reducing the demands for inspector presence at certain crucial times. The most often quoted example is the possibility that, where material is transferred under Agency seal, it may not be necessary for an inspector to be present to reverify the seal on arrival at the receiving facility if a VACOSS type electronic seal is used to record the date and time of seal removal. Although other possible opportunities may exist throughout the fuel cycle for operator use of Agency seals, only situations related to material shipments are considered here.

1.2 In principle, operator involvement in seal procedures might arise in two ways, either by applying seals which are later verified by an inspector or by removing seals which had been applied by an inspector. Both options are considered in relation to the safeguards requirement of timely verification. The direct benefits from having facility operators involved in Agency seal procedures can only relate to matters of efficiency (i.e. to resource savings). To determine the extent of the resource savings requires identification of, and detailed knowledge of, those applications where the involvement of facility operators might be appropriate. Thus this study is restricted to an examination of the technical requirements to be met if it is proposed that facility operators could be involved in Agency seal procedures. The alternatives of seal application by an inspector and seal application by the operator are now being considered in turn.

2. TRANSFERS OF NUCLEAR MATERIAL UNDER AGENCY SEAL

A Application by Inspector plus Removal by Operator

2.1 In this option the inspector applies a seal before the shipper transfers the item. As part

of the agreed routine procedure, the receiver may remove the seal on receipt of the transferred item, in the absence of an inspector. The possibility of the receiver having to remove the seal under exceptional circumstances when normally he would wait until an inspector had routinely verified the seal is not considered under this option. The procedure is shown schematically in Figure 1.

2.2 At A, a convenient time prior to the transfer, the material is verified and placed under seal by the inspector. If the material remains with the shipper for at least one timeliness period then at B the seal will have to be reverified. At C, the sealed material has been received by the operator who should wish to satisfy himself, to the extent possible, that the seal is correctly attached and intact. At D, which may be concurrent with C the operator removes the seal in order to gain access to the sealed material. At E, the inspector verifies the seal data to confirm the event at D. (If appropriate he may reverify the nuclear material as well). Ideally the time between B & E should not exceed one timeliness period but SAGSI has advised that some relaxation of this criterion should be acceptable to take into account reasonable transport times for the transfers.

2.3 The safeguards acceptability of such a scheme requires that the Agency have continuity of knowledge throughout the steps A-D (and, either further continuity of knowledge from D to E, or the capability to gain adequate assurance of non-diversion through the material reverification at E). Each of these three steps is now considered separately.

a.(1) Continuity of Knowledge through A to D

2.4 The fundamental requirements for continuity of safeguards knowledge are that identity and integrity of the seal are maintained and that the identity and integrity of the containment (i.e. the shipping cask) are also maintained. Clearly there is no continuity of knowledge as

MASTER

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

far as the Agency is concerned unless the inspector at E is satisfied that the data from the seal verification confirms that the seal has not been tampered with during this period*. Furthermore, the seal data must also confirm that the seal was applied and removed at the times stated by the inspector at A and the operator at D and that no other 'events' were recorded by the seal between those times. To complete the assurance, the inspector should have the opportunity to verify the integrity of the shipping container.

2.5 If reliance is to be placed on the sealing system, the retrospective assurance of continuity of knowledge up to D as viewed by the inspector at E is provided by an effective sealing system and satisfactory containment, both of which need to be verifiable at E with a conclusive positive outcome. Methods of achieving this continuity of identity of the shipping container in order to verify its integrity at E are considered below.

a(ii) Period D to E

2.6 C/S continuity is required from the time the operator has removed the seal up to the time when reverification or remeasurement is carried out. A diversion scenario making use of a dummy cask has been propounded. This involves a possible discontinuity of the C/S assurance at D where the receiving operator removes the Agency seal from the incoming shipping cask. The diversion procedure is for an undeclared 'identical' cask to be introduced into the field of view of the receipt area surveillance system, whilst the operator removes the Agency seal from the declared container outside of the field of view. Simultaneously, dummy seal removal activities are performed in the field of view and the correct Agency seal is introduced into these activities as quickly as possible.

2.7 Where such a diversion scenario is credible, it is essential to maintain continuity of C/S knowledge of the declared cask in the receipt area. In the absence of an inspector there are in principle two possible methods to achieve this continuity; by continuity of knowledge of the location of the Agency seal up to the moment of its removal within the field of view of the surveillance system** or by assurance of the identity of the sealed shipping cask. Assurance of identity of the cask requires that it has a unique identity and that

* It is inevitable that a suitable seal for the functions being considered in this study must be capable of storing date and time information on seal 'makes' and 'breaks'. All references to seals will imply this capability unless otherwise stated.

** It is the loss of the continuity of knowledge of the location of the seal which enables an undeclared substitute cask to be introduced into the receipt area.

the identity is verified prior to removal of the cask from the surveillance coverage. These two possibilities are now considered separately.

a(iii) Seal Verification

2.8 Assurance of the seal identity and integrity requires some corroborative evidence that the verification refers to the relevant seal on the declared cask in its declared location in the receipt area. It has been suggested that the corroborative evidence could be generated by having the seal identifier and date/time data superimposed on the surveillance data. This could be done by linking the two devices immediately prior to removal of the seal and maintaining that link until the seal has been removed so that the status change of the seal is also superimposed on the surveillance data. Normal surveillance procedures would then be used to provide continuity of assurance. This procedure is the principle of the VACOSS/MIVS interface.

2.9 The basic necessary specification for such an interfacing can be identified fairly readily. The facility operator requires assurance that the interface is functioning correctly. The operator would be expected to demand that the interfacing procedure required the minimum complexity and made limited demand in terms of skills. On the other hand he would need to have unambiguous assurance that the interface connection had been correctly made and that the interrogation/data transfer from seal to surveillance equipment had been completed satisfactorily. The operator would also want to satisfy himself that the seal on the received cask had been correctly attached and was intact. Therefore, it could be argued that the seal status data should be made accessible to the operator (in read-only form) during the interfacing period. From the safeguards point of view it is essential that only the seal on the cask in the field of view can be interfaced and furthermore that the surveillance is 'not misled' to indicate this to be the case when in fact the linking is with the correct seal which is located outside of the field of view. Furthermore the implications of a system failure need to be understood by and be acceptable to both the operator and the Agency.

a(iv) Shipping Cask Identification

2.10 Two reasons justify the need for an inspector to have a high assurance that the shipping cask detected by the receipt area surveillance system is the cask declared by the operator. Firstly, at E the inspector needs to verify the integrity of the shipping cask as well as verifying the removed seal. Clearly this can only be achieved if the inspector visits the facility before the cask is opened (or before it is transferred out of the facility again). Secondly, verification of the identity of the shipping cask detected by surveillance at

receipt area together with seal verification would provide adequate verification of the operator's declaration. This can only be achieved if the inspector makes a visit before the cask is transferred out of the facility.

2.11 Two obvious requirements are that the shipping cask has a unique identity (or at least can provide a high assurance that its identity is as declared by the operator) and that continuity of surveillance is maintained from time of seal removal to time of inspection. If the interfacing between the seal and surveillance system is successfully implemented as outlined in paragraph 2.8 - 2.9 then the seal identifier should adequately meet the cask identifier requirement. However if the interfacing system does not function acceptably it will be necessary to use cask identifiers which are capable of fulfilling this function.

2.12 An obvious technical solution could be a 'seal' attached to the cask by the inspector prior to shipment in such a way that it does not seal the cask but is attached as an identifier. There would be no need for the operator to have access to this identifier. Provided that the identifier is no more vulnerable than the seal there should be no significant reduction in the levels of assurance of non-diversion from the system, if both devices are correctly installed. Such a system places no additional responsibilities upon the operator above the need to remove the seal from the cask in the routine way and to ensure that the cask remains under surveillance until its identity and containment are verified by an inspector. The 'seal' functions purely as an independent and unique identifier of the cask, ensuring that the declared cask was in the field of view of the surveillance system.

2.13 In conclusion; in order that the Agency have high assurance that the operator has removed the correct seal from the correct cask at the declared time, it is essential that:

- i) if a seal/video interface is used, only the seal within the field of view of the CCTV camera can be connected to the interface; or
- ii) the identity of the cask within the field of view of the CCTV needs to be verifiable and continuity of knowledge of the location of that cask is required from the time of seal removal until it is verified by an inspector;
- iii) where the seal/video interface is used, its specification should make allowance for the fact that the facility operator requires assurance that the interface is functioning correctly and that the implications of a system failure are understood and are acceptable to both the operator and the Agency.

These three points are considered to be fundamental to the acceptance of the principle

of having facility operators remove Agency seals on in-coming shipping casks. The first two points can be summarised as: only the declared seal can be opened, after which continuity of knowledge of the unsealed cask is required until an inspector has verified the seal, the cask inventory and the cask integrity.

B. Application by the Operator plus Removal by Inspector

2.14 By a similar step-by-step analysis of the shipment process we have identified two cases which need to be considered: Case 1, where the operator has sealed the cask prior to an inspector having made a timely verification of its contents; Case 2, where verification was made by an inspector but for operational reasons the shipper wished to have the cask unsealed until some time after the inspection had been made.

In Case 1 we conclude, if the cask is sealed by the operator prior to inventory verification, it is essential that:

- i) the operator should use the seal/video interface when sealing the shipping cask. He may apply it to either the seal or the cask identifier if one is fitted; and
- ii) an inspector should verify that the seal had been applied correctly before the seal is removed at the receiving facility;
- iii) if the cask is not to be unloaded at the time the seal is verified, the unsealed cask should be kept under effective C/S until the Inspectorate have the opportunity to verify its inventory;
- iv) when the seal/video interface is used, only the seal (or identifier) within the field of view of the CCTV camera can be connected to the interface.

In Case 2 we conclude, if the cask inventory is verified by an inspector but not immediately sealed, it is essential that:

- i) the shipping cask remains under effective surveillance between the time of inventory verification and the application of the seal by the operator;
- ii) where a unique identifier is available on the cask, this should be verified by the inspector at the time of pre-shipment inventory verification;
- iii) the operator makes use of a seal/video interface when sealing the cask only if there is no unique cask identifier;
- iv) where the seal/video interface is used, only the seal (or identifier) within the field of view of the CCTV camera can be connected to the interface;
- v) an inspector verifies that the seal has been applied correctly before the seal is removed at the receiving facility.

3. DISCUSSION OF THE IMPLICATIONS OF OPERATOR USE OF SEALS

3.1. It is not the intention in this paper to attempt to determine the benefit of having operators either apply or remove Agency seals. Clearly the motivation for pursuing such procedures is to reduce the need for inspector presence at facilities and to allow the operator greater freedom of operations by making him more independent of the need to have inspectors present at critical times. It is probable that the benefits (and costs) will be application-specific. It has been assumed here that the merits of the proposal have justified the need for the implications to be investigated. It has been shown that, in order to implement the proposals, certain procedures and technological requirements have to be observed so as not to reduce the level of safeguards effectiveness from the present standards.

3.2. The key factors arising in the analysis are:

- in principle there are situations where it should be acceptable to permit operators to either apply Agency seals provided that an inspector is able to verify correct application prior to their removal or for operators to remove seals which have previously been applied by an inspector;

- an effective seal/video interface will be required in order to contribute to the assurance that the operators' actions were correct and 'as declared by the operator';

- a seal /video interface would have to be designed in such a way that only the seal within the TV field-of-view could be attached to that interface;

- under some circumstances unambiguous identification of the declared shipping cask is required in addition to the seal identity and status.

3.3. Faults may arise as a consequence of faulty equipment. The latter could be the result of deliberate or accidental actions by either the shipper or the receiver or during transit. The possibility of incorrect procedures by an inspector should not be overlooked, although one would expect this to be a rare occurrence.

3.4. Follow-up procedures following the discovery of procedural or technical faults will be required and they will depend very much on the nature of the anomaly. A VACOSS-type seal and the MIVS may be able to provide some information on the timing of the event which caused the anomaly. If this is the case, then the pursuit of assurance of non-diversion may be directed to a limited number of local inventories. Loss of continuity of knowledge during transit raises the issue of diversion (and substitution) from that material in the shipping cask and also the possibility of the 'borrowing scenario' to temporarily conceal diversion from other inventories.

3.5. The implications of accidental failures of the seal interface procedure or of the seal installation will require serious consideration when evaluating the benefits and costs of negotiating agreements to allow operators to apply or remove Agency seals.

Reference

1. F J Welford, D D Drayer, C S Somier "Some Implications of the application or Removal of Agency Seals by Facility Operators." SRDP RL62 (UKAEA) ISPO 311, 1990.

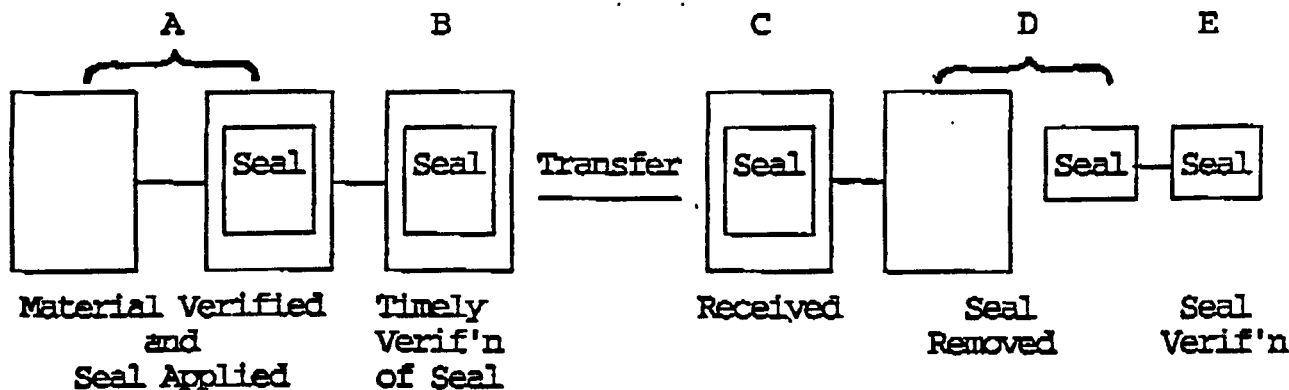


Figure 1: Basic Features of Shipment Operations