SHIPMENTS UNDER SPECIAL ARRANGEMENT : CRITERIA

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ABSTRACT

Permission for special arrangement (SA) is accorded upon ensuring that the shortcomings of the proposed shipment would be off-set by the compensatory measures. In the Regulations for the Safe Transport of radioactive Materials, IAEA Safety Series No. 6 (1961) the Competent Authority was required to take into account the **frequency** of the shipments and the projected exposure. Subsequent editions require that the special arrangement shall ensure that the overall level of safety in transport is at least equivalent to that if all the applicable requirements of the Regulations had been met. In the 1985 edition of the Regulations, the term "Multilateral approval" was used explicitly for such shipments. The concept of SA ensures that a shipment is not prevented for reasons of formalities. It is a boon to the consignor. If claimed as an legal entitlement and used indiscriminately, shipment under SA can be a bane from safety point of view. The dilemma may be solved by making a quantitative assessment of the projected radiological risk arising from the failure of the compensatory measures proposed for the shipment and by establishing a constraint for the dose receivable from SAs in a specified period. Since shipments under special arrangement have not been demonstrated to be particularly unsafe or prone to accidental exposures, there is justification for the continuance of such shipments provided the Competent Authorities issue approvals judiciously. The paper suggests some criteria for the Competent Authority to observe constraints in the issuance of approval certificates for such shipments.

NEED FOR SPECIAL ARRANGEMENTS

Shipment under Special Arrangement (SA) is resorted to when one or more provisions of the applicable regulations for the safe transport of radioactive material cannot be satisfied. Permission for SA may be accorded by the Competent Authority upon -

a) identifying the shortcomings of the proposed shipment;

b) determining the nature of compensatory measures which would be implemented by the consignor; and

c) satisfying itself that the shortcomings of the shipment would be off-set by the compensatory measures.

It is implicit in the above check-list that the shortcomings as well as the compensatory measures should be quantifiable. The quantification would refer to potentially receivable individual / collective exposures because of the shortcomings and the exposures avertible by the compensatory measures.

EVOLUTION OF THE CONCEPT OF SA IN THE REGULATIONS

The earliest reference to special arrangements was made in the Regulations for the Safe Transport of radioactive Materials, IAEA Safety Series No. 6 (1961) [(1)] . It was required that the consignor should make the application for SA to the Competent Authority of the country where the shipment originates and the Competent Authority of each country through or into which the shipment is to pass. The Regulations drew special attention to package design features, special precautions to be taken *en route* or in case of accidents or unexpected delay and special handling procedures. Each Competent Authority "shall" take into account the **frequency** (emphasis our own) of the shipments and the reasonable likelihood of exposure and determine whether applicable dose limits would be exceeded. The approval may specify routing including transfer-points and final destination and special precautions to be observed *en route* in case of accidents or unusual delay.

The 1964 revised edition[(2)] requires that a consignment of radioactive material which does not satisfy all relevant parts of the Regulations may only be transported with the prior approval of the Competent Authority of all countries affected by the movement. The Competent Authority / Authorities shall impose conditions adequate to ensure that the shipment shall be no less safe than if all the relevant provisions of the Regulations had been complied with. The 1967[(3)] edition of the regulations reproduces these provisions verbatim.

The 1973[(4)] edition requires that the special arrangement shall be adequate to ensure that the overall level of safety in transport is at least equivalent to that which would be provided if all the applicable requirements of the Regulations had been met. Further, this edition prescribes some of the contents of the application for approval, viz., a statement of the respects in which, and of the reasons why, the consignment cannot be made in full accordance with the applicable requirements of the Regulations and a statement of any special precautions or special administrative or operational controls which must be taken during transport to compensate for the failure to meet the applicable requirements of the Regulations. This edition also prescribes some of the contents of the Competent Authority approval certificate. These provisions remained unaltered in the amended version of this edition [(5)].

In the 1985 edition[(6)] of the Regulations, the term "Multilateral approval" was used explicitly for shipments under special arrangement as also in its amended version published in 1990.[(7)] The current edition of the IAEA Regulations[(8)] stipulate in detail, the information to be included by the Competent Authority in the SA approval certificate. The provisions are by

far the most detailed and specific. Obviously, shipments under SA have been increasing in magnitude and importance and hence more thought was given to such shipments.

DEFENCE FOR SHIPMENTS UNDER SA

In defence of SA, Gibson [9] observes that ' the regulations ***sensibly*** provide that a consignment of radioactive material which does not meet all the requirements can only be transported with the prior approval of the Competent Authorities of all the countries affected by the proposed transport operation. Such an operation is termed a "special arrangement", … but because its purpose was not explicitly defined in many quarters it was falsely assumed to be a faintly dishonourable device for transporting radioactive materials in a near-dangerous condition. In fact, … it is nothing of the sort … it is always necessary to demonstrate conclusively that the safety of the consignment is beyond doubt. Nor should it be assumed that special arrangements will always involve large quantities of radioactive material; they are equally likely to be invoked when for some valid reason it is not practicable to meet the absolute letter of one of the provisions of the regulations, and where one could convincingly prove that this shortcoming in no way reduced the desired standard of safety … a special arrangement can … justly be considered as a legitimate procedure open to consignors. The need to obtain the prior approval of all Competent Authorities will … keep the numbers of such operations within reasonable proportions'.

COMMONLY ENCOUNTERED BASES FOR SA

The commonly encountered grounds on which applications for permission under SA are made are -

(a) The validity of the design approval certificate of the package has lapsed

(b) It has not been satisfactorily demonstrated that the packaging would withstand the prescribed regulatory tests

(c) Package has a history of a serious accident / damage

(d) Package incorporates an intermittent venting mechanism which has to be manually operated

(e) The total activity of the radioactive content exceeds the approved limit

(f) The physical / chemical form of the radioactive content is different from the specifications in the design approval certificate

(g) The radiation level at the external surface of the package or the transport index of the package exceeds the specified limits

(h) The temperature / thermal flux on the exterior of the package exceeds the regulatory limits

There are other grounds on which applications can be made for transport of radioactive material under special arrangement.

EXAMPLES OF COMPENSATORY MEASURES

The compensatory measures are directly related to the shortcomings. The consignor should –

- determine the maximum individual / collective exposures likely to result from the proposed transport of the radioactive material, attributable to the shortcomings;
- determine the maximum individual / collective exposures which may result from the shipment if the shortcomings were removed; and
- demonstrate that these compensatory measures would completely off-set the exposures attributable to the shortcomings.

Some examples of compensatory measures are -

(a) Establishing by theoretical arguments and appropriate demonstration that the approval certificate in respect of the design of the package can be extended for a further period under the existing regulations in view of the additional controls specially introduced to compensate for the shortcomings.

(b) Making a theoretical analysis of the ability of the package to withstand the prescribed tests and evaluate the weaknesses in this regard.

(c) Provision of engineered safety features for compensating for the damages suffered by the package due to an earlier accident

(d) Appointing an appropriately trained person to accompany the shipment for operating the intermittent venting system of the package during the shipment

(e) Demonstrating that despite the activity of the radioactive content being in excess of the approved limit, the resulting incremental radiological risk arising therefrom would not be unacceptable, because of the additional special instructions displayed on the package directing persons to keep a safe distance from the consignment

(f) Introduction of modifications in the containment system for taking into account the deviations in the physical / chemical form of the radioactive content

(g) Provision of temporary shielding to the package

(h) Provision of physical barriers for ensuring that the increased thermal flux / temperature would not cause injury to handlers and ensuring proper stowage during transport for the protection of other goods

Certain additional arrangements which are normally implemented are –

* Provision of a radiological protection escort to accompany the shipment

* Provision of suitable communication facility to the escort

* Ensuring that the shipment is monitored all along the route.

Thus the consignor should (and would) devise adequate compensatory measures and demonstrate it to the competent authority that with the compensatory measures in place, the shipment would ensure the same level of protection as it would in the absence of the shortcomings.

FREQUENCY OF SHIPMENTS UNDER SA

International shipments made under SA call for multilateral approval. This requirement provides an opportunity to each competent authority of the concerned state to examine the safety provisions for the shipment. As for domestic transport, approvals for SA are sought generally in respect of large shipments of radioactive material.

The number of packages transported under special arrangement constitute a small fraction of the total number of packages transported in a given period. The number of SA shipments do not show a monotonic rise or fall over the period considered. The trend in the other years were also similar. All the applications which were examined for permission for transport under SA in India relate to three grounds only, viz.,

- The validity of the approval certificate issued by the competent authority in respect of the package has lapsed

- a formal approval certificate in respect of the package has not been obtained

- the package has been in use for a few years and needs to be re-examined and certified by qualified engineers for its continued usability

SA FOR DOMESTIC SHIPMENTS - THE DILEMMA

If the consignor indeed provides adequate compensatory measures, the competent authority may accord the necessary approval for ***domestic*** transport under SA. Even if the same consignor does not make repeated applications, other consignors may be encouraged to plan shipments under SA and seek the approval of the competent authority. What is the correct position for the competent authority to assume? If the competent authority is convinced about the adequacy of the compensatory measures, it cannot refuse permission for transport under SA, ***unless there is a regulatory provision discouraging such shipments.***

Can it be argued that it is an entitlement on the part of the consignor to obtain approval for domestic transport under SA, just because he has satisfied his regulatory obligations by providing adequate compensatory measures? Further, so long as the national ***regulations do not stipulate any limit on the number of permissions one may seek*** / obtain for SA shipments, can such permissions be issued purely on the strength of the adequacy of the compensatory measures?

From the point of view of the competent authority, when it is felt that shipment under SA is only second to the best arrangement for transport of radioactive material, should it not refuse such approval without violating the safety principles on which regulations are based ?

There are arguments for and against both the claims but arguments in favour of issuance of approval for domestic shipments under SA overwhelmingly draw their strength from legal considerations. From radiological safety considerations, shipments under SA should be restricted in number.

The regulatory provision for SA is a useful concept and it is necessary too. It ensures that a shipment is not stopped or delayed indefinitely for reasons of technicalities or formalities not having been completed. It is certainly a boon to the consignor. With the claim of regulatory entitlement it can lend itself to indiscriminate use. Thus shipment under SA is a bane from safety point of view.

A SUGGESTED DENOUEMENT

An attempt may be made to solve the dilemma as discussed below:

- In respect of each request for permission for SA, a quantitative assessment should be made, of the projected radiological risk which may arise from the failure of the compensatory measures proposed for the shipment.

- A dose constraint should be established by the Competent Authority for the dose receivable from SAs in a year.

There have been many shipments made under special arrangements, both domestic and international but the radiological risk, has not been seen to be more in such shipments as

compared to regular shipments. Shipments under SA are not particularly more prone to accidents either. In a recent study[10], the collective dose resulting from a shipment made under special arrangement deploying a package with shortcomings in respect of containment integrity and shielding integrity was computed using the PSA method. This dose value was compared with that resulting from the deployment of an approved package of identical design without any shortcomings, for the transport of the same radioactive material keeping the origin of the shipment, destination, mode and route constant. The study concludes that if a certain number of regular shipments are permitted to be made over a period of one year with the approved package, then the number of shipments under SA that may be permitted should be so determined that the collective dose should not exceed that in the case of the regular shipments. Thus it is demonstrated that the compensatory measures are indeed effective. In all cases of shipments under SA in India the members of the crew are provided with personal monitoring badges but so far there has been no instance of any significant exposure to these workers or public.

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