

**SECURITY REQUIREMENTS FOR RECEIPT/TRANSPORT
OF RADIOACTIVE MATERIAL:
OPTIONS TO STREAMLINE THE ON-SITE CLEARANCE PROCESS -**

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NOTE: This paper focuses on the security aspects of radioactive materials shipping both for ingress and egress to licensed nuclear facilities. The sensitive nature of specific security practices demands that identification of any facility not be made beyond type of licensee or geographic region.

ABSTRACT

After the terrorist events of 9/11, nuclear facility security departments nationwide implemented additional controls on incoming shipments of laundry and other radioactive material shipments. These additional controls included inspection of up to 100% of all container/package contents with the incoming shipment. This was a significant change as compared to pre-9/11 and the effect was a substantial increase in manpower required to support incoming/outgoing shipments.

The authors investigated variations in processing methods and identify those which streamline the process while maintaining compliance with security requirements. Research included a survey to ascertain basic security procedures and practices for in-process of radioactive laundry shipments at NRC-licensed facilities. The authors organized data received for 65 facilities into groups with common procedures and analyzed correlations between processes and efficiency. This paper summarizes the results, but for reasons of propriety, does not make reference to specific facilities or regions. It describes the basic practices and highlights the most effective, least burdensome practices currently in use. This information is offered to readers who would like to compare and improve receipt efficiency for radioactive material shipments.

SECURITY ISSUES AND TRENDS

The authors bring two perspectives to this paper, that of the licensee and that of the shipper/vendor. UniTech Services Group ships and receives radioactive laundry shipments from over 100 nuclear facilities in the U.S. and Canada. In forty-five years of providing off-site laundry services, the company accommodates substantial variations which exist between nuclear security programs and radiological procedures.

Some contrasts between site types such as utilities site and research labs, are obvious. The differences between the materials, packaging, and volumes dictate the security procedures which best accomplish the task of assuring that shipments are safe for entrance to the site.

Regulatory oversight has increased substantially over the decades as the industry has matured. However, the NRC redoubled its efforts since the 9/11 terrorist attacks in light of the increased threat. Nuclear facilities, including nuclear power plants, already had a number of security and safeguards measures in place in accordance with Commission regulations. Nevertheless, the events of September 11, 2001 mandated enhancements to ensure that these facilities remain secure. Following 9/11, the NRC immediately advised nuclear facilities to go to the highest level of security in accordance with the system in place at the time.

A series of Advisories, Orders, and Regulatory Issue Summaries have been issued to further strengthen security at NRC-licensed facilities including power reactors, decommissioning reactors, independent spent fuel storage installations, research and test reactors, uranium conversion facilities, gaseous diffusion plants, fuel fabrication facilities, certain users of radioactive materials, and transporters of spent fuel and radioactive materials.

NRC Order 7590-01-P, Issuance Of Order For Interim Safeguards And Security Compensatory Measures, was issued on February 25, 2002. The proprietary, non-public Attachment 2 of this order, "Interim Compensatory Measures for High Threat Environment (Safeguards Information)," specified the specific requirements for licensees to follow. For facilities such as power reactors, the changes generally include:

- increased patrols;
- augmented security forces and capabilities;
- additional security posts;
- installation of additional physical barriers;
- vehicle checks at greater stand-off distances;
- enhanced coordination with law enforcement and military authorities;
- more restrictive site access controls for all personnel;
- expanded, expedited employee background checks.

Although conformance likely served to standardize security processes among licensees, there remains some variability in the procedures and practices employed by individual facilities. For shippers and vendors, this can mean operational challenges in complying with each facility's unique set of requirements.

SHIPPING PROCESS OVERVIEW

There are distinct differences in the security processes for clearing shipments arriving at a licensee site and for those departing. Procedures are instituted to address the potential risks for the licensee. Inbound shipments present the risk of a terrorist or other illegal attempt to introduce prohibited materials or persons inside the controlled area of a facility. Outbound shipments must be monitored to assure unauthorized radioactive or other controlled materials are not allowed to escape site control. Because the licensee has known control over vehicles and shipping

containers while on the site, the egress security process is simpler than an arriving shipment without absolute verifiable security controls. Accordingly, this paper examines the more conservative inbound security processes.

A typical process is described by a utility representative:

“Prior to arrival of a radioactive material shipment, we request from the shipper the basic radiological information required for the shipment, the number of containers and contact names. We then inform the shipper that all containers shall have a security seal placed on the container. This seal will have a number on it, and this number must also be recorded on the associated shipping paperwork. These shipments are normally all Exclusive Use shipments, such as laundry from UniTech Services, incoming outage equipment from approved vendors etc. After this information has been received, this information is forwarded to our security department along with the following:

1. Carrier name (we only use approved carriers that have been reviewed by our security group to assure their security plan meets the federal regulations).
2. Drivers Name, Soc. Sec #, Driver license (this allows our security department to verify the authenticity of incoming shipment).
3. Tractor/trailer ID numbers.
4. Date and Time of expected arrival.
5. Seal numbers applied to container or containers.

With this information our security department determines that the shipment is acceptable and the package can be search exempt. This system meets the new security requirements implemented after 9/11.”

As stated earlier, variations exist between locations, but most facilities require elements of the information described above and several require additional items such as state DOT permits.

SURVEY DATA COLLECTION

A short, concise survey was conducted among two groups. The majority of data was solicited from UniTech's ten regional plant managers who are necessarily practiced in the security processes at each of the sites their facility serves. Selective data was solicited from site representatives, either from within the security department or from radwaste shipping representatives knowledgeable of screening procedures at their site. Licensee representatives were understandably guarded in the type of information that they would provide. The questionnaire avoided proprietary or classified topics and participants were assured all information disseminated in the paper would be general and anonymous.

Completed questionnaires representing 65 U.S. based nuclear facilities were received, including the following:

- 55 utility sites
- 5 labs
- 2 defense contractors
- 3 waste processors
- 2 fuel fabrication facilities

The questionnaire included six process-related closed-end question sets and one open ended question which allowed the respondent to comment on efficiency improvements in the site program since 9/11. The process questions included:

- Shipment frequency
- Shipment reductions/consolidations
- Tamper-resistance (seals and locks)
- Shipment inspections
- Process time and delays

DATA ANALYSIS

Question responses were tabulated and analyzed for anomalies in responses. Those that appeared skewed from the response means were verified to assure that the respondent understood the query. Data is summarized in the subsections below.

Frequency

For the 65 site group, the average annual frequency for laundry shipments is 20.1. The highest shipment activity is 56 per year and the lowest is 4 per year. The median frequency is 17.

Shipment Reductions and Consolidations

One method to reduce the resource requirements of additional security is to reduce the frequency of material shipments through consolidation. The concept of “one-shipment” outages has generated some interest from utility sites, although there are substantial costs to the shipper and the licensee to accommodate the planning, storage, and other material management issues. Table I provides a status of sites with regard to the concept.

Table I Decisions Regarding Consolidation of Shipments

Number Sites Utilizing Consolidation	3 (4.6%)
Number of Reduced Shipments	41 (3.1%)
Considered and Declined Consolidation	1 (1.5%)
Considering Consolidation	15 (23.1%)

As is evident, consolidation, at least for laundry shipments, is not emphasized. It is likely that the existing frequency has been optimized to site needs over time and the logistical efficiency in place outweighs any burden of time and inconvenience generated by the additional security involved. However, almost one quarter of the sites evaluated are keeping the option open.

Tamper-Resistance

A basic tenet of the security process is to assure that shipments prepared by the shipper are controlled between packing and site arrival. The dominant methods for assurance involve security seals and locks.

One-time use seals are applied to containers or trailers. Figure 1 indicates the proportion of studied sites using these methods and how they are used.

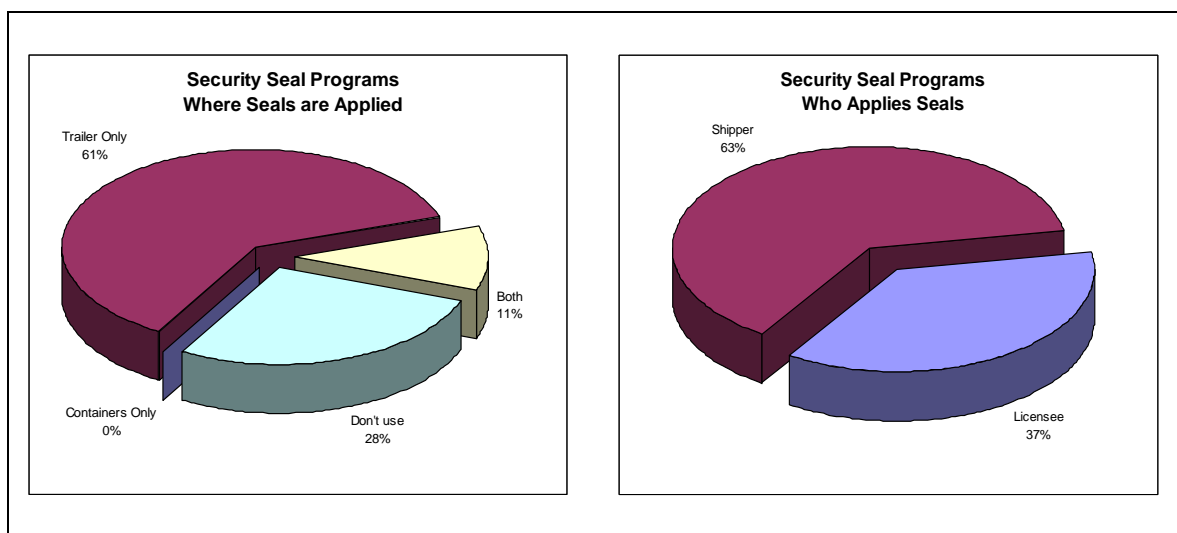


Fig. 1

Locks may be supplied (and sometimes applied) by the licensee. In this study, 9% of the sites use a lock procedure, half of which are supplied by the licensee.

Shipment Inspections

The inspection process is the most involved element of the security process. Although 3% (2 locations) are not involved with comprehensive inspections on laundry shipments, they are limited to locations which do not possess materials or facilities with high security requirements. All other sites employ a shipment inspection process. The basic variables in the process include where and by whom the shipment is inspected. Figure 2 provides a proportional breakout of the UniTech study group.

The traditional method of inspection by licensee at the licensee location is utilized by 54 of the 65 sites. This inspection may occur outside or inside of the security boundary. In a few cases, the trailer is taken by the licensee at the boundary and the driver and tractor remain outside.

6% of licensees elect to come to the shipper location and inspect shipments prior to load, and then monitor the loading process. 5% of licensees certify the shipper to inspect at the shipper location. This method partners the licensee and shipper as a single entity shipper-receiver. Although there is some additional investment in training and certification of shipper employees, there is a direct correlation to expedited access for these licensees.

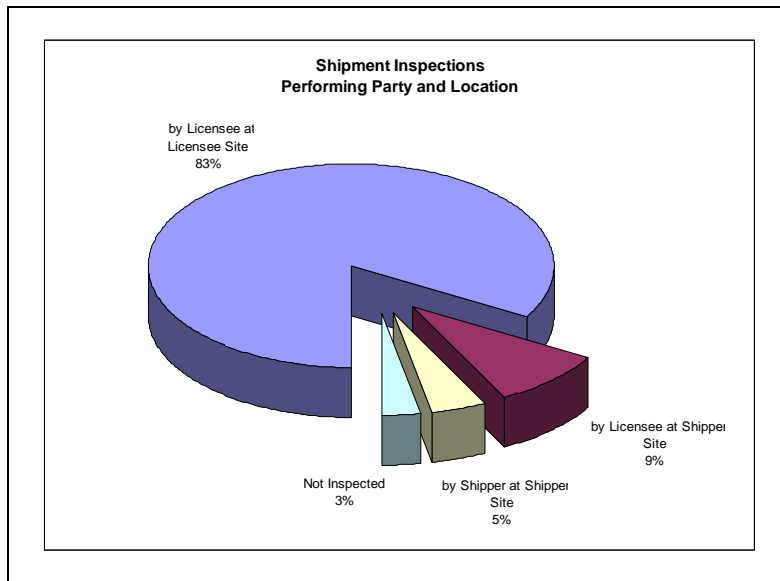


Fig. 2

Documents

While there are few standard document formats among licensees, basic information collected for a shipment is fairly similar. Figure 3 depicts the proportion of sites collecting basic information

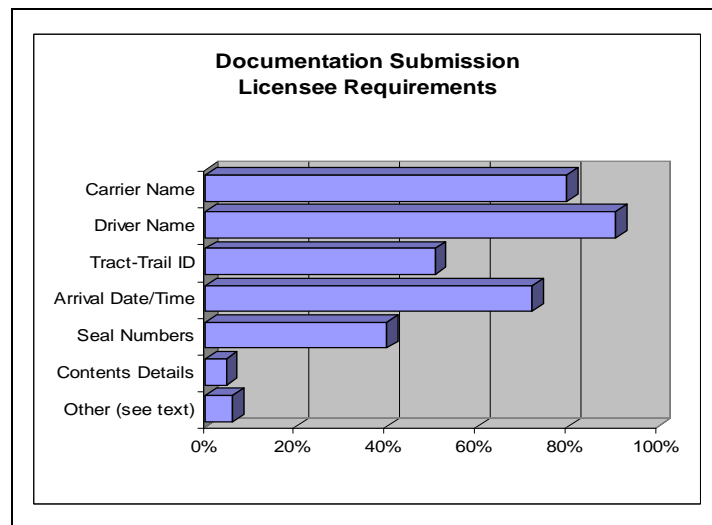


Fig. 3

As is evident in the figure, information about the driver and the vehicle are of paramount interest to licensees. Most often, driver information is verified against licensee records on approved drivers who may have been pre-screened by the licensee. Most licensees require a general description of contents, although such information is a given when dealing with dedicated shippers like UniTech.

Arrival time information dovetails with pre-notification, discussed below. An arrival delay usually requires communication from the shipper to the licensee for advisement, failure to do so can delay processing of a shipment. In these cases, licensees can require a detailed explanation of the cause of the delay and where the vehicle was when the delay occurred.

As is shown in Fig. 4, the shipper has deadlines for documents submission as well as pre-notification of shipment arrival. 17% of licensees in this study require one to three days advance documents submission, presumably for review and approval. However, an 80% majority simply require pre-notification of shipment arrival, with documents provided by the driver. Pre-notification will often include rudimentary information about the driver, vehicle, and shipment contents.

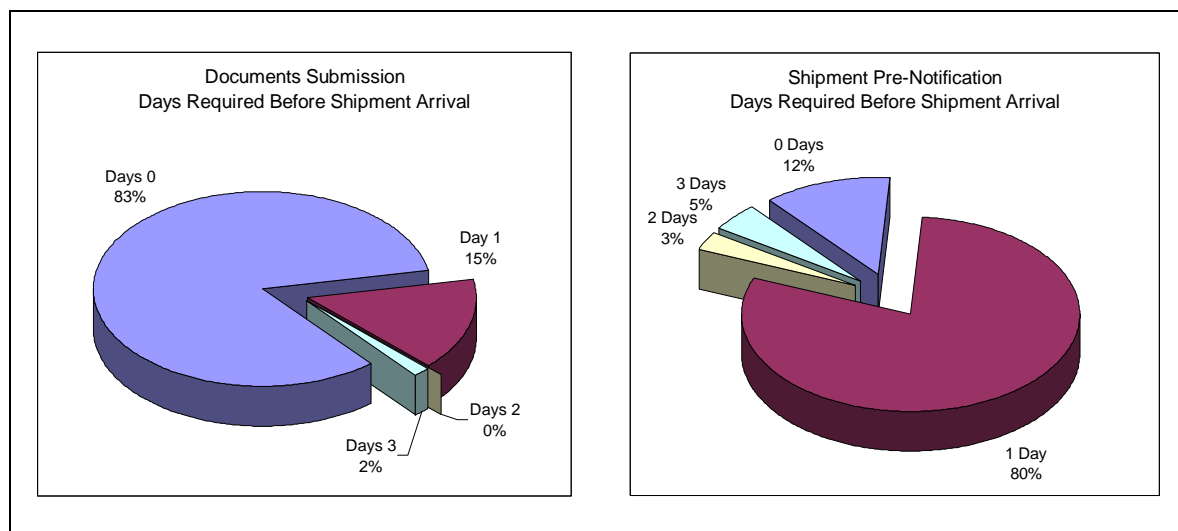


Fig. 4

The longer the period for pre-notification or advance documents submission, the more problematic is it for the shipper. Shipment contents, trailer/driver information, departure time can be subject to change, and the submission of amended data is inconvenient for both sides.

Processing Performance

The study examined the reported time for the 65 sites in overall licensee delays, driver wait time for licensee inspections, and security related activities by the shipper prior to the shipment.

The first point of evaluation centers on pre-requisite responsibilities for the shipper. As cited in the previous section, variations exist between licensees on documents and procedures what they require from the shipper. This data is presented as the shipper's time requirement in Table II.

Shipper requirements for over 85% of the sites do not, on average, take more than 1.5 hours in security compliance preparation time.

Table II

Vendor Preparation Time Range	Site Count (n=65)
< 0.6 Hours	40
.6 to 1.5 Hours	17
1.6 to 2.5 Hours	4
2.6 to 4.5 Hours	4
> 4.5 Hours	0

Table III depicts driver wait time at the licensee site and corroborates the relative delay ratings in Table III. About 60% of the sites studied require between .5 to 2.5 hours for in-processing. The 5 sites included in the less than .5 hour wait time are sites which take possession of a sealed trailer at the gate.

Table IV

Licensee-Side Processing Time (driver wait)	Number of Sites in Time Range
<=0.5 Hours	5
.5 to 1.5 Hours	30
1.6 to 2.5 Hours	10
2.6 to 4.5 Hours	13
>4.5 Hours	7

The shipper's perspective on the relative delays after arrival at the licensee site is summarized in Table IV. The distribution of responses is fairly balanced and alludes to the differences in processing methods and security requirements.

Table IV

Relative Rating Licensee-Side Processing Delays	Number of Responses (n=65)
Minimal	21 (32%)
Average	26 (40%)
Extreme	18 (28%)

As expected, high correlation exists between those sites with minimal processing delays in Table IV and shipper preparation times of less than one hour (86%). Similarly, an 81% correlation was recorded for driver wait times of one hour or less.

CONCLUSIONS

1. It is assumed that all security programs comply with regulatory requirements. However, variations exist in the specific processes and requirements among the sites studied in this paper.
2. Although there are many factors besides site requirements, including shipment types, volumes, local regulatory matters, and site logistical factors, there exists a common thread among the sites that have streamlined the process of clearing incoming shipments. Major contributing factors include:
 - Shipment pre-notification times of 24 hours or less.
 - Approved/pre-screened driver lists.
 - Standardized data forms co-developed by site security and shipper.
 - Vendor personnel trained/certified by site to inspect and seal shipments.
 - Site security personnel observe container/trailer loading at shipper's location.
3. Besides the additional resources and costs involved for both the shipper and the site, highly rigid, unjustified procedures provoke confusion and complacency among those participating in the process.
4. The logistical and operational details in the security process are refined when participants at all levels are invited to participate in the development and ongoing refinement of shipment security assurance. There are simply too many logistical factors for any one group to successfully perform a single-view top-down procedure development.
5. In the case of UniTech, sites which invite advice and suggestions from the shipper typically benefit from a smoother, more efficient, and more effective security program.