

REPORT OF INVESTIGATION
CARRIED OUT BY ROPES & GRAY OF APPARENT
FALSE DOCUMENTATION OF
RESULTS OF RECEIPT INSPECTIONS AT
VERMONT YANKEE NUCLEAR POWER STATION

ROPES & GRAY
225 Franklin Street
Boston, MA 02110
May 21, 1985

8506030457 850523
PDR ADOCK 05000271
G PDR

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BACKGROUND

During the period March 11-15, 1985, personnel from Region 1 of the United States Nuclear Regulatory Commission (NRC) conducted an unannounced safety inspection at Vermont Yankee Nuclear Power Station (VYNPS), owned and operated by Vermont Yankee Nuclear Power Corporation (Vermont Yankee). The inspection involved three areas: (1) Receipt, Storage and Handling; (2) Procurement Program; and (3) Records Program. No violations were identified with respect to the latter two areas. However, with respect to the area of Receipt, Storage and Handling, Vermont Yankee was cited for alleged violations of NRC requirements and, in particular, for "potential falsification of receipt inspection reports". The inspection report involved (No. 50-271/85-11) and the covering letter of transmittal (hereafter referred to and cited as "IR") are attached hereto as Attachment 1. The basis for the suggestion of potential falsification is memorialized in § 2.5 of the IR.

A review of the IR reveals the basic NRC position to have been as follows: When any items requiring quality assurance are received at VYNPS a Receipt Inspection Checklist (RIC) is filled out with respect to those items.

The purpose of the RIC is to document the receipt inspection done of the item. During the inspection the NRC found a number of situations where the RIC involved indicated to the NRC inspector that certain items which were subjects of the RIC had been inspected for certain attributes which could only be observed by opening the packaging in which the items of interest had arrived. A check of these items on the shelf revealed that all, or all but a few, were still sealed in original packaging. As stated in the IR, it was the view of the NRC inspectors that:

"The inspection records indicated that without exception all received items were inspected. In Sections III and IV of the Receipt Inspection Checklist, the receipt inspectors recorded that the attributes such as, physical damage, dimensions, workmanship and electrical insulation were inspected. As described [earlier in the IR], a majority of these items remaining on the shelf were in sealed packages. Inspection for such attributes through the sealed packages is impossible." IR at 7.

In particular the RICs with respect to eight particular purchase orders (POs) were listed as containing false information: Nos. 14409, 16480, 18047, 22041, 22396, 22554, 22706, 22711.

As anticipated in the IR Covering Letter, on April 25, 1985, NRC issued a Notice of Violation and Enforcement Conference Report (hereafter referred to and cited "N/V") which is attached hereto as Attachment 2. After discussing

the enforcement conferences and notice of violation, NRC went on to state:

"In addition, to enable NRC to determine what action, if any, should be taken with respect to your license, you are required to submit under the provisions of 10 CFR 50.54(f), a report of your investigation into apparent false documentation concerning the results of receipt inspections; an explanation of how these incidents occurred and with whose knowledge; a determination of the cause of the falsification, including the responsible individuals; and a description of the action taken as planned to prevent recurrence of similiar incidents." N/V at 2.

Issuance of the two above-described documents received the immediate and undivided attention of the top management of Vermont Yankee. In light of the seriousness of the charges articulated and their implications,¹ it was decided

¹ The Atomic Energy Act § 186, 42 U.S.C. § 2236 utilizes the terminology "material false statement" in describing one of the grounds for which a nuclear power plant's operating license may be revoked. In 1976 the Commission held that a statement may be false under § 286 even if it is made without knowledge of its falsity. Virginia Electric and Power Co. (North Anna Power Station, Units 1 and 2), CLI-76-22, 4 NRC 480, 486-87 (1976), affirmed sub nom. Virginia Electric and Power Co. v. NRC, 571 F.2d 1289 (4th Cir. 1978). This legal rule and distinction is not generally understood by those not familiar with NRC practice and the words "material false statement" appearing in the press are usually surmised by the public to connote a deliberate attempt to lie. Given the careful wording of the IR ("potential falsification", cover letter ¶ 3; "potential falsification" IR at 1, 9; "records appear to be false" IR at 8) and the N/V ("apparent false documentation", N/V at 2) it may be that NRC is not suggesting the possibility that any erroneous statements in the RIC

that Ropes & Gray, Vermont Yankee's outside counsel responsible for advising the company with respect to NRC matters, should be retained to conduct a thorough investigation to determine, among other things, whether any employee or agent of Vermont Yankee had knowingly put false information in any receipt inspection records with an intent to deceive or in any way countenanced such activity. Ropes & Gray was promised, and received, the complete cooperation of management and the employees of Vermont Yankee in this investigation; no request for records, information or interviews was refused or even objected to.

THE METHOD OF INVESTIGATION

Upon receiving the request from Vermont Yankee to conduct the investigation, Ropes & Gray assembled a team of three lawyers from its Trial Group to conduct the investigation. The team requested and reviewed the following records:

- NRC Inspection Report No. 50-271/85-11 (IR),
- NRC Notice of Violation and Enforcement Conference Report (N/V)
- All RICs questioned by NRC in the IR
- All PO's giving rise to the RICs, questioned
- The entire PO file for these PO's,
- The original Vermont Yankee Administrative Procedure for Receipt Inspections and all 12 revisions thereof,
- Reg. Guide 1.38, Rev. 2,

were deliberately made. Unfortunately, if that be the case, it is not clear and certainly the press and state officials have indicated their understanding that deliberate falsehood is what NRC is charging.

ANSI Standard N452.2-1972,
Organization Charts,
Vermont Yankee's Quality Assurance Manual YOQAF-1.A
Previous NRC Inspection Reports
Job Description of the Quality Assurance Technician
Memorandum of Management Interviews of authors
of questioned RICs
The Receipt Inspection Task Force Report

On May 9, 1985, the Ropes & Gray team went to VYNPS.

The team went to the area of the plant where materials are received. A briefing was given on how receipt inspections were conducted. This briefing revealed the following: All materials arriving at VYNPS arrive at a central location where Stores Department personnel first divide them into two categories (1) items requiring quality assurance, and (2) items not requiring quality assurance. Those requiring quality assurance are held for receipt inspection as required by Administrative Procedure 0801.

The Ropes & Gray team witnessed an actual receipt inspection conducted by the Quality Assurance Technician (QAT). The team then toured the warehouse and was shown samples of those items that were the subject of the questioned RICs. Next, seven of the eight receipt inspectors who had filled out questioned RICs were interviewed.² Each interview was conducted by a single member of the Ropes & Gray team one-on-one with the receipt inspector. In each case a written set of questions was

² The remaining receipt inspector was interviewed by telephone on May 15, 1985.

utilized by the interviewer. A copy of the form of questions is attached hereto as Attachment 3. The questioning in each case included additional follow up and cross-examination beyond the questions in the form. Thereafter, interviews were conducted of three management employees who were superiors of the receipt inspectors. These latter interviews were held to ascertain whether, and to what extent, perceived deficiencies in the receipt inspection program had been brought to the attention of supervisory personnel.

CONCLUSIONS

As a result of the record review and interviews described above and for the reasons set forth in detail in the discussion below, the Ropes & Gray team reached the following conclusions in this matter:

1. There is no evidence of any kind that any receipt inspector or other Vermont Yankee personnel engaged in knowingly placing false information in records or attempted in any way to mislead any reader of RICs.
2. The various RIC forms in use throughout the relevant time frame were inadequate in many respects and contributed significantly to the difficulties cited in the IR.
3. The inadequacies of the forms were compounded by an almost total lack of instruction to inspectors as to the methodology to be used in filling out the form which led to

inconsistent treatment of the various categories listed on the form.

4. Both the RIC forms and the revisions of the Administrative Procedure of which they were part left too much room for interpretation by the individual inspector.

5. The various revisions of the Administrative Procedure applicable during the relevant time frame failed to make clear that certain inspection techniques approved by the Nuclear Regulatory Commission were permissible. As a result, techniques which satisfied NRC requirements were insufficient to satisfy the Administrative Procedure.

6. Management gave insufficient attention to changes being made in the language of the RIC Form and Administrative Procedure and thus, failed to remedy the inadequacies of these documents which are the root cause of the inadequacies found in the IR.

DISCUSSION

A. The Relevant Regulations, Guides, Standards, Procedures and Forms

Indispensable to understanding the problem under investigation is some knowledge of the relevant regulations, guides, standards, procedures and forms. The regulations of the Nuclear Regulatory Commission with respect to quality assurance are set out as a series of criteria in 10 CFR 50

App. B. Criterion VII of this regulation provides, in material part, as follows:

"Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery" (emphases added).

A Regulatory Guide issued by the USNRC Office of Standards Development (Reg. Guide 1.38 - Rev. 2) "describes a method acceptable to the NRC staff of complying with the Commission's regulations with regard to the quality assurance requirements for the packaging, shipping, receiving, storage and handling of items for water-cooled nuclear power plants" Reg. Guide 1.38 at 1 (emphasis added).

The Reg. Guide further provides in material part:

"The requirements for the packaging, shipping, receiving, storage, and handling of items for water-cooled nuclear power plants that are included in ANSI N45.2.2.-1972 . . . are acceptable to the NRC staff and [with certain supplements not here relevant] provide an adequate basis for complying with the pertinent quality assurance requirements of Appendix B to 10 CFR Part 50"

The reference to ANSI N45.2.2-1972 is a reference to the American National Standard Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants

(during the Construction Phase)³ ANSI N45.2.2-1972, published by The American Society of Mechanical Engineers, the relevant portion of which is attached hereto as Attachment 4.

The Vermont Yankee Quality Assurance Manual which is the Yankee Operational Quality Assurance Manual, YOQAP-1.A specifically lists as one the regulatory positions which is to be utilized and adhered to is that set forth in ANSI N45.2.2-1972 as endorsed by Reg. Guide 1.38, Rev. 2. YOQAP-1-A § II, Rev. 15, p. 2 (Feb. 15, 1984).

Material to this investigation are the following provisions of ANSI N45.2.2-1972:

"5.2.2. Item Inspection. Unless the package marking prohibits unpacking, the content of all shipments shall be visually inspected to verify that the specified packaging and shipping requirements have been maintained. When items are contained in transparent separate moisture-proof bags or envelopes, visual inspection without unpacking the contents is acceptable. Statistical sampling methods may be used for groups of similar items."

(Emphases added.)

³ "Although ANSI N45.2.2-1972 is entitled 'Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants During the Construction Phase', the requirements included in the standard are considered to be applicable during the operation phase and should be used, when applicable, consistent with the recommendations of this regulatory guide." Reg. Guide 1.38, ¶ C.1.d. (emphasis added).

"Unless the completed item was inspected or examined at the source, it shall be inspected or examined at the point of receiving to verify that the following characteristics conform to the specified requirements. These inspections or examinations shall include such items as:

"(2) Dimensions - Random visual inspection to assure that important dimensions conform with drawings and specifications. Examples are: base plate mounting holes, overall external size, configuration and orientation of parts.

* * *

"(6) Electrical Insulation - Performance of insulation resistance tests for motors, generators, control and power cable, to ensure conformance with specifications" (emphases added).

The relevant Administrative Procedure in this matter is Vermont Yankee's Administrative Procedure 0801 entitled "Receipt, Inspection and Shipment of Material and Equipment", Revisions 7-11. As will be seen, one major difficulty is that the Administrative Procedure did not take advantage of many of the features available under ANSI N45.2.2-1972. Of importance to this investigation are the following aspects of the Administrative Procedure: None of the relevant revisions of the Administrative Procedure affirmatively allowed for the use of sampling techniques as is permitted by ANSI N45.2.2.-1972. The original Vermont Yankee Administrative Procedure for Receipt and Storage of Material and Equipment issued March 10, 1972, and numbered

217⁴ stated in a note, in the words of ANSI N45.2.2.-1972: "statistical sampling methods may be used for groups of similar items." In the third revision of the procedure (AP 0801, Rev. 3) issued October 17, 1975, this language was removed and it had never been reinstated.

In the original procedure issued March 10, 1972, there was reference to not opening packages which had markings prohibiting unpacking. This language was removed in Revision 5 issued August 3, 1977 (AP 0801 Rev. 5), when there was a wholesale overhaul of the form. There remained no reference to this concept until issuance of Revision 9 on April 13, 1981, when a note was inserted stating:

"Certain items, such as fuel channels, which are specially packaged for maximum protection during shipping and storage, and which require a thorough physical inspection prior to installation, will not be removed from their containers at receipt inspection. The appropriate sections of the Receiving Inspection Checklist will be noted "Inspection Deferred" and subsequent inspection of "deferred" characteristics will be documented on the applicable departmental inspection form."

This note remained in the subsequent revisions.

⁴ We were advised that the AP was originally numbered 217 and there then were issued Revisions 1 and 2 of AP 217 on September 15, 1972, and February 15, 1973, respectively. The third revision of the procedure was issued on October 17, 1975, at which time the number was changed to 0801 and it was entitled "AP 0801 Rev. 3." Revisions 4-12 have retained the 0801 designation.

The RIC form itself has always been part of the procedure. When the procedure was originally issued in 1972 as AP 217, the RIC form was much different then it is today. There were, until the major revision in 1977 (Rev. 5 AP 0801), a much lesser number of items to be checked and the checkoff was in boxes labeled "Accept" or "Reject". Subsequent revisions prior to Revision 5 added a few additional items and split the inspection into two parts to be done by "Stores" and "Department Head", but retained the "Accept" or "Reject" nomenclature.

In Revision 5 the number of items to be specifically checked was raised from 12 to 19 (some being multiple aspects of what was previously one concept), the 19 items were set out in four sections each denoted with a Roman numeral and the nomenclature "Accept" or "Reject" was changed to "Yes" or "No". This Yes-No nomenclature has been retained to this day and is a major cause of problems. The new format of Revision 5 placed in Section IV the following six aspects of the inspection: Physical properties, Dimensions, Weld Prep., Workmanship, Lubricants/Oils, and Electrical Installations. The text of the procedure provided:

"If the items have not been source inspected and accepted, Section IV of the Receiving (sic) Inspection Checklist shall be completed by the appropriate Department Head or his designee."
(Emphasis in original.)

In Revision 11 of AP 0801 issued June 17, 1982, the Section IV items listed above were inserted as Items 10-15 in Section III; Section IV was deleted and the above-quoted language was deleted.

To summarize then with respect to the Administrative Procedure and the RIC form:

1. During the entire relevant period the language of the procedure did not address the validity of utilizing sampling techniques although it had prior to October 17, 1975.
2. During the relevant period until April 13, 1981, the Procedure did not address the concept of special packaging which should not be opened; thereafter, the Procedure did cover that concept.
3. During the relevant period until June 17, 1982, the items: Physical Properties, Dimensions, Weld Prep., Workmanship, Lubricants/Oils, and Electrical Installation did not have to be checked if there had been a source inspection and acceptance.
4. During the entire period the "Yes-No" format was in effect.

B. General Problems Revealed
From the Investigation

The interviews of those who had filled out RICs revealed that there was no clear and consistent interpretation of what various items on the form meant. The RICs reviewed

reveal cases where the inspector thought that "Yes" meant acceptable with respect to one item; and "No" meant acceptable with respect to another. See, e.g. RICs for P.O. Nos. 9706, 16480. Also some inspectors made use of the comment column extensively, others did not. While most forms indicate that inspectors understood and thought that the designation "not applicable" (N/A) was an appropriate one; one inspector told the interviewer that it was his understanding "Yes" or "No" had to be checked in each case. The forms did not evidence any consistency as to when Section IV was used or not used. In some cases a certificate of compliance was found in the P.O. Jacket and Section IV was filled in; in other similar situations it was not.

The interviews revealed that in most cases no training at all was provided with a view to having the terms in the form interpreted consistently. Indeed, such training as the receipt inspectors interviewed had, came either from their background or simple observation of predecessors at Vermont Yankee.

A number of the interviewees expressed the view that the procedure and the form left much too much room for individual subjective interpretation. According to these individuals, this militated against consistency. All interviewees stated that there was no review of the RICs

once they were filled out. The inspector simply filed it with the P.O. documents.

There was inconsistency with respect to the understanding of the "special package" note. Some inspectors believed that a special protective package was never to be opened. Others thought that at least one of each item did have to be opened in order to do an inspection. In none of the challenged RICs which post dated Revision No. 9 did the "inspection deferred" notation appear.

With a single exception, and despite the absence of language in the procedure permitting it, all of the receipt inspectors utilized sampling as a normal method. It was justified by "past practice", "good judgment", and the fact that the procedure did not say it could not be done. It was also pointed out that ANSI N45.2.2.-1972 allows it and that no NRC personnel had ever questioned it. Several interviewees claimed that NRC inspectors had toured the Stores area a number of times and items requiring Quality Assurance were clearly visible on shelves in sealed packages yet no complaint was made.

C. Analysis of Individual RICs

1. RICs As To Which Apparent
Falsification Was Charged by NRC

P.O. 14409; RIC 5/30/81

The items involved were solenoid valves. According to the P.O., three were delivered. NRC found all three still on the shelf. Two of the three were in solid foam containers which were still sealed. In addition, although the RIC says dimensions were checked, NRC in the IR states "the receipt inspector stated that a dimensional check was probably not performed." IR at 8. Thus, the NRC charge is based upon the use of sampling and the understanding of NRC that even the sample was not probably in fact checked for dimensions.

In fact a dimensional check was made. The receipt inspector who stated that none was probably made was not the same one who actually did the inspection for No. 14409. The interview with that individual revealed that he did do a dimension check on the one he opened. The balance of the story is unique. The receipt inspector involved was the only one who was interviewed who did not normally use sampling as a technique. However, he engaged in it in this case because he knew that the parts would never be utilized at VYNPS. This was so because the design that permitted the valves' utilization had been superceded and the valves could not be used in the new design configuration. To get the

valves "off the floor" he filled out the RIC on the basis of an inspection of one solenoid valve. This is the only case found in the investigation where a receipt inspector knowingly deviated from his normal practice. And close questioning revealed that he did not subjectively believe this deviation was equivalent to falsification in the circumstances.

P.O. 16480; RIC 8/31/81

The items involved were Collets and Pistons. Six were ordered on the P.O. The NRC found all six on the shelf; five of the six were still in hermetically sealed bags. In addition, the item "electrical insulation" was checked "Yes", although Collets and Pistons have no electrical parts. Thus, the NRC charge is based upon use of sampling and the fact that "the RIC indicates they had been inspected for electrical insulation which does not pertain to collets and pistons." IR at 9.

The interview with the receipt inspector revealed that (a) he believed that all inspections were to be done by sampling based upon his background and experience; (b) that he did not believe collets and pistons were of sufficient complexity to be covered by the "special packaging" note in the procedure, therefore, a sampling inspection should be done and one was opened; and (c) that he was required to circle either yes or no in every case. With respect to a physical property that simply was not applicable to a given

item it was either circle "no" and create a problem or circle "yes" on the theory that no such property being required there was no problem. When the not-applicable item was in the nature of documentation, he apparently used the technique of circling no and noting N/R which means "not required". He cannot remember why he did not treat "electrical insulation" or "lubricants and oils" the same way.

P.O. 18047; RIC 7/16/82

The item involved was agastat relays. The NRC found 47 of 47 on the shelf still in hermetically sealed bags. The IR notes that the RIC states they were checked for dimensions and electrical insulation, IR at 8, which is impossible without unpackaging them. The IR also notes that the receipt inspector admitted not knowing what dimensional attributes to measure.

The interview of the inspector revealed that in fact he removed no agastat relays from its package; that he believed the "special packaging" note in the procedure required this course of action; that his answers on dimensions were based on information on the package and that the basis for okaying electrical insulation was the fact that the accompanying certificate of compliance stated certain tests were successfully passed and the actual test procedures were furnished as part of the documentation. (In light of the certificate of compliance, it is doubtful that these

attributes were required by the procedure to have been inspected as of this date in light of the prior source inspection.) The receipt inspector felt he made clear the fact that the inspection had not entailed opening the packages by the comment opposite § III, Item 7 "Physical Damage": "Material to be insp. by maint. prior to inst. for internal damage." He admits that he would have done better to have filled in all items with "inspection deferred" as called for by the special packaging note.

P.O. 22041; RIC 7/24/84

The items involved are 18 diesel generator fuel element cartridges. Of 17 still on the shelf, NRC found 16 in sealed packages. The basis of the charge apparently is sampling and the fact that "The QA Technician indicated that he had no criteria to measure against and that a dimensional check was probably not performed." IR at 9. The QAT was not the receipt inspector. The receipt inspector who did the inspection was interviewed telephonically. He stated that he had no real memory of this particular RIC, but surmised that the RIC was based upon a sample of the one package that was opened. He said that with respect to "dimensions" if there were no drawings he understood that the answer was to be "Yes".

P.O. 22396; RIC 4/5/84
P.O. 22711; RIC 6/7/84

Both of these PO's involved 90° angles, P.O. 22396 involved four boxes, of which two were found on the shelf; both sealed. P.O. 22711 involved 8 boxes, of which three of five remaining on the shelf were both sealed. The charge is based on the fact that the RICs are checked "Yes" for dimensions; however, "The QA Technician indicated he had no criteria to measure against and that a dimensional check was probably not performed." IR at 9. The QAT did the receipt inspection in both cases.

The interview of the QAT revealed that he did make the statements attributed to him to NRC. He says in both cases he sampled by opening and looking at one box. However, the basis for the "Yes" on dimensions was not the sample but rather upon a comparison of the part number on the boxes to the catalog which sets out dimensions by part number. His basis for all these actions were "past practice" and "good judgment".

P.O. 22554; RIC 4/20/84
P.O. 22706; RIC 6/12/84

Both of these PO's involved Hilti Kwik Bolts. P.O. 22554 was for ten boxes, of which four of five remaining on the shelf were found sealed by NRC. P.O. 22706 was for twenty boxes, all of which were still on the shelf and seventeen of which were still sealed. The charge is based upon the facts that: "RIC indicates these items received a

dimensional check. The QA Technician indicated he had no criteria to measure against and that a dimensional check was probably not performed." IR at 9.

In fact the QAT did not perform the inspections involved in these RICs. An interview of the receipt inspector who filled out these RICs reveals that in each case he opened and inspected at least one box; he checked the label and compared size and weight of the box to the other boxes; he physically measured bolts from the boxes opened and then laid a number of others beside the measured ones to check their dimensions.

2. Other RICs Reviewed

In addition to the RICs discussed above questions were raised, though falsification charges were not made, as to three other RICs. As a result these also were investigated.

P.O. 9706; RIC 7/15/78

The items involved were four solenoid valves; three of the four on the shelf were found sealed. An interview with the receipt inspector revealed that his practice with items like these which were not "nuclear specific" was to inspect by sample which he did in this case.

P.O. 10269; RIC 6/20/78

The items involved were agastat relays. The P.O. shows that seventeen were purchased of which seven of seven left on the shelf were found sealed by NRC. An interview of the inspector indicated that he did not have much specific

memory of this seven year old RIC. He did say that he would have done the inspection by sample which he believed to be appropriate and the RIC answers would, therefore, be based upon the sample.

P.O. 12259; RIC 12/13/79

The items involved were collets and pistons. A total of five were ordered; three of three still on the shelf were sealed. The inspector recalls sampling one package and basing the RIC on that sample. He thought sampling was appropriate and permissible.

D. Overall Analysis as
to Cause of Problems

Essentially, three matters gave rise to the unfavorable comment that Vermont Yankee has received in this matter. First, there was the essentially uniform practice of inspecting by sample. There is little doubt that this is permissible under the ANSI standard approved in NRC Reg. Guide 1.38. The problem is that the procedure, A.P. 0801, does not state that such a method is permissible. No reason has been ascertained as to why the language was removed which allowed sampling of similar items and the reason is, in all likelihood, lost forever in history. It may well be simply an inadvertent deletion accompanied by subsequent proofreading error. It is clear that both the inspectors and the various supervisors who oversaw the activities thought sampling was appropriate and that until 1985 NRC

raised no question, as is understandable given the regulatory position in Reg. Guide 1.38.

A second factor that caused problems was a form and procedure which was susceptible of varying interpretations accompanied by a total lack of effort to engender a degree of consistency by appropriate training. There is no evidence that any lack of training resulted in inadequate inspections affecting safety; indeed, the evidence is all to the contrary. The lack of training did result in inconsistent use of the form and the items on it.

Third, there is no doubt that the QAT admitted, and correctly so, that he was, in certain cases, without criteria in the area of dimensions. This is a lack of training and expertise at least on the surface. However, the ANSI Standard describes the dimension inspection as "random visual inspection to assure that important dimensions conform with changes and specifications." This does not connote a precise measuring procedure and yet AP 0801 and the RIC form are ambiguous and leave the impression that greater precision is required.

In short, the procedure and form need a thorough overhaul so the paper conforms with the activity, which activity in fact appears to be adequate to the task and the regulatory requirements. The responsibility for this obviously lies with management which apparently did not keep close enough surveillance over the language of the procedure

and the form. The investigation revealed that the failure to overhaul this procedure and form earlier apparently is attributable to the fact that, given all the tasks necessary to assure that overall QA at a nuclear plant is adequate, this one simply had not the urgency other matters did (especially in light of the fact that all the items involved get reinspected before actually being used) and it had not "worked its way to the top of the pile".

Finally, a note on the suggestion of deliberate falsification. The conclusion as to the lack of evidence of such activities is stated earlier. It is believed the foregoing discussion adequately supports this conclusion. No doubt some could argue that a good deal of the basis of the conclusion is a belief in the truthfulness of answers given by interviewees. This is true. But it is always true that a determination as to human intent cannot be objectively demonstrated. One objective piece of evidence bearing on intent is the absence or existence of a motive to deceive. To begin with, the investigation revealed a uniform appreciation by Vermont Yankee personnel for the consequences both in economic and public health and safety terms that could flow from use of a faulty item at a nuclear facility. In addition, if any of these RICs involved an item to be rushed from the receiving dock to the reactor building to allow a start up one could surmise a motive to cheat to get the plant on line. But no RIC involved such a

situation. Given these factors it is essentially impossible to construct a rational motive for any receipt inspector to attempt to mislead people by deliberately trying to pass faulty items. Thus, there is a high degree of confidence associated with the conclusion as to a lack of any deliberate attempt, or desire, to create false records.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
631 PARK AVENUE
KING OF PRUSSIA, PENNSYLVANIA 19406

APR 02 1985



Docket No. 50-271

Vermont Yankee Nuclear Power Corporation
ATTN: Mr. Warren P. Murphy
Vice President and Manager
of Operations
RD 5, Box 169
Ferry Road
Brattleboro, Vermont 05301

Gentlemen:

Subject: Inspection Report No. 50-271/85-11

This refers to the routine safety inspection conducted by Mr. J. A. Prell of this office on March 11-15, 1985, at the Vermont Yankee Nuclear Power Station, Vernon, Vermont, of activities authorized by NRC License No. DPR-28 and to the discussions of our findings held by Mr. Prell with Mr. D. Reid of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the NRC Region I Inspection Report which is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

Based on the results of this inspection, it appears that some of your activities were not conducted in full compliance with NRC requirements. These apparent violations involve the lack of a receipt inspection and storage program for safety-related material and the potential falsification of receipt inspection reports. The details of these violations are included in the attached report (see Section 2.5). We are considering these items for appropriate enforcement action and will be addressing them later in separate correspondence. An enforcement conference is scheduled for April 11, 1985, to discuss this matter. At this meeting, you are requested to discuss your understanding of the circumstances which led to these problems and the corrective actions you have taken or plan to take to prevent future recurrence of such problems.

No reply to this letter is required. Your cooperation with us in this matter is appreciated.

Sincerely,

Stewart D. Ebnetter, Director
Division of Reactor Safety

Enclosure: NRC Region I Inspection Report Number 50-271/85-11

cc w/encl:

R. W. Capstick, Licensing Engineer
W. F. Conway, President and Chief Executive Officer
J. P. Pelletier, Plant Manager
Donald Hunter, Vice President
Cort Richardson, Vermont Public Interest Research Group, Inc.
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
State of New Hampshire
State of Vermont

U.S. NUCLEAR REGULATORY COMMISSION
Region I

Report No. 50-271/85-11
Docket No. 50-271
License No. DPR-28
Licensee: Vermont Yankee Nuclear Power Corporation
RD5 Box 169 Ferry Road
Brattleboro, Vermont 05301
Facility Name: Vermont Yankee Nuclear Power Station
Inspection At: Vernon, Vermont
Inspection Conducted: March 11-15, 1985
Inspectors: J. Prell
J. Prell, Reactor Engineer
J. Prell for
W. Oliveira, Reactor Engineer
Approved By: Lee H. Bethune for
Dr. P. K. Eapen, Acting Chief, QA Section
Division of Reactor Safety

3-29-85
date

3-29-85
date

4/4/85
date

Inspection Summary: Routine Unannounced Inspection Conducted March 11-15, 1985
(Report Number 50-271/85-11)

Areas Inspected: Quality records storage program, procurement program, and receipt, storage and handling program for safety-related items. The inspection involved 75 hours onsite by two region based inspectors.

Results: Violations (inadequate receipt inspection and potential falsification of receipt inspection records - paragraph 2.5) were identified in the receipt, storage and handling program for safety-related material.

DETAILS

1. Persons Contacted

- J. Babbitt, Security Supervisor
- D. Bauer, Assessment Engineer
- L. Bozek, Senior Engineer, Operations Quality Group (OQG), Yankee Atomic Electric Company (YAEC)
- F. Burger, Quality Assurance (QA) Coordinator
- R. Butterfield, Operations Technical Assistant
- * J. Desilets, Operations Department Supervisor
- * P. Donnelly, Technical Services Superintendent (Acting)
- D. Dyer, OQG Engineer, YAEC
- * C. Falkner, Document Control Coordinator
- J. Granfrancesco, Maintenance Supervisor
- * G. Gilmore, Storekeeper
- W. Limberger, Senior Engineer, Operations
- * R. Martin, Quality Design and Procurement Supervisor, YAEC
- D. McElwee, Equipment Qualification (EQ) Coordinator
- * R. Milligan, Administrative Supervisor
- C. Perrevecchio, QA Technician
- W. Peterson, OQA and Engineering Group (EG) Supervisor, YAEC
- J. Pelletier, Plant Manager
- * D. Pike, OQG Supervisor, YAEC
- * D. Reid, Operations Superintendent

2.0 Receipt, Storage and Handling

2.1 References/Requirements

1. 10 CFR 50, Appendix B.
2. ANSI N45.2.2-1972, Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants.
3. ANS 3.2/ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.
4. Vermont Yankee Final Safety Analysis Report, Appendix D.
5. Yankee Operational Quality Assurance Program, YOQAP-1-A, Operational Quality Assurance Manual.
6. Administrative Procedure (AP)-0801, Revision 12, Receipt, Inspection and Shipment of Material and Equipment.
7. AP-0802, Revision 7, Identification and Control of Materials, Parts and Components.
8. AP-0803, Revision 8, Storage of Materials and Equipment.

9. AP-0806, Revision 1, Issuing and Returning of Material, Parts and Components.
10. AP-6021, Revision 8, Nonconformance Reports.
11. ANSI N18.1-1971, Selection and Training of Nuclear Power Plant Personnel.

2.2 Program Review

The inspector reviewed the documents listed in Section 2.1 and determined that the licensee had established a receipt, storage, and handling program for safety-related material which:

- Provided for receipt inspection of all incoming safety-related materials and supplies. Reference 6 of Section 2.1 establishes the licensee's practices for receipt and inspection of material.
- Identified qualified vendors who may supply safety-related items which are supported solely by a certification of conformance.
- Required that received materials be examined for conformance with requirements specified in the purchase order.
- Provided for documentation of receipt inspection and storage of receipt inspection records.
- Provided controls for tagging and marking of acceptable and nonconforming items.
- Established controls for the disposition and documentation of nonconforming items.
- Established controls for the conditional release of nonconforming items.
- Established responsibilities for each aspect of the program.
- Established controls for shelf-life components.
- Provided for periodic inspections of the storage areas.

2.3 Program Implementation

Implementation review of the program included the following:

- Tours of the warehouse. Tags were used to segregate safety-related items from nonsafety-related items. All items but one (P.O. 13068) were properly stored, identified, and segregated. Upon identification by the inspector, the licensee removed the P.O. 13068 item from the shelf for proper tagging. The inspector found no indication of water leakage or rodent damage.
- Verification that access controls exist which limit entrance to the warehouse.
- Verification that hazardous materials were stored away from safety-related items. Flammables and other hazardous chemicals were stored in enclosed metal cabinets.
- Verification that safety-related items were stored at their proper storage level or better. The warehouse is a Level B storage area. All items inspected were classified as Level B or lower.
- A tour of the QC Hold area and verification that the licensee's program for nonconforming items was being properly implemented.
- Review of the following completed safety-related purchase order packages and verification that receipt inspections had been recorded and documented.

<u>P.O. Number</u>	<u>Description</u>
14409	Solenoid Valves
9706	Diesel Air Start Components
22396	Ninety Degree Angles
22711	Spring Nuts and Ninety Degree Angles
22554	Bolts
12259	Collets and Pistons
16480	Collets and Pistons
19358	IRM
22041	D.G. Fuel Element Cartridge
21945	Agastat Relays
22474	120 Vac Relay
10269	Time Delay Relays
18047	Agastat Relays
22706	Bolts
13068	125 Vdc Coil Control

In addition, the inspector held discussions with the Instrumentation and Control (I&C) and Maintenance Department Heads, the Plant Manager and his staff and stores personnel regarding the effectiveness of the receipt, storage and handling program.

2.4 QA/QC Interface

The annual QA audit of this area, VY-84-08, "Procurement and Material Control," conducted by Yankee Atomic Electric Company (YAEC) was reviewed. One facet of this audit covered the training/qualification of plant personnel performing receipt inspections on safety-related material. Results of this audit are discussed in Section 2.5 below.

2.5 Findings

During the tours of the warehouse, the inspector viewed the as-stored conditions for those items received under purchase orders identified in paragraph 2.3. A majority of the items received under eleven of these purchase orders were not opened by the receipt inspectors. These items were still packaged in their non-transparent sealed shipping boxes or envelopes.

Table 1 is a summary of the inspector's observations for the items received under the eleven purchase orders.

Table 1

<u>P.O. No.</u> <u>Date of</u> <u>Inspection</u>	<u>No. and Kind of</u> <u>Items Received</u>	<u>No. of</u> <u>Items</u> <u>on Shelf*</u>	<u>No. of</u> <u>Items</u> <u>Still</u> <u>Sealed</u>	<u>No. of</u> <u>Items</u> <u>Possibly</u> <u>Inspected</u>	<u>Items</u> <u>Indicated</u> <u>as being</u> <u>Receipt</u> <u>Inspected</u>
14409/ 5/30/81	3-Solenoid Valves 2-Repair Kits	3 2	2 0	1 2	Valves #1, 2, 3 Solenoid Valve and Kits
9706/ 7/15/78	4-3-way Solenoid Valves 4-Norgram Air Filters 12-Air Filter Elements	4 3 4	3 3 4	1 1 8	Valves, elbows, filters (all items on P.O.)
16480/ 8/31/81	6-Collets and Pistons	6	6**	0	Spares (all items on shipping receipt 218-108035)

<u>P.O. No.</u> <u>Date of</u> <u>Inspection</u>	<u>No. and Kind of</u> <u>Items Received</u>	<u>No. of</u> <u>Items</u> <u>on Shelf*</u>	<u>No. of</u> <u>Items</u> <u>Still</u> <u>Sealed</u>	<u>No. of</u> <u>Items</u> <u>Possibly</u> <u>Inspected</u>	<u>Items</u> <u>Indicated</u> <u>as being</u> <u>Receipt</u> <u>Inspected</u>
12259/ 12/31/79	5-Collets and Pistons	3	3	2	Collet and Piston (all items on shipping receipt)
10269/ 6/20/78	17-Different Time Delay Relays	7	7	10	All relays on PO
18047/ 7/16/82	51-Different Relays	47	47	4	All relays indicated on packing list
22041/ 7/24/84	18-Fuel Filter Cartridges 2/box	17	16	2	All items indicated on package list
22396/ 4/5/84	100-Ninety degree Angles 25/box	2 boxes	2 boxes	2 boxes	All items indicated in shipping order
22554/ 4/20/84	10 boxes-3/8" x 2 3/4" bolts	5 boxes	4 boxes	6 boxes	All items on PO
22706/ 6/12/84	20 boxes-3/8" x 2 3/4" bolts	20 boxes	17 boxes	3 boxes	All items indicated on shipping order
22711/ 6/7/84	8 boxes-Ninety degree angles 25/box	5 boxes	3 boxes	5 boxes	All items indicated on shipping order
	15 boxes-3/8" Spring Nuts 100/box	11 boxes	10 boxes	5 boxes	All items indicated on shipping order

* Missing items presumably were issued for use into the plant.

** One item stored in an hermetically sealed aluminum envelope appeared to have been torn while in storage.

The inspector reviewed the receipt inspection records for the above purchase orders. The inspection records indicated that without exception all received items were inspected. In Sections III and IV of the Receipt Inspection Checklist, the receipt inspectors recorded that the attributes such as, physical damage, dimensions, workmanship and electrical insulation were inspected. As described in Table 1, a majority of those items remaining on the shelf were in sealed packages. Inspection for such attributes through the sealed packages is impossible. The eleven identified Receipt Inspection Checklists covered a span of six years (1978-1984) and were signed by eight different individuals: four Department Heads, one Department Head designee, two QA Technicians and one Storekeeper. All Receipt Inspection Checklists since 1982 were signed off by the QA Technician or the Storekeeper.

Further inquiry resulted in these additional findings and conclusions:

(1) Inadequate Receipt Inspection Procedures

The inspector's review of the above purchase orders indicated that the inspection efforts varied significantly from person to person. For example, all of the inspection activities required on the receipt inspection checklist (RIC) for PO 14409 were not performed because the receipt inspector knew that the components received under this PO would never be used at the facility. However, the licensee failed to tag these components to identify this fact. Additionally, these components were not segregated from other stored safety-related items.

For P.O. 22041 and P.O. 18047 a sampling inspection was thought by the licensee to be adequate to accept all the components received under a given P.O. However, the licensee procedures and specific procurement documents neither endorsed acceptance of received goods by sampling inspections nor provided specific guidance for determining the appropriate sampling plan.

These observations indicate that the licensee program failed to establish acceptable procedures for receipt inspection.

(2) Inadequate Personnel Training, Guidance and Tools

Prior to February 1, 1982, all receipt inspections were conducted and signed off by the cognizant Department Head. After February 1, 1982, a new position, QA Technician, was created to be responsible for all receipt inspections. The licensee's full time QA Technician stated to the inspector that he did not receive any formal training in receipt inspections. As stated in YOQAP-1-A, the licensee has taken exception to the qualification

requirements of ANSI N45.2.6 for this position. Licensee administrative procedures related to receipt inspection provide little or no inspection guidance. Procedures governing inspections of items for physical damage, physical properties, dimensions, weld preparations, workmanship, lubricants and oils, and electrical insulation do not exist. The licensee has established some guidance for such receipt inspection attributes as identification and marking, documentation, protective covers and seals, coatings and preservatives, inert gas blankets, desiccants, and cleanliness. However, in most cases, the established guidance was inadequate since it only addressed packaging, transportation and classification level requirements. The inspectors also determined through questioning of the QA Technician that the only tools available for dimensional inspections were a tape measure and a steel ruler.

Because of this apparent lack of tools, training and written guidance, the receiving inspector did not perform the required inspections although he documented on the Receipt Inspection Checklist that he did.

Given below are five examples where the receipt inspector documented that he had inspected those attributes on the RIC but in fact he had not performed the inspections. These five records appear to be false.

<u>P. O. Number</u>	<u>Attributes Which Were Indicated as Being Inspected But Were Not</u>
16480	Electrical Insulation
14409	Dimensions
18047	Dimensions, Electrical Insulation
22396	Dimensions
22711	Dimensions

Notes: P.O. 16480 did not have any electrical parts. In P.O. 14409 the receipt inspector stated that a dimensional check was probably not performed. In P.O. numbers 18047, 22396 and 22711, the receipt inspector stated he did not know what dimensional or electrical attributes to measure or inspect.

(3) Ineffective QA Audits

In YAEK audit VY-84-08, the training and qualifications of plant personnel were audited. Under the "Assessment of the Effectiveness of the Activities Audited", the conclusion was made that these personnel were "highly knowledgeable of the procedural requirements". This appears to contradict the NRC findings and raises questions as to the effectiveness of the audit.

In addition, the audit report did not reflect a review of stored items and storage conditions.

(4) Inadequate Preventive Maintenance Program for Items in Storage

The licensee has not established a preventive maintenance (PM) program for safety-related items stored in the warehouse as required by 10 CFR 50, Appendix B and ANSI N45.2.2. Purchase orders did not require PM information from the vendor. Although the licensee has implemented a good PM program for stored rotating electrical equipment, there is no evidence that PM is being performed for items stored in inert gas or with desiccants. As an example, PO 10269, received on March 16, 1978, had the following notation stamped on the nontransparent hermetically sealed envelopes "Storage Inspection: check container upon receipt for damage/loss of vacuum. Examine contents in 3 year intervals of packaging." The contents were still sealed in the manufacturers sealed envelope six years after receipt.

(5) Apparent Falsification of Inspection Records

It appears that the present licensee program is conducive to falsification of receipt inspection records. The receipt inspector or his alternate is the only individual who presently signs the receipt inspection; there is no management review. Prior to 1982, management personnel signed receipt records as noted in paragraph 2.5(2). Examples of PO's which contained false information are:

<u>PO No.</u>	<u>Apparent Falsification</u>
14409	RIC indicates solenoid valve Serial Numbers 1, 2, and 3 were inspected. Inspector found Serial Numbers 2 and 3 still packaged inside solid foam containers.
16480	RIC indicates that the 6 collets and pistons had been inspected. The inspector found all 6 in their hermetically sealed bags. In addition, the RIC indicates they had been inspected for electrical insulation which does not pertain to collets and pistons.
18047	RIC indicates relays were dimensionally checked. The QA Technician stated he did not know what dimensional attributes to measure.
22041	RIC indicates these items received a dimensional check. The QA Technician indicated he had no criteria to measure against and that a dimensional check was probably not performed.
22396	
22554	
22706	
22711	

Items (1) through (4) above indicate a programmatic breakdown of receipt inspections. They collectively appear to be a violation.

Item (5) also appears to be a violation resulting from the falsification of receipt inspection records.

2.6 Management Meetings

The inspectors met with the Plant Manager and his staff to discuss these findings on March 14, 1985.

At that time, the inspector asked the licensee five questions NRC Region I management sought answers to. They were:

1. "What was the basis for apparently not inspecting all items?"
2. "Why doesn't the documentation accurately reflect what the inspection covered?"
3. "Where are the missing items?"
4. "What guarantees can the licensee provide to the NRC that these missing items are performing their intended function?"
5. "Why wasn't this programmatic breakdown identified by supervision or QA?"

That evening, licensee management informed the NRC that the following immediate actions had been taken.

1. Stores had removed all the identified items from the warehouse and placed them into the QC Hold area.
2. Until further notice, all safety related materials were to be receipt inspected against the RIC and documented prior to being released to the plant.
3. Engineering would be requested to review the receipt inspections conducted for the identified items along with their known or likely installations and make an engineering safety evaluation of placing these items into service without an adequate receipt inspection.

2.7 Summary of the Licensee's Findings in Receipt Inspections

On March 15, 1985, after the NRC inspector made known his findings, the licensee provided a copy of an internal memorandum dated February 22, 1985, entitled "Meeting to Develop Recommendations for Enhancement of Receipt Inspection" VYB85/74. This memorandum was addressed to the Vice President and Manager of Operations and summarized a January 11, 1985, meeting between Yankee Nuclear Services Division (YNSD) QA, VY Corporate, and VY Plant personnel regarding the adequacy of the current VY receipt inspection function. The following weaknesses were identified in the memorandum:

- "1. Receipt inspectors sign for acceptance of dimensional characteristics and conformance to drawings and specifications, but do not actually measure dimensions nor, in most cases, compare received items to applicable documentation other than the purchase order and the vendor's C of C. Supporting documentation is not readily available.
2. Receipt inspectors have received no hands-on technical training in the techniques of mechanical and visual inspection of materials, parts, and components.
3. Receipt inspectors do not have the equipment necessary to perform even minimum dimensional inspection of received items.
4. Too much faith is placed upon the vendor's C of C as ensuring the adequacy of purchased items.
5. Resolution of problems identified at receipt inspection (other than those documented in non-conformance reports) may be subject to the "pressures of production", since the only source resolution is the Ordering Department.
6. Receipt inspection has been treated as a "part-time" duty of the stores QA technician, which promotes superficiality of inspection due to the pressure of other priorities."

This memorandum proposed several corrective actions to resolve the above weaknesses. These actions were undergoing VY management review at the time of this inspection.

3.0 Procurement Program

3.1 References/Requirements

1. 10 CFR 50, Appendix B, Criteria IV and VII.

2. ANSI N45.2.13-1976, Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants.
3. ANS 3.2/ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.
4. Yankee Operational Quality Assurance Program YOQAP-1-A, Operational Quality Assurance Manual.
5. Vermont Yankee Final Safety Analysis Report, Appendix D.
6. AP-0800, Revision 10, Material and Service Procurement.
7. AP-6020, Revision 10, Material and Service Purchase Approval.
8. Yankee Atomic Electric Company Approved Vendor List, Revision 16.

3.2 Program Review

The inspector reviewed the documents listed in Section 3.1 and determined that the licensee had established a procurement program for safety-related replacement items which included the following:

- Only approved and qualified suppliers were used for supplying safety-related items.
- Procurement procedures were developed in accordance with ANSI N45.2.13-1976.
- Responsibilities were identified for initiation, review, and approval of procurement documents.
- Purchase and receipt records for safety-related items were retained and maintained in accordance with established requirements.
- The engineering organization performed technical and quality evaluations of all purchase requisitions.
- Quality Assurance (QA) performed overview of the above activities.
- Controls were established for making changes to procurement documents.

3.3 Program Implementation

The inspector selected the following purchase orders for safety-related items to ascertain whether procurement activities were conducted in accordance with programmatic and QA requirements.

<u>Purchase Order Number</u>	<u>Description</u>
22124	UV Sensor Tube Module
22146	RCIC Trip Throttle Valve
22173	Containment Monitors
22271	EQ ASCO Solenoids
22179	3/4" Swing Check Valves for Diesel Air Start
22395	Reactor Feedwater Nozzle Mockup
22378	ASCO Pressure Switch
22474	Agastat Relays
22592	Diesel Generator ASCO Valves and Repair Kit
22673	710 DU Spare Parts Kit for Analog Trip System
22684	SNB Motor and Operator for V23-15
22738	Gaskets and Disc for RCIC Valve
23021	O-Ring Kits
23261	125 Hp. Motor for Cooling Tower
23263	Gasket Material for QA MOV's
23616	Limit Switches and Gaskets

The inspector verified that the vendors for the above purchase orders were on the Approved Vendors List; that QA and Engineering had reviewed the purchase requisitions; and that the requisitions referenced the appropriate codes, standards, Part 21, shelf-life, and Certificate of Conformance requirements.

3.4 Findings

No violations were identified.

4.0 Records Program

4.1 Requirements/References

1. 10 CFR 50, Appendix B.
2. Technical Specification Section 6.6.
3. FSAR Section 1.9, Quality Assurance Program.
4. ANSI N45.2.9-1974.
5. ANSI N18.7-1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.
6. YOQAP-1-A, Revision 15, Operational Quality Assurance Manual.
7. Administrative Procedure (AP) 0834, Revision 11, Plant Record Retention.
8. AP 6802, Revision 11, Drawings and Aperture Cards.
9. AP 6805, Revision 8, Document Control.
10. AP 6806, Revision 5, Transfer of Quality Assurance Records to Document Control Center.
11. AP 6808, Revision 3, Record Disposition.

4.2 Program Review

The inspector reviewed the licensee's Quality Assurance records storage program. This program was established to meet the requirements of the documents referenced in paragraph 2.1. The licensee's procedures adequately identified the records required to be maintained. All records required to be maintained by the Technical Specifications are identified and tracked in the licensee's Departmental Record Type List. Responsibilities and controls for storage and filing, transfer, retention, maintenance and disposition of records are also identified and assigned in the licensee's procedures.

4.3 Program Implementation

The inspector verified the implementation of the record storage programs in AP 0834 and AP 6806 by tours of several departmental storage areas and the storage vault. The designated record clerks/custodians:

- (1) readily retrieved any records requested, including microfilm records located in specific areas throughout the plant.
- (2) controlled the receipt and verification of records including changes and supplemental information. The inspector reviewed the Records Receiving Checklist for the Health Physics Department and the Stores and Purchasing Department. These records had been submitted for microfilming.
- (3) controlled the access to files and the accountability of records.
- (4) were knowledgeable of the retention requirements and the disposition of records.

When the records personnel were not sure of the record retention periods, especially for the records not covered by regulatory requirements or ANSI N45.2.9, they consulted the applicable department heads for answers. Furthermore, AP 6808 requires the signature of a department head for the destruction of any records regardless of the retention period. For example, the inspector noted that the Reactor Engineering Department Head signed the Records Disposition Form to have the Nuclear Engineering Conference Reports for 1976-1981 destroyed. Likewise, the Training Department Head requested that certain outdated records be returned to him after they were microfilmed.

The storage vault was inspected. This vault met the requirements of a single storage facility discussed in ANSI N45.2.9, Paragraph 5.6. The temperature and humidity (72°F and 50%) was within the range indicated in AP 0834 (68°F-75°F and 30-55%). Temperature/humidity information was recorded monthly on Form 0834.02. Access to the vault is controlled by the Administrative Supervisor, the Document Control Coordinator or her assistant. The permanent records in the vault include the Health Physics logs, Chemistry logs, radiographs, and strip charts. The strip charts, after a year, are sent to a vault in Iron Mountain, New York.

The inspector randomly selected the following records for review:

- Health Physics Log Book (8/12/79 through 12/10/79)
- Chemistry Log Book (8/10/72 through 10/26/72)
- Radiographs
 - RHR 3BF6 (2/17/71)
 - MS ID F5 (1/11/71)
 - Core Spray (12/30/69 and 4/11/71)
 - Reactor Recirc (6/17/76)

The inspector also verified that the drawings received by Document Control Center (DCC) from YAEC were in agreement with the transmittal documents; that the drawings were properly distributed; and that the microfilm for these drawings was properly filed. Specifically, the inspector verified that the drawing revisions of an Engineering Design Change Request (EDCR 84-13) and a Plant Design Change Request (PDCR 84-01) from Engineering Support were in agreement with the Master Point Index.

The following records were reviewed to verify proper implementation of the program:

- Reportable Occurrences related to Information Notices (IN), Generic Letters, Inspection Reports (IR), and Licensee Event Reports (LERs):
 - IN 85-09, IN 85-10, IN 85-11 IN 85-04, IN 84-81, IN 84-79 and IN 84-78
 - Generic Letter 84-24 and LERs 84-12, 84-13, 84-14, 84-15 and 85-01
 - IR 84-23, Licensee is preparing reply to open items 84-23-02 and 84-23-04
- I&C calibration records for a Decade Box, Voltmeter, and Potentiometer.
- Surveillance test record of a Standby Gas Treatment System.
- Operational logs and records such as: Operator Round Sheet; Auxiliary Operator Round Sheet; Sump Timer Data Sheet; and Meter Data Sheet.
- Reactor Engineering records such as: Fuel Receiving Supervisor's Checklist; Fuel Container Checklist; and Special/Spent Nuclear Material (SNM) Transfer Form.

- Maintenance Inspection Reports for MR 84-2260, 2247, and 2169.
- Inservice Inspection (ISI) for 1983: ISI Insulation Removal and Replacement package; and 1983 Vermont Yankee Work Plan.
- DCC records such as Drawing Status Revision Report and Master Print Index. The inspector and DCC assistant randomly selected twenty drawings from the print index of 17,900 drawings and verified that these drawings were microfilmed.
- Equipment Qualifications (EQ) records for Level Transmitter LT 2-3-72A (MR 85-0411), and Pressure Transmitter PT 2-3-52D.
- MR 84-0263, Reactor Building Closed Cooling Water Pump and MR 84-1757, Emergency Core Cooling System Battery Charger.

4.4 QA/QC Interface Involving Records

The annual YAEC audit (VY 84-13) of Document Control, which included records, was conducted in October 1984. The audit report was issued on November 21, 1984. The plant's response, which was adequate and timely was sent to the Manager of Operations on January 3, 1985 for his review and approval. Operational QA (OQA) only retains the latest YAEC QA Audit. Plant Audit reports are maintained at YAEC, Framingham, Massachusetts. The inspector also reviewed OQA Inspection Checklists 84-12, 84-16, 84-32, 83-35, 83-50, and 85-16. These checklists conformed to ANSI N45.2.9 requirements.

4.5 Findings

No violations were identified.

5.0 Exit Meeting

The inspectors met with the Plant Manager's designee and other staff members denoted in Paragraph 1 on March 15, 1985, to summarize the scope and findings of the inspection. These representatives acknowledged the inspector's findings. See paragraph 2.6 for details of other management meetings.

At no time during the inspection was written material provided to the licensee by the inspectors.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
631 PARK AVENUE
KING OF PRUSSIA, PENNSYLVANIA 19406

ATTACHMENT 2

Docket No. 50-271

APR 25 1985
RECEIVED NRY 85-72
VERMONT YANKEE
LICENSING

Vermont Yankee Nuclear Power Corporation
ATTN: Mr. Warren P. Murphy
Vice President and Manager of Operations
RD #5, Box 169
Ferry Road
Brattleboro, Vermont 05301

APR 29 1985

Gentlemen:

Subject: Notice of Violation and Enforcement Conference Report

On April 11, 1985, an enforcement conference was held in the NRC Region I office with you and members of your staff to discuss our concerns regarding deficiencies in the quality assurance program relating to the receipt inspection and storage of safety-related material. A report of the conference is enclosed. These concerns were identified by the NRC during an inspection conducted on March 11-15, 1985, and were documented in NRC Inspection Report 50-271/85-11, forwarded to you by letter dated April 2, 1985.

Specifically, these concerns involve: (1) failure to provide adequate instructions for inspecting safety-related material upon receipt and for storing of safety-related material; and (2) failures to correctly document the results of certain inspection attributes of received safety-related material at the facility. The first concern is set forth as a violation in Appendix A to this letter. Although this violation is classified as Severity Level IV in accordance with the NRC Enforcement Policy, 10 CFR Part 2, Appendix C published in 49 FR 8583 (March 8, 1984), it together with the other findings of Inspection Report 50-271/85-11 are of particular concern to the NRC because they represent a breakdown in management control of that portion of the quality assurance program regarding receipt inspection and storage.

Furthermore, this represents the third breakdown in management control of a portion of the quality assurance program in the past two years. The two previous concerns involved: (1) twelve problems in the quality assurance program were identified in NRC Inspection Report 50-271/83-22; these problems indicated that the quality assurance staffing level was inadequate and the program was too narrow in its scope and coverage; and (2) a failure was identified in NRC Inspection Report No. 50-271/84-23 where non-metallic spare parts purchased between 1975 and 1983 were not included in the recently established shelf-life control program. We are therefore emphasizing that any further breakdown of the quality assurance program could lead to escalated enforcement action.

We also have a concern with respect to the manner in which your staff dealt with the NRC inspector in this most recent inspection. Apparently, the administrative supervisor was aware as early as January 1985 that your receiving inspection practices were not in compliance with NRC requirements but he chose to remain silent during the inspection in this very area. When the inspection was essentially over plant management first attempted to mitigate the NRC findings on the premise that your staff had already identified the problems. We rely on licensees to provide us with factual and timely information related to plant activities and expect your staff to fully inform NRC inspectors of known problems in the course of inspections and not wait to see if an NRC inspector happens to identify a known problem on his own.

You are required to respond to the enclosed Notice of Violation and you should follow the instructions therein. In your response, you should also describe the actions you have taken or planned to (1) assure that the adequacy of safety-related material received, stored or installed at the plant has not been affected by the deficiencies in the receipt inspection and storage program, and (2) improve the effectiveness of your QA program implementing procedures and their administration.

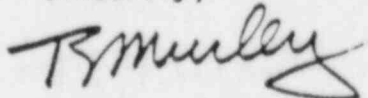
In addition, to enable NRC to determine what actions, if any, should be taken with respect to your license, you are required to submit under the provisions of 10 CFR 50.54(f), a report of your investigation into apparent false documentation concerning the results of receipt inspections; an explanation of how these incidents occurred and with whose knowledge; a determination of the causes of the falsification, including the responsible individuals; and a description of the actions taken or planned to prevent recurrence of similar incidents. Your written reply to this letter and the results of future inspections will be considered in determining whether further enforcement action is appropriate.

We will examine closely your response to this letter and the enclosed Notice of Violation to assure that the proposed actions are adequate to preclude future breakdowns in QA program implementation.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice", Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosures will be placed in the NRC Public Document Room.

The responses directed by this letter and the enclosed Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

Sincerely,



Thomas E. Murley
Regional Administrator

Enclosures:

1. Appendix A, Notice of Violation
2. Report of Enforcement Conference

cc:

R. W. Capstick, Licensing Engineer
W. F. Conway, President and Chief Executive Officer
J. P. Pelletier, Plant Manager
D. Hunter, Vice President
C. Richardson, Vermont Public Interest Research Group, Inc.
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
State of New Hampshire
State of Vermont

APPENDIX A

NOTICE OF VIOLATION

Vermont Yankee (VY) Nuclear Power Corporation

Docket No. 50-271
License No. DPR-28

As a result of the inspection conducted on March 11-15, 1985, documented in Inspection Report 50-271/85-11, and in accordance with the NRC Enforcement Policy (10 CFR 2, Appendix C), the following violation was identified:

10 CFR 50, Appendix B, Criterion VII states in part: "Measures shall be established to assure that purchased material, equipment ... whether purchased directly or through contractors and subcontractors conform to the procurement documents. These measures shall include provision, as appropriate, for ... examination of products upon delivery." Additionally, 10 CFR 50, Appendix B, Criterion XIII states in part: "Measures shall be established to control the ... storage, ... and preservation of material and equipment in accordance with work and inspection instructions to prevent ... deterioration."

Paragraph C.1.f of Section VII, of the Yankee Operational Quality Assurance Manual, YOQAP-1-A, states: "Satisfaction of this criterion (VII) shall be assured through ... receipt inspection of vendor furnished material to assure ... material and documentation are inspected in accordance with predetermined instructions and are determined acceptable prior to use." Paragraph C.1.b of Section XIII of YOQAP-1-A states: "Satisfaction of this criterion (XIII) shall be assured through the ... preparation of instructions in accordance with design and specification requirements which control the ... storage ... of safety classified materials ... to preclude ... deterioration by environmental conditions such as temperature or humidity."

Contrary to the above, as of March 15, 1985, VY implementing procedures AP-0801 and AP-0803 were inadequate in that these procedures: (1) failed to provide sufficient predetermined instructions which resulted in incomplete, careless and nonrepresentative receipt inspections as exemplified by receipt inspection reports for solenoid valves (PO 14409, PO 9706), collets and pistons (PO 16480, PO 12259), relays (PO 10269, PO 18047), Diesel Generator Fuel Filter cartridges (PO 22041), ninety degree angles (PO 22396, PO 22711) and Kwik bolts (PO 22554, PO 22706); (2) failed to define preventive maintenance requirements for the storage of safety classified materials to preclude deterioration by environmental conditions such as temperature and humidity and as exemplified by PO 10269 whose items had not been examined for six years although the manufacturer recommended examinations at three year intervals.

This is a Severity Level IV Violation (Supplement I).

Pursuant to the provisions of 10 CFR 2.201, Vermont Yankee Nuclear Power Corporation is hereby required to submit to this office within thirty days of the date of the letter which transmitted this notice a written statement or explanation in reply, including: (1) the corrective steps which have been taken and the results achieved, (2) corrective steps which will be taken to avoid further violations, and (3) the date when full compliance will be achieved. Where good cause is shown, consideration will be given to extending this response time.

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Enforcement Conference Report No. 50-271/85-15

Docket No. 50-271

License No. DPR-28

Licensee: Vermont Yankee Nuclear Power Corporation

RD 5, Box 169

Ferry Road, Brattleboro, Vermont 05301

Facility Name Vermont Yankee Nuclear Power Station

Meeting at: King of Prussia, Pennsylvania

Meeting conducted: April 11, 1985

NRC Personnel: P. K. Eapen
for J. Prell, Reactor/Engineer

4/23/85
date signed

Approved by: P. K. Eapen
Dr. P.K. Eapen, Acting Chief,
QA Section, Operations Branch, DRS

4/23/85
date signed

Enforcement Conference Summary:

2 / An Enforcement Conference was held on April 11, 1985 to discuss the concerns associated with an inadequate receipt inspection and storage program and inaccurate and misleading receipt inspection reports. The licensee discussed the actions taken to address these concerns.

DETAILS1. Vermont Yankee Nuclear Power Company

W. Murphy, Vice President and Manager of Operations
J. Pelletier, Plant Manager
R. Milligan, Administrative Supervisor
W. Limberger, Senior Engineer, Operations Support

Yankee Atomic Electric Company

W. Peterson, Manager, Audit and Engineering

Nuclear Regulatory Commission

T. Murley, Regional Administrator
J. Allan, Deputy Regional Administrator
S. Ebnetter, Director, Division of Reactor Safety
R. Starostecki, Director, Division of Reactor Projects
W. Kane, Deputy Director, Division of Reactor Projects
L. Bettenhausen, Branch Chief, Operations Branch
L. Tripp, Section Chief, Reactor Projects Section #3A
P. Eapen, Acting Chief, Quality Assurance Section
W. Raymond, Senior Resident Inspector
D. Holody, Enforcement Specialist
G. Meyer, Project Engineer
J. Prell, Reactor Engineer

2. BACKGROUND

NRC inspection 50-271/85-11 was conducted to review the licensee's quality records storage, procurement, and receipt, storage and handling programs for safety-related material. The following concerns were identified with-in the receipt inspection and storage program:

- a) Inadequate receipt inspections of safety-related material were conducted because of inadequate procedures.
- b) Receipt inspectors were not provided with adequate training, tools, or guidance needed to perform their duties.
- c) A QA audit was of questionable effectiveness since it came to an opposite conclusion from the NRC inspection.
- d) The preventive maintenance program for stored items was inadequate.
- e) Receipt inspection reports failed to accurately document the characteristics inspected.

Details of this inspection are provided in NRC Inspection Report No. 50-271/85-11.

3. DISCUSSION

The NRC staff requested the licensee's representatives to comment upon the inspection report and to discuss the actions planned or taken to address the NRC identified concerns.

The licensee's representatives provided the following information:

- a) The licensee acknowledged that their procedures for receipt inspections were inadequate in that they lacked specificity and provided no guidance for sampling inspections. The licensee stated that at least one item of each identified purchase order was inspected. Based on this sample inspection the inspector signed off the Receipt Inspection Checklist for those items as being acceptable. In light of the NRC inspector's findings, a special task force was formed on March 18, 1985, to evaluate the effects of an inadequate receipt inspection program on materials already placed in the plant and to make recommendations by May 1, 1985, for improving the receipt inspection program.
- b) The licensee took exception to the statement that a receipt inspector had not received any training for his duties. Copies of tests taken by the receipt inspector in 1982 were produced. The licensee acknowledged that this training was weak in that it did not address all receipt inspection characteristics. The licensee also took exception to the statement that this receipt inspector did not have any tools for making dimensional measurements. Administrative Procedure AP-0801 states that the receipt inspector may request support from the appropriate Department Head in matters requiring detailed technical review and that when calibrated measuring or test equipment is needed for receipt inspections, it will be provided by the Maintenance or I/C Departments. The licensee did acknowledge that the receipt inspector may not have used these services or tools.
- c) The licensee stated that the QA audit referred to in the NRC Inspection Report 50-271/85-11 was designed to ascertain the degree of adherence to existing procedures. The audit was designed neither to determine the adequacy of these procedures nor the accuracy of the Receipt Inspection Checklists. Within this framework, the licensee felt that the audit was effective but did acknowledge that there was room for improvement in the audit program.
- d) The licensee acknowledged that there were shortcomings in their preventive maintenance program for items stored with desiccants and that the task force would be making recommendations for improvement in this area.

- e) The licensee stated that there was never any deliberate intent by management or the receipt inspector to deceive when filling out the receipt inspection reports. Instead, inaccuracies discovered by the NRC in these reports merely indicate the individual receipt inspectors' understanding and implications of the receipt inspection function at that time.

4. ENFORCEMENT ACTION

Refer to Appendix A of the transmittal letter to this report.

QUESTIONS FOR INSPECTORS

Name?

Age?

Present home address?

Present business address?

Present title?

Description of duties and responsibilities in present position?

Educational background?

Any other formal training?

When first employed by Vermont Yankee?

Summarize (chronologically) your employment history with Vermont Yankee (including a brief description of duties and responsibilities in each position)?

Focusing on your involvement in the receipt inspection process and the signing of "Receipt Inspection Checklists" (RICs):

1. When were you involved, and for how long?
2. What was your position or title at that time?
3. What were your general duties and responsibilities in this capacity?
4. What were your specific duties and responsibilities with respect to the receipt inspection process?

5. Who was your immediate superior?
6. Did you report to anyone else?
7. Did anyone report to you?
8. What was your understanding of the "chain of command" with respect to the receipt inspection process?
9. What, if any, in-service training were you given prior to or during your service as a receipt inspector?
10. What, if any, other qualifications did you have for this position?

11. What tools or equipment were you given to carry out your duties and responsibilities as a receipt inspector?

With respect to your inspection of incoming goods (and completion and signing of RIC's), do you recall who first explained to you how this process should be performed?

[SHOW INSPECTOR COPY OF QUESTIONED RIC SIGNED BY HIM.]

With respect to the particular RIC before you,

1. [QUIZ GENERALLY RE NRC STATED DEFECT?]

2. What was the basis for each circled choice in Sections III and IV (when package not opened)?

3. Who directed, advised, or approved this method of inspection?

4. Was this your customary practice?
5. How long did you use this method of inspection?
6. Did you ever change inspection methods?
If so, how, when and why?
7. Other comments or questions . . .

[SHOW INSPECTOR COPY OF PROCEDURE HANDOUT THEN IN EFFECT.]

Have you seen this document before?

When did you first see it?

Did the information contained in the document have any bearing upon the inspection process which you employed?

Is there a particular section or passage which you relied upon to justify your method of inspection?

Did you ever complain or comment to anyone about the RIC forms?

Did you feel the RIC forms were adequate?

Did you ever complain or comment to anyone about the procedure handout?

Explain your participation, if any, in the present NRC investigation?

Explain your participation, if any, in other similar NRC investigations?

AMERICAN NATIONAL STANDARD
REACTOR PLANTS AND THEIR MAINTENANCE

Packaging, Shipping, Receiving,
Storage and Handling of Items
for Nuclear Power Plants
(During the Construction Phase)

ANSI N45.2.2 - 1972

SECRETARIAT

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

This standard was approved by the American National Standards Committee N45 and its Secretariat, and it was subsequently approved and designated N45.2.2-1972 by the American National Standards Institute on December 20, 1972.

Any part of this standard may be quoted. Credit lines should read: "Extracted from American National Standard Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants, (During the Construction Phase) ANSI N45.2.2-1972, with the permission of the publisher, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017."

FOREWORD

This standard deals with the care and inspection of material, equipment and components, hereafter referred to as items, from the time they have been released for packaging at the end of manufacturing until they have been placed in their final designated location in the generating station. The standard was developed under sponsorship of The American Society of Mechanical Engineers (ASME) as an effort by the American National Standards Committee N45 on Reactor Plants and Their Maintenance. This committee has been chartered to promote the development of standards for the location, design, construction, and maintenance of nuclear reactors and plants embodying nuclear reactors, including equipment, methods, and components specifically for this purpose.

In May of 1969 the N45 Committee established an ad hoc Committee (N45-3.2) on Packaging, Shipping, Receiving, Storage and Handling of Equipment. The purpose of this committee was to prepare a standard for general industry use that would define the requirements for these activities so as to assure attainment of quality construction. The ad hoc committee was composed of representatives of key segments of the nuclear industry, including utilities, reactor suppliers, construction contractors, component manufacturers, and consultants.

The preparation of material for this standard was initiated with the intent that appropriate requirements would be included in the ASME Boiler and Pressure Vessel Code. Subsequent to these efforts, it was decided that the requirements would be prepared as a separate American National standard. The initial draft of this standard was prepared in February 1970. Since then revisions have been made to reflect comments received from committee members, other ad hoc committees of N45, and selected individuals from the nuclear industry and the United States Atomic Energy Commission. The standard contained herein was developed from this activity.

In April of 1970 the N45 Committee established a subcommittee N45-3.0 to guide the preparation of nuclear quality assurance standards. This subcommittee is responsible for establishing guidelines and policy to govern the scope and content of various standards, monitoring the status of standards in process, recommending preparation of additional standards, and final approval of standards prior to their submittal to the N45 Committee for balloting. Working with the N45-3.0 Subcommittee and concurrently with the development of this standard by the N45-3.2 ad hoc committee, other ad hoc committees of N45 developed a series of standards that set forth both general and detailed technical provisions for certain activities to assure quality during the construction phase of nuclear power plants. These standards include the general quality assurance program requirements and provisions for cleaning, instrumentation and electrical work, housekeeping, civil, structural, and mechanical work; qualifications of quality assurance personnel; and other quality assurance practices.

In October 1972 the N45-3 Subcommittee was renamed N45-2, and Work Group N45-3.2 was renamed N45-2.2.

At the time of issue of this standard the following other N45 quality assurance standards were in preparation or issued:

1. N45.2, Quality Assurance Requirements for Nuclear Power Plants.
2. N45.2.1, Cleaning of Fluid Systems and Associated Components During the Construction Phase of Nuclear Power Plants.
3. N45.2.3, Housekeeping During the Construction Phase of Nuclear Power Plants.
4. N45.2.4, Installation, Inspection, and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Station.
5. N45.2.5, Construction Phase Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel for Nuclear Power Plants.
6. N45.2.6, Qualification of Inspection, Examination, and Testing Personnel for the Construction Phase of Nuclear Power Plants.

7. N45.2.8, Installation, Inspection, and Testing Requirements for Mechanical Equipment During Construction of Nuclear Power Plants.
8. N45.2.9, Requirements for Quality Assurance Records for Nuclear Power Plants.
9. N45.2.10, Definition of Terms.
10. N45.2.11, Quality Assurance Requirements for the Design of Nuclear Power Plants.
11. N45.2.12, Quality Assurance Program Auditing Requirements for Nuclear Power Plants.
12. N45.2.13, Supplementary Quality Assurance Requirements for Preparation of Procurement Documents for Nuclear Power Plants.
13. N45.2.14, Supplementary Quality Assurance Requirements During the Manufacture of Class IE Instrumentation and Electric Equipment for Nuclear Power Generating Stations.

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the Secretary, American National Standards Committee N45, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47 Street, New York, New York 10017.

AMERICAN NATIONAL STANDARDS COMMITTEE N45^a
Reactor Plants and Their Maintenance

OFFICERS

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F. S. Sansone, Alternate, Nuclear Energy Property Insurance Association, Hartford, Connecticut

PUBLIC HEALTH SERVICE

J. E. Martin, U.S. Department of Environmental Protection Agency, Rockville, Maryland

E. D. Harward, Alternate, U.S. Dept. of Environmental Protection Agency, Rockville, Maryland

TRAVELERS INSURANCE COMPANY, THE

F. W. Catudal, The Travelers Insurance Company, Hartford, Connecticut

^aAs of December 7, 1971

UNDERWRITERS' LABORATORIES

L. H. Horn, Underwriters' Laboratories, Incorporated, Chicago, Illinois

U.S. ATOMIC ENERGY COMMISSION

Mervyn Booth, U.S. Atomic Energy Commission, Washington, D.C.

E.C. Caw, U.S. Atomic Energy Commission, Washington, D.C.

F. J. Shaw, Division of Operational Safety, U.S. Atomic Energy Commission, Washington, D.C.

INDIVIDUAL MEMBERS

Roger Cox, Yankee Atomic Electric Company, Westboro, Massachusetts

D. L. Leone, Sargent & Lundy, Chicago, Illinois

Harold Lichtenberger, Nuclear Division, Combustion Engineering, Incorporated, Windsor, Connecticut

J. H. Mandell, MPR Associates, Incorporated, Washington, D.C.

Subcommittee on Nuclear Quality Assurance Standards (N45-3)

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J. W. Anderson, Oak Ridge National Lab., Oak Ridge, Tennessee

R. S. Bain, Pacific Gas & Electric Co., San Francisco, California

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A. Elivols, Stone & Webster Engrg. Corp., Boston, Massachusetts

S. G. Casale, Westinghouse Electric Co., Pittsburgh, Pennsylvania

R. H. Davidson, Tennessee Valley Authority, Knoxville, Tennessee

R. L. Dietl, Duke Power Co., Charlotte, South Carolina

H. F. Dohel, Babcock & Wilcox, Lynchburg, Virginia

W. F. Ferguson, Oak Ridge National Lab., Oak Ridge, Tennessee

J. W. Hollowell, Westinghouse Electric Corp., PWR Systems Div., Pittsburgh, Pennsylvania

S. K. Hoffman, The Ralph M. Parsons Co., New York, New York

J. H. Hots, Babcock & Wilcox, Lynchburg, Virginia

W. P. Kelleghan, Tennessee Valley Authority, Knoxville, Tennessee

F. W. Knight, Westinghouse Electric Corp., Pittsburgh, Pennsylvania

M. E. Langston, U.S. Atomic Energy Commission, Div. of Reactor Development & Technology, Washington, D.C.

D. G. Long, General Electric Co., San Jose, California

W. M. Morrison, U.S. Atomic Energy Commission, Div. of Reactor Standards, Washington, D.C.

G. M. Schierberg, Stone & Webster Engineering Corp., Boston, Massachusetts

K. A. Swartz, Consumers Power Company, Jackson, Michigan

J. Wehler, Combustion Engineering, Windsor, Connecticut

D. B. Weaver, Tennessee Valley Authority, Knoxville, Tennessee

The Ad Hoc Committee on PACKAGING, SHIPPING, RECEIVING, STORAGE & HANDLING OF EQUIPMENT included the following personnel in the development of this standard.

J. W. Hollowell, Chairman, Westinghouse Electric Corp., Pittsburgh, Pennsylvania

H. D. Laford, Secretary, Stone & Webster Engrg. Corp., Boston, Massachusetts

W. Faess, Babcock & Wilcox Co., Seneca, South Carolina

L. R. Hartman, Baltimore Gas & Electric Co., Baltimore, Maryland

J. H. Marshall, Niagara Mohawk Power Corp., Buffalo, New York

W. M. O'Grady, Philadelphia Electric Co., Philadelphia, Pennsylvania

T. D. Rippe, Public Service Electric & Gas Co., Newark, New Jersey

W. R. Shafan, General Electric Co., San Jose, California

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PACKAGING, SHIPPING, RECEIVING, STORAGE AND HANDLING OF ITEMS FOR NUCLEAR POWER PLANTS

(During the Construction Phase)

1. INTRODUCTION

1.1 Scope

This standard defines requirements for packaging, shipping, receiving, storage, and handling of nuclear power plant items. These items include the parts of structures, systems, and components whose satisfactory performance is required for the plant to operate reliably, to prevent accidents that could cause undue risk to the health and safety of the public, or to mitigate the consequences of such accidents if they were to occur. The requirements stated herein deal with the protection and control necessary to assure that the requisite quality of those important parts of the plant are preserved from the time items are fabricated until they are incorporated in the plant.

This standard is intended to be used in conjunction with ANSI N45.2, Quality Assurance Program Requirements for Nuclear Power Plants. The requirements may also be extended to other appropriate parts of nuclear power plants when specified in contract documents.

1.2 Applicability

~~The requirements of this standard apply to the work of any individual or organization that participates in the packaging, shipping, receiving, storage and handling of items to be incorporated into nuclear power plants as discussed in Subsection 1.4 of this standard.~~ The extent to which the individual requirements of this standard shall apply will depend upon the nature and scope of the work to be performed and the importance of the item or service involved. The requirements are intended to assure that the quality of items is not degraded as a result of packaging, shipping, receiving, storage, and handling practices and techniques.

1.3 Responsibility

The organization or organizations responsible

for establishing the applicable requirements for the activities covered by this standard shall be identified and the scope of their responsibilities shall be documented. The work of establishing practices and procedures and providing the resources in terms of personnel, equipment and services necessary to implement the requirements of this standard may be delegated to other organizations and such delegation also shall be documented. However, it is the responsibility of each organization performing work covered by this standard to comply with the procedures and instructions issued for the project and to conform to the requirements of this standard applicable to his work.

The following shall be used as a guide in determining those responsibilities which shall be established and documented:

1. Classification of items (protection level)
2. Packaging design and methods
3. Shipping requirements and methods
4. Receiving requirements and methods
5. Storage requirements and procedures
6. Handling requirements and procedures
7. Records

1.4 Definitions

The following definitions are provided to assure a uniform understanding of select terms as they are used in this standard.

Barrier - A flexible material designed to withstand the penetration of water, water vapor, grease, or harmful gases.

Carrier - The transporting agency.

Classification - The organization of items according to their susceptibility to damage during shipping, receiving and storage only. It does not relate to the function of the item in the completed system.

Documentation - Any written or pictorial in-

formation describing, defining, specifying, reporting, or certifying activities, requirements, procedures or results.

Dynamic Load Test - A test to demonstrate the ability of hoisting equipment to safely handle its rated load by exercising the equipment through vertical and horizontal movement along its lines of travel, using a load of specified weight.

Handling - The act of physically moving items by hand or by mechanical machinery, not including transport modes.

Item - Any level of unit assembly, including system, subsystem, subassembly, component, part, or material.

Nonconformance - A deficiency in characteristic, documentation, or procedure which renders the quality of an item unacceptable or indeterminate. Examples of nonconformance include: physical defects, test failures, incorrect or inadequate documentation, and deviation from prescribed processing, inspection or test procedures.

Package - The shipping container plus the contents of the container.

Package Unit - Any assembly of mechanical and/or electrical components and parts which can be disassembled without destroying the integrity of the individual parts.

Receiving - To take delivery of material at the construction site or other location designated by the purchaser.

Storage - The act of holding items at the construction site or in an area other than its permanent location in the plant.

Storage Facilities - Warehouse or yard area designated and prepared for holding of items.

Transit Carrier (Open) - Trucks, Trailers, Railroad cars, Barges, Aircraft, or Ships which *do not* provide protection of items from the environment.

Transit Carrier (Closed) - Trucks, Trailers, Railroad cars, Barges, Aircraft or Ships which *do* provide protection of items from the environment by nature of their inherent design.

Transportation Mode - A method identified by the conveyance used for transportation of items and includes any motor vehicles, ships, railroad cars, or aircraft. Each cargo-carrying body (trailer, van, box-car, etc.) is a separate vehicle.

Wrap - A flexible material, formed around the item or package to exclude dirt and to facilitate handling, marking or labeling.

Other terms and their definitions are contained in ANSI N45.2.10.

1.5 Referenced Documents

Other documents that are required to be included as a part of this Standard are either identified at the point of reference or described in Section 9 of this Standard. The issue or edition of the referenced document that is required will be specified either at the point of reference or in Section 9 of this standard.

2. GENERAL REQUIREMENTS

This section contains requirements that are to be fulfilled by the organization or organizations responsible for performing any segment of work described in Sections 3 through 8 of this standard.

Measures shall be established and implemented for the packaging, shipping, receiving, storage and handling of specified items to be incorporated in the nuclear power plant, and for the inspections, examinations, testing and documentation to verify conformance to specified requirements.

2.1 Planning

The specific items to be governed by this standard shall be identified. Planning shall take into account the need for the preparation and control of procedures and work instructions as necessary to comply with specified requirements. Planning shall include a review of the design specifications and drawings for the items covered by this standard to assure that packaging, shipping, receiving, storage, and handling activities have been incorporated and that they can be accomplished as specified.

2.2 Procedures and Instructions

Procedures and instructions shall be generated, used, and maintained current; these shall contain sufficient detail to provide for the listed items (see Subsection 2.1 of this Standard) a basis for packaging design, shipping requirements, receiving, storage and handling procedures, implementation thereof, and inspection, in accordance with this standard.

2.3 Results

Inspection and test results shall be documented in a suitable test report or data sheet. Each report shall identify the item to which it applies, the procedures or instruction followed in performing the task and the identification of the following:

- (1) Conditions encountered which were not

- anticipated, including nonconformance.
- (2) Identity of inspector or tester.
 - (3) Completion date.

Test reports and data sheets shall include an evaluation of the acceptability of inspection and test results and provide for identifying the individual who performed the evaluation.

2.4 Personnel Qualifications

Those personnel who perform inspection, examination or testing activities at the job site shall be qualified in accordance with N45.2.6. Off-site inspection, examination or testing shall be audited and monitored by personnel who are qualified in accordance with N45.2.6.

2.5 Measuring and Test Equipment

2.5.1 Selection. Inspection, examination, and testing equipment utilized to implement the requirements of this standard shall be selected to have accuracy and tolerance sufficient to determine conformance to specified requirements.

2.5.2 Calibration and Control. As appropriate, measuring and test equipment shall be adjusted and calibrated at prescribed intervals against certified equipment having known valid relationships to nationally recognized standards. If no national standards exists, the basis for calibration shall be documented. Records shall be maintained and equipment suitably marked to indicate calibration status.

2.6 Housekeeping

In job-site areas, facilities, and environments where packaging, shipping, receiving, storage and handling of items is performed in accordance with the requirements of this standard, the housekeeping requirements shall be in accordance with N45.2.3.

2.7 Classification of Items

The requirements for activities covered by this standard (packaging, shipping, receiving, storage and handling) are divided into four levels with respect to protective measures to prevent damage, deterioration or contamination of the items, based upon the important physical characteristics and not upon the important functional characteristic of the item with respect to safety, reliability and operation. It should be recognized, however, that within the scope of each level there may be a range of controls and that the detailed requirements for an item are dependent on the importance of the item to safety or reliability. For example, even though a reactor vessel and struc-

tural steel are classified as level D, the degree of protection and control over the reactor vessel should exceed that of the structural steel. ~~Each of the specific items governed by this procedure (See Subsection 2.1 of this standard) shall be classified into one of these four levels by the buyer or the contractor.~~ The manufacturer's documented standard or minimum requirements shall be considered when classifying the items. Items, once classified, shall be restricted to the level or higher for each of the packaging, shipping, receiving, storage and handling operations. Items shall not be classified according to the requirements of one level, then packaged, shipped, received, stored or handled according to a level of lower grade. Any package unit or assembly made up of items of different levels shall be classified to the highest level designated for any of the respective parts. If the unit is disassembled, a level shall be indicated for each part. When the unit cannot be physically disassembled, special rules are contained herein.

Items covered by this standard shall be categorized under the following levels:

2.7.1 Level A — Items classified to level A are those that are exceptionally sensitive to environmental conditions and require special measures for protection from one or more of the following effects: temperatures outside required limits, sudden temperature changes, humidity and vapors, gravitational (g) forces, physical damage and airborne contamination (e.g. rain, snow, dust, dirt, salt spray, fumes).

The following shall be used as a guide for classifying items intended for this level classification:

- (1) Special electronic equipment and instrumentation.
- (2) Special materials, such as chemicals that are sensitive to environment.
- (3) Special nuclear material (fuel) and sources. The requirements of the AEC fuel license and conditions and other governmental agencies shall be met.

2.7.2 Level B — Items classified to level B are those that are sensitive to environmental conditions and require measures for protection from the effects of temperature extremes, humidity and vapors, g forces, physical damage and airborne contamination and should not require special protection required for level A items.

The following shall be used as a guide for classifying items intended for this level classification:

- (1) Instrumentation
- (2) Electrical penetrations

- (3) Batteries
- (4) Welding electrode and wire
- (5) Control rod drives
- (6) Motor control centers, switchgear and control panels
- (7) Motors and generators
- (8) Precision machined parts
- (9) Erection spares, such as gaskets, "O" rings
- (10) Air handling filters
- (11) Computers

2.7.3 Level C — Items classified to level C are those that require protection from exposure to the environment, airborne contaminants, g forces and physical damage. Protection from water vapor and condensation is not so important as that for Level B items.

The following shall be used as a guide for classifying items intended for this level classification.

- (1) Pumps
- (2) Valves
- (3) Fluid filters
- (4) Reactor internals
- (5) Compressors
- (6) Auxiliary Turbines
- (7) Instrument cable
- (8) Refueling equipment
- (9) Thermal insulation
- (10) Fans and blowers
- (11) Cement

2.7.4 Level D — Items classified to level D are those that are less sensitive to the environment than level C. These items require protection against the elements, airborne contamination, and physical damage.

The following shall be used as a guide for classifying items intended for this level classification.

- (1) Tanks
- (2) Heat exchangers and parts
- (3) Accumulators
- (4) Demineralizers
- (5) Reactor vessel
- (6) Evaporators
- (7) Steam generators
- (8) Pressurizer
- (9) Piping
- (10) Electrical cable
- (11) Structural items
- (12) Reinforcing steel
- (13) Aggregates

3. PACKAGING

3.1 General

This section contains the requirements for packaging of items for protection against corrosion, contamination, physical damage or any effect which would lower the quality or cause the item to deteriorate during the time it is shipped, handled and stored. The degree of protection specified will vary according to storage conditions and duration, shipping environment, and handling conditions.

Implementation of this packaging section is accomplished by identifying the item and the appropriate packaging level, and then applying the appropriate criteria contained herein concerning cleaning, preservatives, desiccants, inert gas blankets, cushioning, caps and plugs, barrier and wrapping materials, tapes, blocking and bracing, containers, marking, other quality assurance provisions and documentation. Appendix A-3 contains additional requirements generally not available in other documents. These requirements are a mandatory part of this standard.

3.2 Levels of Packaging

The packaging requirements are based on the protection the items should receive during shipping, handling, and storage. The requirements of this standard are intended to be in addition to industry classifications or tariff rules for rail, truck, air and water shipments and regulatory agency rules already established in the transportation industry and in no way are they intended to reduce the minimum standards established by these regulatory agency rules.

The following packaging criteria are divided into four levels corresponding to the categories of Subsection 2.7 of this Standard.

3.2.1 Level A Items. (See paragraph 2.7.1). Level A items require the highest degree of protection and shall conform to the following criteria:

- (1) Package design requirements are for extraordinary environmental protection to avoid the deleterious effects of shock and vibration, to control temperature or humidity within specified limits, or for any other special requirements.
- (2) Items shall have been inspected for cleanliness immediately before packaging. Dirt, oil residue, metal chips or other form of contamination shall have been removed by approved cleaning methods. Any entrapped water shall have been removed.

- (3) Items which are not immediately packaged shall be protected from contamination.
- (4) All items shall be packaged with a barrier (see Subsection 3.6 of this Standard) so that water vapor, salt air, dust, dirt and other forms of contamination do not penetrate the package.
- (5) Items shall be packaged in containers or crates (see Subsection 3.7 of this standard).
- (6) Items which can be damaged by condensation trapped within the package shall be packaged with approved desiccant (see paragraph 3.6.3) inside the sealed water-vaporproof barrier or by an equivalent method (for example, see paragraph 3.6.2).
- (7) All openings into items shall be capped, plugged or sealed (see Subsection 3.5 of this standard). Weld end preparations shall be protected against corrosion and physical damage.
- (8) Items packed in containers shall be blocked, anchored, braced and/or cushioned (see Subsection 3.8 of this standard) to prevent physical damage to the item or barrier.
- (9) Items and their containers shall be identified by marking (see Subsection 3.9 of this standard).

3.2.2 Level B Items. (See paragraph 2.7.2) Level B items require a high degree of protection and the package shall be designed to avoid the deleterious effects of shock, vibration, physical damage, water vapor, salt spray, condensation and weather during shipping, handling and storage. This packaging shall be equivalent to that for Level A except that the extremes of paragraph 3.2.1 (1) need not apply. Level B items such as control panels or similar special items may be shipped with a minimum of protection when transported in a fully enclosed furniture type van with special suspension, provided the shipment goes through to destination in the original vehicle and Level B storage facilities are available at the site.

3.2.3 Level C Items. (See paragraph 2.7.3) Level C items require protection from exposure to salt spray, rain, dust, dirt, and other airborne and windblown contaminants. Protection from water vapor and condensation is less important than for Level B items. The following criteria shall apply:

- (1) Criteria (2) (3) (5) (7) (8) and (9) for Level A items (see paragraph 3.2.1) shall apply to Level C items.
- (2) Items shall be packaged with a waterproof enclosure so that water, salt spray, dust, dirt, and other forms of contamination do

not penetrate to the item.

- (3) Items subject to detrimental corrosion, either internal or external, shall be suitably protected.

3.2.4 Level D Items. (See paragraph 2.7.4) Level D items require protection from physical and mechanical damage. The following criteria shall apply:

- (1) Items, just before packaging, shall have been inspected for cleanness according to the requirements specified in the purchasing document. Dirt, oil residue, metal chips or other forms of contamination shall have been removed by approved cleaning methods. Any entrapped water shall have been removed.
- (2) All openings into items shall be capped, plugged and sealed (see Subsection 3.5 of this standard). Weld end preparations shall be protected from corrosion and physical damage.
- (3) Items subject to detrimental corrosion, either internal or external, shall be suitably protected.
- (4) Items packed in containers shall be blocked, braced and/or cushioned to prevent physical damage (see Subsection 3.8 of this Standard).
- (5) Items such as aggregate and reinforcing steel shall be suitably protected against detrimental contamination or corrosion.
- (6) The identity of the item shall be maintained by marking (see Subsection 3.9 of this standard) or other appropriate means.

3.3 Cleaning

Cleaning includes the preparation of items for preservation or packaging, or both, to minimize the requirements for site cleaning. Items shall be inspected for cleanness immediately before packaging according to the cleaning requirements specified in the purchase document. Any dirt, oil residue, metal chips or other forms of contamination shall be removed by documented cleaning methods. Any entrapped water shall be removed. Any item which is not immediately packaged shall be protected from further contamination. (See Appendix section A3.3 for additional requirements.)

3.4 Methods of Preservation

Items subject to deleterious corrosion shall be protected by using either contact preservatives, inert gas blankets, or vapor-proof barriers with desiccants. (See Subsection 3.6 of this standard for vaporproof barriers and desiccants.)

3.4.1 Contact Preservatives. Contact preservatives are compounds applied to bare metal surfaces to prevent surface corrosion during shipping and storage and generally require removal prior to installation. (See Appendix section A3.4.1 for additional requirements.)

3.4.2 Inert Gas Blankets. Purging and pressurizing the interior of an item or its container or both with a dry inert gas provides a means of preventing moisture or corrosive atmospheres from acting on sensitive bare metal surfaces or other materials. The item or its container shall be either evacuated prior to filling with the inert gas or adequately purged with the same gas prior to applying the gas blanket. (See Appendix section A3.4.2 for additional requirements.)

3.5 Caps, Plugs, Tapes, and Adhesives

These items shall be of materials which enable them to perform their intended function adequately without causing deleterious effects on items or systems operation.

3.5.1 Caps and Plugs. Caps and plugs shall be used to seal openings in items having sensitive internal surfaces, and to protect threads and weld end preparations. (See Appendix section A3.5.1 for additional requirements.)

3.5.2 Tapes and Adhesives. Pressure sensitive, removable, tape should be used in lieu of adhesives in contact with bare metal surfaces. Tapes or adhesives which could have damaging effects on the item or system shall not be used. Tapes near a weld shall be removed completely immediately prior to performing a weld or closure. Tapes used for identification rather than sealing which are not near a welding operation may remain until system testing. (See Appendix section A3.5.2 for additional requirements.)

3.6 Barrier and Wrap Materials and Desiccants

A barrier generally is a flexible material designed to withstand the penetration of water, water vapor, grease, or harmful gases. A wrap is a flexible material, formed around the item or package to exclude dirt and to facilitate handling, marking or labeling. Material thickness shall be selected on the basis of type, size and weight of equipment or item to be protected, such that the barrier or wrap will not easily be damaged by puncture, abrasion, weathering, cracking, temperature extremes, wind conditions, and the like. Barrier and wrap materials shall be non-halogenated when used in direct contact with austen-

itic stainless steels, shall be noncorrosive, shall not readily support combustion and shall not be otherwise harmful to the item packaged. Vaporproof barrier materials used with desiccants constitutes another preservation system (see Subsection 3.4 of this standard); it protects against potential damage by water vapor condensate.

3.6.1 Water-proof Barrier Material. Waterproof barrier material shall be resistant to grease and water; it shall protect items from airborne and windblown soils.

3.6.2 Vapor Barrier Material. Vaporproof barrier materials shall be sealable and the edge of the barrier which normally will be opened at destination shall be of sufficient area to permit at least two subsequent sealing operations. (See Appendix A3.6.2 for additional requirements.)

3.6.3 Desiccants. Desiccants may be used within a vaporproof barrier when condensation or high humidity could damage an item by corrosion, mold, or mildew. (See Appendix A3.6.3 for additional requirements.)

3.7 Containers, Crating and Skids

3.7.1 Containers. Containers are used when maximum protection for the item or its barrier is required. Domestic types used shall be limited to:

- (1) Cleated, sheathed boxes (500 lb maximum net weight).
- (2) Nailed wood boxes.
- (3) Wood-cleated solid fiberboard boxes.
- (4) Fiberboard boxes (120 lb maximum net weight. See Appendix A3.7.1 for additional requirements).
- (5) Metal or fiber drums.
- (6) Crates (see paragraph 3.7.2).
- (7) Wire bound boxes (200 lb maximum net weight).
- (8) Other specially designed containers for special equipment.

Cleated boxes in excess of 50 lb shall be bound with steel strapping or equivalent around the container at not less than two places. (See Appendix A3.7.1 for additional requirements.)

3.7.2 Crates and Skids. Crates and skids shall be used for equipment in excess of 500 lb. Skids and runners shall be used on boxes with a gross weight of 100 lb or more, allowing a minimum floor clearance for forklift tines as provided by 4 inch lumber.

3.8 Cushioning, Blocking, Bracing and Anchoring

3.8.1 Cushioning. Cushioning shall be used where protection from shock and vibration is required; the cushioning materials shall have sufficient strength to perform this function. (See Appendix A3.8.1 for additional requirements.)

3.8.2 Blocking and Bracing. Blocking and bracing used for protection of the load to be supported, shall be compatible with the size, shape, and strength of bearing areas of the shipment. The blocking and bracing used to prevent item movement shall withstand thrust and impact applied in any direction. Blocking and bracing used in direct contact with the item being blocked shall not have a corrosive effect on the item.

3.8.3 Anchoring. Anchoring of the item within a crate or on a skid shall adequately fasten the item during shipment and protect the item from potential damage due to rough handling. To facilitate disassembly and minimize damage when removing container contents, bolting is preferred. (See Appendix A3.8.3 for additional requirements.) Temporary cushioning, blocking, bracing or anchoring placed within an item for shipping protection that must be removed prior to operation of the item shall be identified by warnings placed in a conspicuous manner to effect proper removal of the packing material.

3.9 Marking

To maintain proper identification and instructions or both during shipping, receiving and storage, and to provide for identification after the outside of the container has been removed, the item and the outside of containers shall be marked. (See Appendix 3.9 for additional requirements.)

4. SHIPPING

4.1 General

This section covers the requirements for loading and shipment of items as defined in Subsection 2.7 of this standard. Described are environmental protection during transit, procedures to minimize damage in transit, precaution required when handling items during loading and transit, and identification and inspection on overseas shipments.

The mode of transportation used shall be consistent with the protection classification of the item (see Subsection 2.7 of this standard) and with the packaging methods employed (see Subsection 3.2 of this standard).

4.2 Transportation Requirements

4.2.1 Open Carriers. For shipment on open carriers where items may be exposed to adverse environmental conditions, the following shall apply:

- (1) Level A, B, and C items shall be covered for protection from environmental conditions. Tarpaulins, when used, shall be fire retardant; and they shall be installed in a manner to provide drainage and to insure air circulation to prevent condensation.
- (2) Barrier and wrapping materials (see Subsection 3.6 of this standard) subject to transportation damage shall be covered with waterproof shrouds such as tarpaulins, so that they are not exposed directly to the environment.

4.2.2 Closed Carriers. For shipment on closed carriers the following shall apply:

- (1) When level A, B, and C items cannot be adequately protected from weather or environment on open carriers, closed carriers shall be used.
- (2) Use of fully enclosed furniture vans is recommended when shipping large delicate items such as control panels.

4.2.3 Special Shipments. Items that exceed established weight or size limitations for railroads or highways, or require special handling should be given additional consideration in the following areas:

- (1) The type of bracing and tie down methods to be used with the mode of transportation selected for special shipments shall be specified.
- (2) "NO HUMPING" shall be specified on rail shipments of these items, and "NO HUMPING" signs shall be prominently displayed.
- (3) Use of impact recording meters should be specified on shipments of heavy or relatively large items incorporating delicate factory installed instrumentation. Meters, when specified, shall be installed prior to loading (to record any rough handling during loading). Procedures shall be established to interpret recorded data, and to thoroughly check the integrity of an item when there is evidence of rough handling. A notice that impact recording meters are being used shall be prominently displayed. Special recording meters with operating time limits greater than the expected transit time shall be specified or, if the expected transit time exceeds the operating time

limit of the recorders being used, provisions shall be made to service the meters during transit.

- (4) The use of "Escorts" may be specified to accompany shipments, when additional surveillance is required during transit of certain items.
- (5) For special shipments, the conveyance used for transport shall be certified to be structurally adequate to take the loads imposed during loading, while en route, and during unloading. Prior to shipment the route shall have been investigated to assure safe transit.

4.3 Precautions During Loading and Transit

4.3.1 Loading. The weight, lifting points, or center of gravity indicated on the crate, skid, or package by the shipper (see Subsection 3.9 of this standard) shall be utilized to insure proper handling during loading, transfer between carriers, and unloading (see Section 7 of this standard).

4.3.2 Rigging. Carbon steel rigging equipment shall not come in direct contact with stainless steel except when attached to lifting lugs, eyes, or pads, in order to avoid surface damage.

4.3.3 Handling Precautions. All austenitic stainless steel and nickel base alloy materials shall be handled in such a manner that they are not in contact with lead, zinc, copper, mercury, or other low melting elements, alloys, or halogenated material.

4.3.4 Package/Preservative Coatings. Packages and/or preservative coatings shall be visually inspected after loading, and damaged areas repaired prior to shipment. Items shipped with desiccants shall be inspected after loading to assure that sealed areas are intact.

4.3.5 Sealed Openings. Sealed Openings shall be visually inspected after loading to assure closures are intact. Materials used for resealing shall be in accordance with Section 3 of this standard.

4.3.6 Stacking. Written instructions covering the location and stacking limits of the crates or boxes on the transport vehicle shall be specified; these should be marked on the container.

4.3.7 Theft and Vandalism. Precautions shall be taken to minimize the possibility of theft and vandalism during shipment of items.

4.4 Identification and Marking

Identification and markings on the outside of

all packages, skids or protective covering shall be maintained in accordance with Subsection 3.9 of this standard.

4.5 Shipments From Countries Outside United States

4.5.1 Overseas Shipment. When overseas shipments are involved, use of deck cargo facilities shall be avoided unless necessary due to physical dimensions. Shipments utilizing approved watertight containers may be carried on deck.

4.5.2 Inspection at Point of Shipment. For special shipments, items shall be inspected to insure integrity of packaging or protective enclosures after being loaded aboard ship.

4.5.3 Inspection at Port of Entry. For special shipments, items shall be inspected to insure integrity of packaging or protective enclosures when items are off loaded at the port of entry.

4.5.4 Identification and Markings. Identification and markings shall follow the procedure outlined in Subsection 3.9 of this Standard. The English language and avoirdupois weight shall be used for all identification and marking. Duplicate markings and identification in other languages or weight systems may be used.

4.5.5 Transportation Requirements. Requirements outlined in Subsection 4.2 (Transportation) and in Section 7 of this Standard shall be followed where applicable.

4.6 Nuclear Material Shipments

Special nuclear material and sources shall be shipped as specified in the AEC fuel license and by other regulatory agencies.

5. RECEIVING

5.1 General

This section contains requirements that are to be fulfilled by the organization or organizations responsible for the receiving of items. Receiving starts when the items arrive at a storage facility or construction site before unloading or unpacking. Included are procedures, inspections, marking, identification and documentation prior to placing the item in storage or directly in its final location. Shipping damage claims, transfer of ownership, financial responsibility and contractual obligations are commercial obligations which are not included in the scope of this Standard.

5.2 Receiving Inspection Requirements

5.2.1 Shipping Damage Inspection. Preliminary visual inspection or examination shall be performed prior to unloading to determine if any damage occurred during shipping. Observations for unusual conditions shall include:

- (1) *Fire* - Charred paper, wood or paint, indicating exposure to fire or high temperature.
- (2) *Excessive Exposure* - Weather-beaten, frayed, rusted, or stained containers indicating prolonged exposure during transit.
- (3) *Environmental Damage* - Water or oil marks, damp conditions, dirty areas, or salt film (indicating exposure to sea water or winter road salt chemicals).
- (4) *Tie Down Failure* - Shifted, broken, loose or twisted shipping ties, and worn material under ties, indicating improper blocking and tie down during shipment.
- (5) *Rough Handling* - Splintered, torn, or crushed containers indicating improper handling. Review of impact recording instrument readings.

5.2.2 Item Inspection. Unless the package marking prohibits unpacking, the content of all shipments shall be visually inspected to verify that the specified packaging and shipping requirements have been maintained. When items are contained in transparent separate moisture-proof bags or envelopes, visual inspection without unpacking the contents is acceptable. Statistical sampling methods may be used for groups of similar items. Care shall be taken to avoid contamination of the items during inspection. The inspections shall be performed in an area equivalent to the level of storage requirement for the item (see Section 6 of this standard). These inspections and examinations shall include the following as appropriate:

- (1) *Identification and Marking*. Verification that identification and markings are in accordance with applicable codes, specifications, purchase orders, drawings, and this standard.
- (2) *Manufacturing Documentation* - Assurance that the item received was fabricated, tested and inspected prior to shipment in accordance with applicable code, specification, purchase order and/or drawings.
- (3) *Protection Covers and Seals* - Visual inspection to assure that covers and seals meet their intended function.
- (4) *Coatings and Preservatives* - Verification

that coatings and preservatives are applied in accordance with specifications, purchase orders or manufacturer's instructions.

- (5) *Inert Gas Blanket* - Verification that the inert gas blanket pressure is within the acceptable limits.
- (6) *Desiccant* - Verification that the desiccant is not saturated, as indicated through the use of humidity indicators. Desiccants shall be regenerated or replaced as necessary in accordance with special instructions.
- (7) *Physical Damage* - Visual inspection to assure that parts of items are not broken, cracked, missing, deformed or misaligned and rotating parts turn without binding. Accessible internal and external areas shall be free of detrimental gouges, dents, scratches and burns.
- (8) *Cleanliness* - Visual inspection to assure that accessible internal and external areas are within the specification requirements for dirt, soil, mill scale, weld splatter, oil, grease, or stains. If inspection for cleanliness was performed prior to sealing and shipping, and inspection upon receipt indicates that there has been no penetration of the sealed boundary, then inspection for internal cleanliness is optional.

Unless the completed item was inspected or examined at the source, it shall be inspected or examined at the point of receiving to verify that the following characteristics conform to the specified requirements. These inspections or examinations shall include such items as:

- (1) *Physical Properties* - Assurance that physical properties conform to the specified requirements and that chemical and physical test reports, if required, meet the requirements.
- (2) *Dimensions* - Random visual inspection to assure that important dimensions conform with drawings and specifications. Examples are: base plate mounting holes, overall external size, configuration, and orientation of parts.
- (3) *Weld Preparations* - Random verification that weld preparations are in accordance with applicable drawings and specifications.
- (4) *Workmanship* - Visual inspection of accessible areas to assure that the workmanship is satisfactory to meet the intent of the requirements.
- (5) *Lubricants and Oils* - Verification of presence of proper lubricants and oils, if re-

quired, by either specification, purchase order, or manufacturers' instructions.

- (6) *Electrical Insulation* - Performance of insulation resistance tests for motors, generators, control and power cable, to ensure conformance with specifications.

5.2.3 Special Inspection - Where receiving inspection in addition to that described above is required, the "Special Inspection" procedure, complete with documentation instructions, shall be attached to the item or container (see Section 3 of this standard); this is in addition to the copy sent through normal channels. The special inspection shall be performed and the results of the inspection shall be documented.

5.3 Disposition of Received Items

5.3.1 Acceptable - Containers and items inspected or examined and found in conformance with specified requirements shall be identified as acceptable in accordance with the status indicating system employed (see Subsection 5.4 of this standard) and placed in a storage area for acceptable items or moved to the final location for installation or use.

5.3.2 Nonconforming - Items which do not conform to the specified requirements shall be identified as nonconforming in accordance with the system employed (see Subsection 5.4 of this standard) and when practical the item shall be placed in a segregated storage area or removed from the project site to prevent inadvertent installation or use.

5.3.3 Conditional Release - If the nonconformance which caused the item to be classified "unacceptable" can be corrected after installation, the item may be released for installation on a conditional release basis. A statement documenting the authority and technical justification for the conditional release of the item for installation shall be prepared, and made part of the documentation.

5.4 Status Indicating System

A system or method for identifying the status of items (e.g. an inventory system, tagging, labeling, color code) shall be employed that clearly indicates whether items are acceptable or unacceptable for installation. A controlled physical separation is an acceptable equivalent method. The system shall indicate the date the item was placed in the acceptable or unacceptable installation status. The use of the system shall be regulated by the Quality Control program. The system shall provide for the conditional release of items for installation pending subsequent

correction of the nonconformance. When tags are used the stock shall be made from material which will not deteriorate during storage; tags shall be securely affixed to the items and displayed in an area that is readily accessible. The stock used shall not be deleterious to the item.

5.5 Correction of Nonconformances

Items designated nonconforming or unacceptable for installation or use shall be corrected using authorized procedures, to meet specified requirements, or accepted "As is". If this is not possible, the item shall be scrapped or otherwise discarded.

5.5.1 Reinspection - Items that have been corrected shall be reinspected. The area of inspection may be confined to the area of the nonconformance. When it has been determined that the corrected item is satisfactory, the status of the item as denoted by the system shall be changed to acceptable. An appropriate entry shall be made in the documentation after acceptance is determined.

5.6 Marking

Required marking shall be verified to provide positive identification during receiving, storage, and installation. Items not properly identified at receiving may be marked using the method in the appendix (see Appendix A 3.9 of this standard).

Changing, correcting or any other marking on Code Stamp name plate is prohibited, unless authorized by the manufacturer whose serial number is applied.

5.7 Documentation

A written record of the receiving inspection, package identification, tagging, corrective actions, and justification for conditional acceptance shall be prepared. These records shall be made a part of the permanent records provided for in Section 8 of this standard.

6. STORAGE

6.1 General

6.1.1 Scope. This section contains requirements that are to be fulfilled by the organization responsible for performing the storage of items. Levels and methods of storage necessary are defined to minimize the possibility of damage or lowering of quality due to corrosion, contamination, deterioration or physical damage from the time an item is stored

upon receipt until the time the item is removed from storage and placed in its final location.

6.1.2 Levels of Storage. Environmental conditions for items classified as Levels A, B, C, and D, described in Subsection 2.7 of this Standard shall meet requirements as described in the following paragraphs:

- (1) Level A items shall be stored under special conditions similar to those described for Level B items but with additional requirements such as temperature and humidity control within specified limits, a ventilation system with filters to provide an atmosphere free of dust and harmful vapors, and any other appropriate requirements.
- (2) Level B items shall be stored within a fire resistant, tear resistant, weathertight, and well ventilated building or equivalent enclosure. Precautions shall be taken against vandalism. This area shall be situated and constructed so that it will not be subject to flooding; the floor shall be paved or equal, and well drained. Items shall be placed on pallets or shoring to permit air circulation. The area shall be provided with uniform heating and temperature control or its equivalent to prevent condensation and corrosion. Minimum temperature shall be 40 F and maximum temperature shall be 140 F or less if so stipulated by a manufacturer.
- (3) Level C items shall be stored indoors or equivalent with all provisions and requirements as set forth in Level B items except that heat and temperature control is not required.
- (4) Level D items may be stored outdoors in an area marked and designated for storage, which is well drained, preferably gravel covered or paved and reasonably removed from the actual construction area and traffic so that possibility of damage from construction equipment is minimized. Items shall be stored on cribbing or equivalent to allow for air circulation and to avoid trapping water.

6.2 Storage Areas

Periodic inspections shall be performed to assure that storage areas are being maintained in accordance with these requirements. The housekeeping requirements shall be in accordance with N45.2.3.

6.2.1 Access to Storage Areas. Access to

storage areas shall be controlled and limited only to personnel designated by the responsible organization.

6.2.2 Cleanliness and Housekeeping Practices. Cleanliness and good housekeeping practices shall be enforced at all times in the storage areas. The storage areas shall be cleaned as required to avoid the accumulation of trash, discarded packaging materials and other detrimental soil.

6.2.3 Fire Protection. Fire protection commensurate with the type of storage area and the material involved shall be provided and maintained.

6.2.4 Storage of Food and Associated Items. The use or storage of food, drinks, and salt tablet dispensers in any storage area shall not be permitted.

6.2.5 Measures to Prevent Entrance of Animals. Measures shall be taken to prevent the entrance of rodents and other animals into indoor storage areas or equipment to minimize possible contamination and mechanical damage to stored material.

6.3 Storage Methods

Storage methods and procedures shall comply with the requirements described in the following paragraphs.

6.3.1 Ready Access to Stored Items. All items shall be stored in such a manner as to permit ready access for inspection or maintenance without excessive handling, to minimize risk of damage.

6.3.2 Arrangement of Items. Items stacked for storage shall be arranged so that racks, cribbing or crates are bearing the full weight without distortion of the item.

6.3.3 Storage of Hazardous Material. Hazardous chemicals, paints, solvents, and other materials of a like nature shall be stored in well ventilated areas which are not in close proximity to important nuclear plant items.

6.3.4 Identification. All items and their containers shall be plainly marked so that they are easily identified without excessive handling, or unnecessary opening of crates and boxes.

6.3.5 Coverings. Weatherproof covering, when used for outdoor storage, shall be flame-resistant type of sheeting or tarpaulins. They shall be placed so as to provide drainage and to insure air circulation to minimize condensation. They shall be tied down to prevent moisture from entering laps and to protect the coverings from wind damage.

6.4 Control of Items in Storage

Control of items in storage is described in the following paragraphs.

6.4.1 Inspections and Examinations. Inspections and examinations shall be performed and documented on a periodic basis to assure that the integrity of the item and its container as provided for under Section 3 of this standard is being maintained. Deficiencies noted shall be corrected and documented. The characteristics verified during this inspection or examination shall include such items as:

- (1) Identification and marking (see Subsection 3.9 of this Standard).
- (2) Protective covers and seals (see Subsection 3.9 of this standard).
- (3) Coatings and preservatives (see paragraph 3.4.1).
- (4) Desiccants and inert gas blankets (see paragraph 3.6.3 and 3.4.2).
- (5) Physical damage.
- (6) Cleanness.

6.4.2 Care of Items. Care of items in storage shall be exercised in accordance with the following. Requirements for proper maintenance during storage shall be documented and written procedures or instructions shall be established.

- (1) Items in storage shall have all covers, caps, plugs or other closures intact. Methods used to seal openings shall be in accordance with Section 3 of this standard. Covers removed for internal access at any time for any reason shall be immediately replaced and resealed after completion of the purpose for removal.
- (2) Temporary preservatives shall be left intact during storage. Should reapplication of preservatives be required at the site, only those previously approved shall be used.
- (3) Items pressurized with inert gas shall be monitored at such a frequency as to insure that the gas pressure is maintained within specified limits during storage. Desiccant humidity indicators shall also be monitored and desiccants shall be changed or reprocessed when specified.
- (4) Instrumentation racks shall be energized as specified by the manufacturer.
- (5) Space heaters enclosed in electrical items shall be energized.
- (6) Rotating electrical equipment shall be given insulation resistance tests on a scheduled basis.

- (7) The shafts of rotating equipment shall be rotated on a periodic basis. The degree of turn shall be established so that the parts receive a coating of lubrication where applicable, and so that the shaft does not come to rest in a previous position. (90 deg. and 450 deg. rotations are examples.)
- (8) Other maintenance requirements specified by the manufacturer's instruction for the item shall be performed.

6.4.3 Post Fire Evaluation. In the event a fire should occur in the storage area or at any time, each item known to have been heated to an ambient temperature of over 150 F or subjected to smoke contamination shall be withheld from installation or use until it has been thoroughly examined and the item has been verified to be in conformance with specified requirements.

6.5 Removal of Items from Storage

Only items which have been inspected and are considered acceptable for installation or use in accordance with the receiving inspection procedure shall be removed from storage for installation or use. (See Section 5 of this standard.) Items released from storage and placed in their final locations within the power plant, shall be inspected and cared for in accordance with the requirements of Section 6 of this standard, and other applicable standards.

6.6 Storage Records

Written records shall be prepared that include such pertinent information as storage location, inspection results, protection, and personnel access.

7. HANDLING

7.1 General

This section contains requirements that are to be fulfilled by the organizations responsible for handling items. This section covers the requirements for the handling of items in Subsection 2.7 of this standard utilizing appropriate equipment in accordance with methods and procedures specified to minimize damage and preserve the quality of the item and container.

7.2 Methods and Procedures

Detailed handling instructions and procedures shall be prepared for all items that require special handling instructions because of weight, size, susceptibility to shock damage, high nil ductility transition temperatures, or any other conditions that warrant special instructions. Such instructions or procedures shall be made available prior to the time the item is to

be handled and shall give weights, sling locations, balance points, methods of attachment, maximum hoist line speeds and other pertinent features to be considered as necessary for safe handling.

Items not specifically covered above shall be handled in accordance with sound material handling practices.

7.3 Hoisting Equipment

All equipment for handling items shall be used and maintained in accordance with the following:

7.3.1 Hoisting equipment used for handling shall be certified by the manufacturer. The certification shall indicate the various parameters for the maximum load to be handled.

7.3.2 Hoisting equipment shall not be loaded beyond its rated load, as certified by the manufacturer, except for test purposes.

7.3.3 The requirements of ANSI B30.2.0, Safety Standard for Overhead and Gantry Cranes, ANSI B30.5, Safety Standard for Crawler, Locomotive and Truck Cranes, ANSI B30.6, Safety Standard for Derricks, and ANSI A10.5, Safety Requirements for Material Hoists shall be followed.

7.3.4 For special lifts, hoisting equipment may be re-rated, or modified and re-rated, upon approval by the manufacturer or if the manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determination shall be documented and recorded appropriately. Re-rated equipment shall be given a dynamic load test over the full range of the lift using a test weight at least equal to the lift weight. A dynamic test includes raising, lowering and traversing the load in contrast to a static test where the test weight may be increased incrementally with no movement.

7.4 Inspection of Equipment and Rigging

An inspection program shall be established for equipment and rigging. A system shall be established that will indicate acceptability of all equipment and rigging after each inspection. This system shall specify control of nonconforming lifting equipment. Periodic inspections shall be supplemented with special visual and non-destructive examinations and dynamic load tests prior to handling of items described in Subsection 7.2 of this standard.

7.4.1 Rigging that is frayed, worn or otherwise deteriorated shall not be used.

7.4.2 Hoisting equipment that does not meet manufacturer's specifications shall not be used.

7.4.3 Equipment and rigging shall be kept clean and free of contaminants that are detrimental to the material being handled.

7.4.4 Rigging items such as hooks, shackles, and turnbuckles that appear to have yielded or are distorted shall not be used.

7.5 Personnel

The responsible organization shall determine that the personnel engaged in operating material handling equipment are competent and have demonstrated satisfactory ability in operating similar lifting equipment.

8. RECORDS

Record copies of completed procedures; reports; personnel qualification records; test equipment calibration records; test deviation or exception records; and inspection and examination records shall be prepared as required by this standard. These records shall be placed with other project records as required by code, standard, specification or project procedures.

9. AMERICAN NATIONAL STANDARDS REFERRED TO IN THIS DOCUMENT

When the following standards referred to in this document are superseded by a revision approved by the American National Standards Institute, the revision shall apply:

- N45.2 Quality Assurance Program Requirements for Nuclear Power Plants
- *N45.2.3 Housekeeping During the Construction Phase of Nuclear Power Plants
- *N45.2.6 Qualifications of Quality Assurance Personnel for the Construction Phase of Nuclear Power Plants
- *N45.2.10 Quality Assurance Terms and Definitions
- MH 6.1 Pictorial Markings for Handling of Goods
- B30.2.0 Safety Code for Overhead and Gantry Cranes
- B30.5 Safety Code for Crawler, Locomotive, and Truck Cranes
- B30.6 Safety Code for Derricks
- A10.5 Safety Requirements for Material Hoists

*These standards are being approved by the American National Standards Institute and they should be available early in 1973.

APPENDIX

A3 *PACKAGING

The following are additional minimum requirements to be used with the rules of Section 3. of N45.2.2: "Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants".

A3.3 Cleaning

Specific cleaning procedures are considered to be part of the manufacturing specifications. The following general criteria shall apply:

- (1) The cleaning process including cleaning compounds chosen shall in no way damage the item during cleaning or subsequent service when considering the composition, surface finish, complexity or other inherent features or other interface equipment after installation.
- (2) The cleaning process or processes chosen shall remove loose mill and heat scale, oil, rust, grease, paint, welding fluxes, chalk, abrasives, carbon deposits, coatings used for nondestructive testing processes and other contaminants which would render ineffective the method of preservation and packaging, or other specified requirements.
- (3) Item surfaces after cleaning shall be free of cleaning media, such as aluminum oxide, silica, grit, lint, chemical cleaning residue, petroleum solvent residue, etc.
- (4) After cleaning, the item shall be protected from contamination until preservation or packaging is complete.

A3.4.1 Contact Preservatives. The following criteria shall be used when considering the type of contact preservative to be used.

- (1) The contact preservative shall be compatible with the material on which it is applied.
- (2) Contact preservatives which are nondrying

shall require a neutral-grease-proof protective wrap when packaged.

- (3) The procedure for applying contact preservatives shall not require disassembly of the item nor shall it be necessary to disassemble the item at the site for complete removal. An exception would be for long term storage protection to be agreed upon by the owner, buyer and manufacturer.
- (4) The method of contact preservative removal shall be accomplished with approved solvents and wiping cloths or by flushing internal cavities with solvents which are not deleterious to the item or other interconnecting material. However, preservatives for inaccessible inside surfaces of pumps, valves and pipe for systems containing reactor coolant water shall be indicated to facilitate touch-up.
- (5) The name of the preservative used shall be the water flushable type.
- (6) When motors, pumps, turbines, etc., are shipped with oil reservoirs and bearings cavities filled with preservative oil, the item shall be so tagged and instructions for draining, flushing, refilling and periodic rotation shall be included with the item.
- (7) When it is anticipated that the item might require an extended storage period, six (6) months or longer, a preservative needed for the long term protection of the item shall be applied or arrangements shall be made to periodically reapply the preservatives.

A3.4.2 Inert Gas Blankets. When inert gas blankets are used, the following criteria shall apply:

- (1) Inert gas blankets shall be used only when the exterior shell of the item or its container can be tightly sealed to form a leak-proof barrier.
- (2) Only a commercial grade of dry, oil-free, inert gas shall be used.
- (3) Provisions shall be made for measuring and maintaining the blanket pressure within the required range within each pressurized purged item or container. Closures and seals shall be tightly secured so that the absolute (by mass) pressure after final seal is main-

NOTE: *The paragraph numbers contained herein are not sequential but correspond to the respective paragraph of Section 3 of this standard where they are referenced.

tained for 24 hours without adding gas, prior to shipping the item from the manufacturer's plant.

- (4) The item or container shall be marked in bold letters cautioning that an inert gas blanket has been used. The required pressure range also shall be marked on the item or container.

A3.5.1 Caps and Plugs. Caps and plugs shall conform to the following criteria:

- (1) Nonmetallic plugs and caps shall be brightly colored. Clear plastic closures are not to be used except when specified for a special purpose; for example, as a window for humidity indicator cards. Special attention shall be given in the control of these closures.
- (2) Metallic plugs and caps contacting metal surfaces shall not cause galvanic corrosion at the contact areas. Gasketing or other nonmetallic materials used in conjunction with metallic caps or plugs shall exhibit no corrosive effect on the material.
- (3) Simplicity of installation, inspection, and removal without damage to the item shall be considered.
- (4) Provisions shall be made to preclude the plug or cap from falling into or being pushed into the opening after its installation.
- (5) Plugs or caps shall be secured with tape (see paragraph A3.5.2 of this Appendix) or other means as necessary to prevent accidental removal.
- (6) All plugs and caps shall be clean and free of visible contamination such as, but not limited to dust, dirt, stains, rust, discoloration or scale.
- (7) Plugs and caps used in contact with austenitic stainless steel shall be made from non-halogenated materials or stainless steel.

A3.5.2 Tapes and Adhesives. Tapes and adhesives shall conform to the following criteria:

- (1) When contacting austenitic stainless steel and nickel alloy surfaces:
 - (a) The halogen and sulfur contents of tapes should not be in excess of 0.10% by weight each. Paperbacked (masking) tape shall not be used.
 - (b) Upon removal of tape, all residual adhesive shall be removed by a non-halogenated solvent (acetone, alcohol or equal) wiping.

- (c) Starch, silicone and epoxy type material may be used for tape adhesives.
- (2) When contacting other surfaces and containers:
 - (a) Tapes and adhesives used to seal non-austenitic materials or containers are not subject to the above restrictions.
 - (b) Tape shall be impervious to water and not subject to cracking or drying out if exposed to sunlight, heat or cold.
- (3) Tapes should be brightly colored to preclude their loss into a system.

A3.6.2 Vapor Barrier Material. When maximum vapor protection is required, barrier material shall meet the maximum water vapor transmission rate of 0.05 grams per 100 square inches per 24 hours per ASTM E96 Tests for Water Vapor Transmission Of Materials In Sheet Form, Procedure E and shall be packaged with an approved desiccant. The barrier material should be brightly colored to preclude loss within a system.

A3.6.3 Desiccants. Desiccants shall consist of nondeliquescent, nondusting, chemically inert, dehydrating agents. The following criteria apply when they are used.

- (1) When used with austenitic stainless steels, the desiccant and the bag material shall not have a halogen content over 0.25%. The desiccant bag shall be made of puncture, tear and burst resistant material.
- (2) The reactivation temperature and time shall be marked on the desiccant container.
- (3) Canisters used to contain desiccants shall be placed so as to cause no deleterious effects such as galvanic corrosion, even when the desiccant has reached its absorptive capacity for water vapor.
- (4) Desiccant bags and canisters, when used, shall be secured to prevent movement, rupture of the bags, or damage to the item being protected.
- (5) Water-vaporproof flexible barriers shall be used to seal items containing desiccants. The included air volume within the flexible barrier shall be kept to a minimum.
- (6) Items which contain desiccant shall have all openings securely sealed. When flange connections are a part of the barriers, O-rings or gaskets shall be used with all bolts in place and tightened sufficiently to insure a water-vaporproof seal. Weld end preparations, after capping, shall be covered with a water-vapor proof seal.

- (7) Packages and items containing desiccant shall be marked. The total number of separate bags and/or containers in the package shall be indicated.
- (8) The minimum quantity of desiccant for use in each package shall be determined in accordance with Formula I or Formula II, as applicable.

Formula I: To determine minimum of desiccant for use with other than sealed rigid metal barrier:

$$U = 1.6A \text{ plus } XD.$$

Formula II: To determine minimum units of desiccant for use within sealed rigid metal barrier:

$$U = KV \text{ plus } XD.$$

In the above formulas:

A= Areas of barrier in square feet

U= Number of units* of desiccant to be used

*A desiccant unit is that quantity of desiccant, as received, which will absorb at equilibrium with air at 25 C at least the following quantities of water vapor: 3.00 grams at 20% relative humidity and 6.00 grams at 40% relative humidity.

D= Pounds of dunnage (other than metal) within barrier

K= 0.0007 when volume is given in cubic inches

K= 1.2 when volume is given in cubic feet

V= Volume within barrier in cubic inches or cubic feet

X= 8 for hair felt, cellulosic material (including wood) and other material not categorized below

X= 6 for bound fibers (animal hair, synthetic fiber or vegetable fiber bound with rubber)

X= 2 for glass fiber

X= 0.5 for synthetic foams and rubber

- (9) A humidity indicator shall be included in every water-vaporproof envelope containing desiccant. As applicable, the indicator shall be located behind inspection windows or immediately within the closing edge, face, or cover of the barrier, and as far as practical from the nearest unit of desiccant.

A3.7.1 Fiberboard Boxes. The following criteria apply for fiberboard boxes used as exterior containers:

- (1) Boxes shall be weather-resistant fiberboard preferably from the following grade types (or compliance symbol): V2 s, V3 s, or V3 c. (Federal Specification PPP-B-636.)
- (2) Box style shall be RSC - Regular slotted

box, (Outer flaps meet, inner flaps and outer flaps are of equal length).

- (3) Fiberboard boxes shall be securely closed with a water resistant adhesive applied to the entire area of contact between the flaps. All seams, and joints shall be further sealed with not less than two inch wide, water resistant tape.
- (4) Boxes shall be strapped with pressure-sensitive reinforced tape, length-wise (top, bottom and ends), girthwise (top, bottom and sides) and horizontal sides and ends.
- (5) Wood cleating on fiberboard boxes shall be fabricated from sound, well-seasoned lumber.

A3.8.1 Cushioning. Selection of cushioning materials shall be based on the following:

- (1) It shall exhibit no corrosive effect when in contact with the item being cushioned.
- (2) It shall have low moisture content and exhibit low moisture absorption properties; or if the cushioning material has some moisture absorbing capacity, the item shall be protected with a watervapor-proof barrier.
- (3) It shall have negligible dusting characteristics.
- (4) It shall not readily support combustion.

A3.8.3 Anchoring. When bolts are used for anchoring the following criteria shall apply.

- (1) If precision bolt holes in the item are used for anchoring, precaution shall be taken to insure that properly fitting bolts of the correct dimension and characteristics are used to prevent marring or elongation of the holes.
- (2) Holes bored through containers or mounting bases shall provide a snug fit.
- (3) When mounting items to container bases equipped with skids, bolts shall be extended through the skids whenever practical. In such instances counter-sinking of the bolt in the sliding surface of the skid is necessary.
- (4) Washers shall be used under the nuts to decrease the possibility of the bolt pulling through the wood.
- (5) Nuts shall be properly torqued. To prevent their loosening during shipment, lock nuts, lock washers, cotter pins, or staking shall be employed.

A3.6 Markings:

Items shall be marked to preserve identity in accordance with the following criteria:

- (1) The specified identification shall be stamped, etched, stenciled or otherwise marked on the item or on tags to be affixed securely to the item in plain, unobstructed view. When metal stamps are employed, low stress rounded bottom type stamps shall be used when the item proper is marked. When vibrating marking tools are used they shall be fitted with a carbide marking tip or equivalent and shall be designed to provide a rounded impression not to exceed 0.010 inches in depth. Etching shall not be used on nickel alloys or on weld areas or sensitized areas of stainless steel. Electric arc marking pencils shall not be used.
- (2) The marking shall not be deleterious to the material nor violate any other section of this standard.
- (3) When tags are employed, they shall be of a material which will retain the marking, withstand weathering deterioration, and other normal shipping and handling effects and shall not be detrimental to the item.
- (4) The English language shall be used. Duplicate marking may be made in other languages.
- (5) References to weights shall be in avoirdupois units. Duplicate markings in other systems may also be indicated.

Markings on the outside container shall be in accordance with the following criteria:

- (1) Container markings shall appear on a minimum of two sides of the container, preferably on one side and one end.
- (2) The English language shall be used. Duplicate marking may be made in other lan-

guages or in pictorial markings according to ISO Recommendation R780 Pictorial Markings For Handling of Goods (general symbols) or ANSI MH6.1.

- (3) References to weights shall be in avoirdupois units. Duplicate marking in other systems may also be indicated.
- (4) Container markings shall be applied with waterproof ink or paint in characters no less than 3/4 inch high, container size permitting.
- (5) Where tags or labels are used, they shall be affixed to the container using a waterproof adhesive, tacks where practical, or a corrosion resistant wire.
- (6) Container marking shall include the following information:
 - (a) Destination
 - (b) Return address
 - (c) Package numbers showing the purchase order number, followed by the package number and the total number of packages.
 - (d) Material identification number
 - (e) Handling instructions -- Fragile, Center of Gravity, Keep Dry, This Side Up, Sling Here, Do Not Freeze, stacking limitations as appropriate.
 - (f) Weight of package (in excess of 100 pounds).
 - (g) Special Instructions. Desiccant Inside, Special Inspection, Storage, Unpacking Restrictions, etc. as appropriate.

Marking of items not within a container, such as pipe, tanks and heat exchangers, shall exhibit specified information in a location which is in plain unobstructed view, but not directly applied to bare austenitic stainless steel and nickel alloy metal surfaces of the item.

ANSI N45.2.3(a) - 1978

ADDENDA

TO

ANSI N45.2.3-1973 (R 1978)

Housekeeping During the Construction Phase of Nuclear Power Plants

Revise paragraph 3.2.3 to read:

Fire Protection and Prevention. Equipment and instructions for the protection from, and prevention of, damage by fire shall be provided in accordance with the requirements of the NFPA National Fire Code. Procedures or instructions for fire protection shall include provisions for fighting fires involving the use of available community fire departments, trained project brigades, and others. Procedures or instructions shall include plans for provision of water supplies, hydrants, automatic sprinklers, access for fire fighting, and distribution of extinguishers and fire fighting equipment. Fire surveillance during and immediately following operations such as welding and heat treating shall be provided when materials are located such that flames, flying sparks, weld spatter, or excessive heat resulting from the operation could cause combustion with resulting damage to items of the nuclear plant. Fire protection facilities shall be in service beginning with the initial stages of permanent construction. Pre-fire planning shall be conducted as a requirement of the fire protection procedures or instructions which shall include evacuation of confined areas.

**THIS STANDARD, INCLUDING THE ABOVE ADDENDA, WAS REAFFIRMED
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