

DEVELOPING AN ANSI STANDARD FOR SEMITRAILERS USED TO TRANSPORT RADIOACTIVE MATERIALS*

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ABSTRACT

A proposed new American National Standards Institute (ANSI) standard has been prepared which establishes requirements for the design, fabrication, and maintenance of semitrailers used in the highway transport of weight-concentrated radioactive loads. A weight-concentrated load is any payload which exceeds 1,488 kilograms per lineal meter (1,000 lb/ft) over any portion of the semitrailer. The proposed standard also provides detailed procedures for in-service inspections, as well as requirements for testing and quality assurance. The standard addresses only semitrailers, excluding the tractor. Trailers already in service may be certified as complying with the standard if they meet the requirements of the standard. This standard is intended to provide guidance and acceptance criteria needed to establish a uniform minimum level of performance for the designer, manufacturer, owner, operator, and shipper. This standard is not intended to apply to special, non-routine shipments of a one-time or occasional nature which require special permitting. The background and history of the standard are traced and a summary discussion of the standard is provided in this article.

INTRODUCTION

The origin of the ANSI N14.30, Proposed American National Standard for the Design, Fabrication and Maintenance of Semitrailers Employed in the Transport of Weight-Concentrated Radioactive Loads, hereafter called N14.30, may be traced to a review of the ANSI N14.2 Proposed Standard for Tiedowns to Trucks. In October 1986, Mr. R. H. Towell, a staff engineer at the I.E. DuPont Nemours and Company, wrote a letter to the ANSI N14 Management Committee recommending that a new standard be developed for the selection of vehicles (semitrailers) for transporting radioactive packages. In his letter Mr. Towell observed that "little is accomplished by a good tiedown if the truck (semitrailer) is inadequate for the load."

The ANSI N14 Management Committee responded at its annual meeting by approving the development of this standard. Mr. Mathew Kosmider, Allied Signal, Metropolis, IL, was named the first chairman of the N14.30 Writing Group. The writing group's first task was to prepare a survey, in the form of a "Questionnaire Concerning (the proposed) Nuclear Standard/Project Initiation

Notice and Data Sheet," which was sent to a cross section of individuals representing utilities, government agencies, universities, and private industry. The recipients were chosen because of their involvement in the field of transporting radioactive materials either as consultants, designers, manufacturers, regulators or shippers. When the results of the survey were tabulated it was apparent that a

standard was needed and the writing group was authorized to proceed. Responses to the survey questions are presented below.

QUESTIONNAIRE RESULTS

1. Do you know of any conflicts or overlaps among this project and other current projects, existing standards or organizational scopes?
Yes--2
No--31
- 2a. What is your opinion of the need for this standard?
Definitely not needed-- 0
Not needed --2
May be needed--8
Needed --11
Very much needed--8
No opinion --6
- 2b. What is your opinion of the impact of this standard on that segment of the industry to which it is directed?

* Work supported by the U.S. Department of Energy Assistant Secretary for Defense Programs, Office of Defense Waste and Transportation Management, under DOE Contract No. DE-AC04-86AL31950

Highly detrimental--0

Detrimental--3

No impact--2

Beneficial--16

Highly beneficial--7

No opinion --7

2c. What is your opinion of the use that will be made of this standard?

No use will be made --0

Used by few organizations--14

Used by many organizations--11

No opinion--8

3. Identify any material interests not represented on the standards writing committee that you believe should be represented.

I know of no additional representation that is needed--29

The following additional representation is needed--4

(Electric Utilities and Nuclear Waste Transportation)

4. Identify any additional organizations with which you think this project should be coordinated.

I know of no additional coordination that is required--24

Coordination should be established with the following additional organizations--9

(Electric Utilities and Nuclear Waste Transportation)

5. Please state below any additional or expanded comments you wish to offer (identify expanded comments with the applicable question number). -- Eleven respondents' comments ranged from concerns for the capital cost of equipment to the need for a standard covering all highway shipments.

Mr. Kosmider was reassigned and Mr. Dan Huffman was named his successor as chairman of the writing group. Mr. Huffman wrote a preliminary draft N14.30 in April 1988, which was used as a "strawman" for the first review by the writing group. Over the next 18 months the writing group held three working meetings, wrote numerous letters and made countless phone calls related to the issues which surfaced during the review and comments of progressive drafts. Finally, most of the issues had been satisfactorily resolved and the proposed standard was submitted to the writing group for a ballot. Many of the votes were cast as a "conditional" yes or no, which required additional clarification or resolution of issues by the chairman. The final tally was Yes - 15, No - 1, No Vote - 4. The writing group sent N14.30 to Mr. John Arendt, chairman, on October 30, 1989,

for a vote of the full ANSI N14 Committee. N14.30 could become an approved standard in 1990.

**SUMMARY OF ANSI N14.30
PROPOSED AMERICAN NATIONAL
STANDARD FOR THE DESIGN, FABRICATION
AND MAINTENANCE OF SEMITRAILERS
EMPLOYED IN THE TRANSPORT OF WEIGHT-CON-
CENTRATED RADIOACTIVE LOADS**

Scope and Purpose

The scope is to establish design, fabrication and maintenance requirements for the highway transport of weight concentrated (greater than 1,488 kilograms per lineal meter) radioactive loads. The purpose is to provide guidance and pertinent acceptance criteria needed for establishing uniformity of performance applied to semitrailers used to transport radioactive loads on a routine basis. The effective date is twelve months after approval by ANSI.

Related Standards and Publications

The following standards and publications are referenced:

ANSI-N14.1-1987: Packaging of Uranium Hexafluoride for Transport

ANSI-N14.27-1986: Carrier and Shipper Responsibilities and Emergency Response Procedures for Highway Accidents Involving Truckload Quantities of Radioactive Materials

ANSI/AWS D1.1-1988: Structural Welding Code, Steel

ANSI/AWS D1.2-1988: Structural Welding Code, Aluminum

Transport Trailer Manufacturers Association (TTMA) Practices and Manuals

North American Standard Commercial Vehicle Inspection Guide

How to Weld USS T1 Construction Alloy Steels

Australian Road Research Board Report No. ARR-N.116

Title 49 CFR (selected related parts)

University of Michigan Transportation Research Institute (UMTRI) Report on the Influence of Size and Weight Variables on Roll Stability of Heavy Trucks (semitrailers)

Definitions, Acronyms, and Chemical Symbols

Approximately forty words and phrases common to the semitrailer industry (e.g., "bogie," "dead load," and "live

load") are defined in the standard. Twelve acronyms and chemical symbols used in the standard are defined.

Design

Design parameters are provided for environment, speed, and terrain. The center of gravity must be less than 120% of the center-to-center width between tires. Trailers must be capable of traveling at posted highway speed unless noted. Structural members shall be designed with a 2.5 safety factor without exceeding yield. The upper coupler and suspension shall not be less than the capacity rated by the manufacturer. Failure due to cyclical loading shall be considered for local buckling and weld fatigue. Welds shall be prepared, cleaned, and made in accordance with approved procedures. Materials of construction shall be those which are recognized by the semitrailer industry as being acceptable for their intended use. The suspension may be either air-ride or conventional springs. Axles shall be rated by their manufacturer for the application. Brakes shall be in compliance with 49 CFR 571.116 and 121. The landing gear shall be equipped with sand shoes. The manufacturer shall comply with the applicable sections of 49 CFR and the TTMA. The designer shall identify all critical structural members and welds.

Fabrication

Semitrailer components (excluding structural members and tiedown devices) shall be commercially available and will meet the design criteria previously outlined. Fabrication shall be according to print and specifications; using certified welding procedures as defined by the American Welding Society (AWS). The entire fabrication process shall be documented by the manufacturer and be made available at the time of certification.

Testing and Inspection

All component parts (including structural members) shall be inspected to ensure compliance with the design and fabrication specifications. After any deficiencies have been corrected the semitrailer shall be static load tested at two times the heaviest live design load for two hours and the semitrailer re-inspected after the load is removed. A dynamic load road test shall be performed using the maximum live design load over a course that is not less than ten miles in length and includes starts, stops, lane changes, on/off ramp curves and corners. After the road test the load shall be removed and the semitrailer inspected again. As a minimum the NDE examination shall include the following:

- Visual inspection of structural members for cracks, wear, and deformation
- Visual inspection of 5th wheel upper coupler for deformation and dye-penetrant inspection of joining welds

- Magnetic particle or dye-penetrant inspection of welds joining primary structural and secondary members
- Dye penetrant and visual inspection of welds joining suspension to structural members
- All inspections prior to painting
- Acceptance criteria for weld inspections per ANSI/AWS
- The acceptance criteria shall conform to the design. All inspections shall be performed by or witnessed by personnel qualified for the methods being used.

Certification

The manufacturer shall certify to the first owner in writing that the semitrailer meets the criteria and requirements of ANSI N14.30. The certification process shall include, as a minimum, the following:

- Verification that the welders, procedures, and inspectors are/were qualified
- An examination of mill test certificates for the materials of construction as required by the design specification
- A review of all drawings, specifications, procedures, and acceptance criteria
- A review of design calculations
- Verification that component parts comply with the applicable requirements
- A review of the static and dynamic load tests
- Verification that the trailer meets DOT requirements

An identification plate shall be attached to the semitrailer. It is the responsibility of the shipper to verify that the trailer is currently certified to ANSI 14.30 prior to use. Documents shall be retained by the fabricator and copies of documents shall be retained by the owner for the service life of the semitrailer. Manufacturers may decide how multiple trailers of the same design are to be certified.

Maintenance, In-Service Inspections, and Repairs

The federally-mandated regulations are discussed and the responsibilities for maintenance are detailed. The manufacturer is responsible for describing the maintenance requirements for the particular individual semitrailer, and the requirements are supplemented by guidance based on the TTMA recommendations. Covered areas include Preventative Maintenance, Level 1 Inspection, Level 2 Inspection, Post Trip Inspection, Documentation, Inspection Scheduling, Recertification at 500,000 miles, and Semi-

trailer Service Life (which is ten years or 1,000,000 miles, whichever comes first).

Quality Assurance Program

The quality assurance (QA) requirements were based on the pertinent sections of several QA programs. Originally there was strong sentiment for invoking the applicable sections of ANSI/ASME NQA-1. It was pointed out that this could result in a prohibitive cost of semitrailers. Various military specifications were explored and ultimately rejected because of the problem of linkage to applicable documents. Finally, a compromise was reached by using the "good words" from NQA-1 and MIL-I-45208A. The QA program for N14.30 is intended to provide assurance that those activities which are important to satisfactory performance in service and safety will be done correctly. The QA requirements are separated into the following sections: 1) Definitions; 2) Program; 3) Organization; 4) Design; 5) Documents; 6) Inspection and Testing; 7) Measuring and Test Equipment; 8) Special Processes; 9) Inspection Status; 10) Nonconforming Material; 11) Corrective Action; 12) Records; 13) Training; and 14) Audits.

Trailers Not Manufactured to this Standard

Semitrailers not manufactured according to N14.30 may be certified under N14.30 by meeting the intent, requirements, and guidelines of Sections 4 through 6. Provisions are provided for those existing trailers which may not have specific information required for new trailers. Certifiers are required to be a licensed professional engineer experienced in semitrailer manufacture and/or repair. Once an existing semitrailer has been certified to N14.30, all of the other requirements of N14.30 shall be adhered to.

Appendixes

A. Examples of Weight Concentrated Loads

B. Sample Structural Load Calculation

C. Sample ANSI Identification Plate

D. Sample Trip Preventative Maintenance Safety Inspection Form

E. Sample "GO/NO GO Gauge

F. Sample Level 1 Preventative Maintenance Inspection Form

G. Sample Trailer Inspection Due Date Panel

H. Sample level 2 Preventative Maintenance Inspection Form

I. Sample Terminal Preventative Maintenance Control Record Form

CONCLUSION

The need for a uniform national standard to establish requirements for semitrailers used to transport radioactive materials is obvious, because of the public perceptions of nuclear industry activities and programs. ANSI has responded to this need by developing a new standard for designers, manufacturers, and users of semitrailers. This standard was prepared through the involvement of individuals representing a cross section of private industry, public utilities, and government agencies. If ANSI had not come forward with this standard it is likely that another standard would have been forced upon the nuclear industry, with very little input from those most affected. The eventual adoption of this standard will add to public confidence and should further improve the safety record of the nuclear industry in the United States.