CONSOLIDATED APPLICATION FOR RENEWAL
OF
CERTIFICATE OF COMPLIANCE
FOR
MODEL NO.: NFS URANYL NITRATE TANK TRAILER

Certificate No. 5059

Package Identification No.: USA/5059/AF

Submitted By: Nuclear Fuel Services, Inc.
P. O. Box 218
Erwin, TN 37650

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1.0 GENERAL INFORMATION

1.1 Introduction

This document represents a consolidated application for renewal of Certificate of Compliance No. 5059 for the Model No. Uranyl Nitrate Tank Trailer. The package is used for the shipment of Uranyl Nitrate Hexahydrate Solution. The package is shipped Fissile Class III and only one package is permitted per shipment.

The applicable portions of the format described in Regulatory Guide 7.9 "Standard Format and Content of Part 71 Applications for Approval of Packaging of Type B, Large Quantity, and Fissile Radioactive Material", will be followed in this application.

1.2 Package Description

1.2.1 Packaging

The weight of the tank trailer is 14,000 pounds and it will carry up to 45,600 pounds of solution. The tank trailer is constructed in accordance with DOT specifications MC-310, MC-311, or MC-312. The 3,600 gallon insulated tank is of all welded construction. The tank which is the containment vessel is 3/16 inch type 304 L stainless steel. All welds are 100% X-rayed. The tank has no bottom outlets. The loading port is located on the top rear of the tank, and no other access to the tank is provided. The tank is designed for operation at 35 PSIG. The normal pressure in transit will be essentially atmospheric. Section 1.3 Appendix contains sketches of the tank.

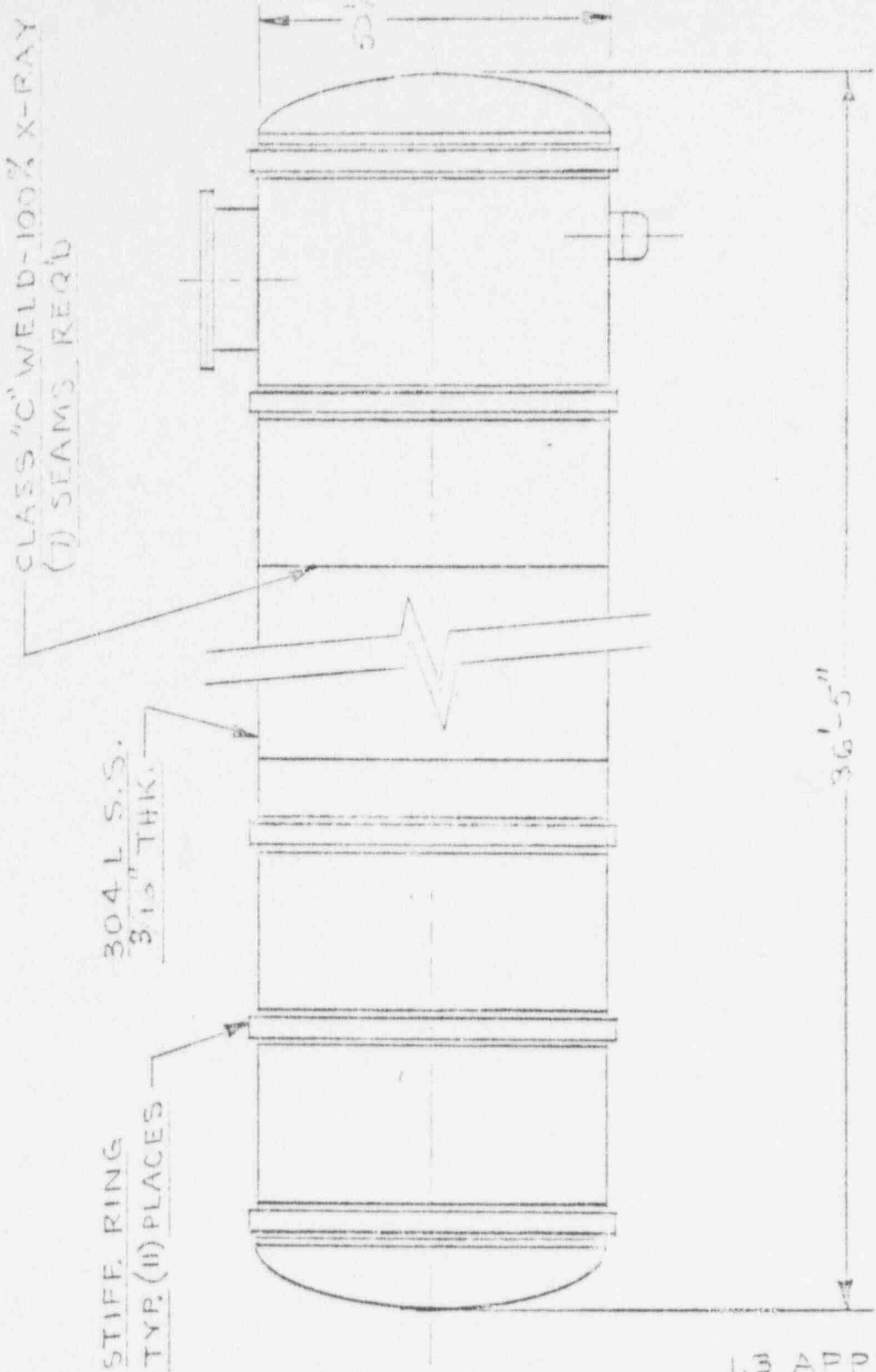
1.2.2 Operational Features

Water tight retainer pans have been provided underneath the full length of the tank to collect leakage that could occur under normal use. A spill box is provided to contain leakage into the access port during loading or unloading.

1.2.3 Contents of Packaging

The package will contain Uranyl Nitrate in dilute acid solution. The maximum U-235 enrichment in the uranium will not exceed 20% by weight. The U-235 content of the solution shall not exceed 10 grams per liter. Since the Uranyl Nitrate is the final product of a facility which recovers unirrdiated low enriched uranium, no other isotopes are present in significant quantities.

The total uranium content shall not exceed 357 grams per liter. The nitric acid concentration will normally be 1.0M or less.



1.3 APPENDIX A

BY	DATE	REVISIONS	LET.

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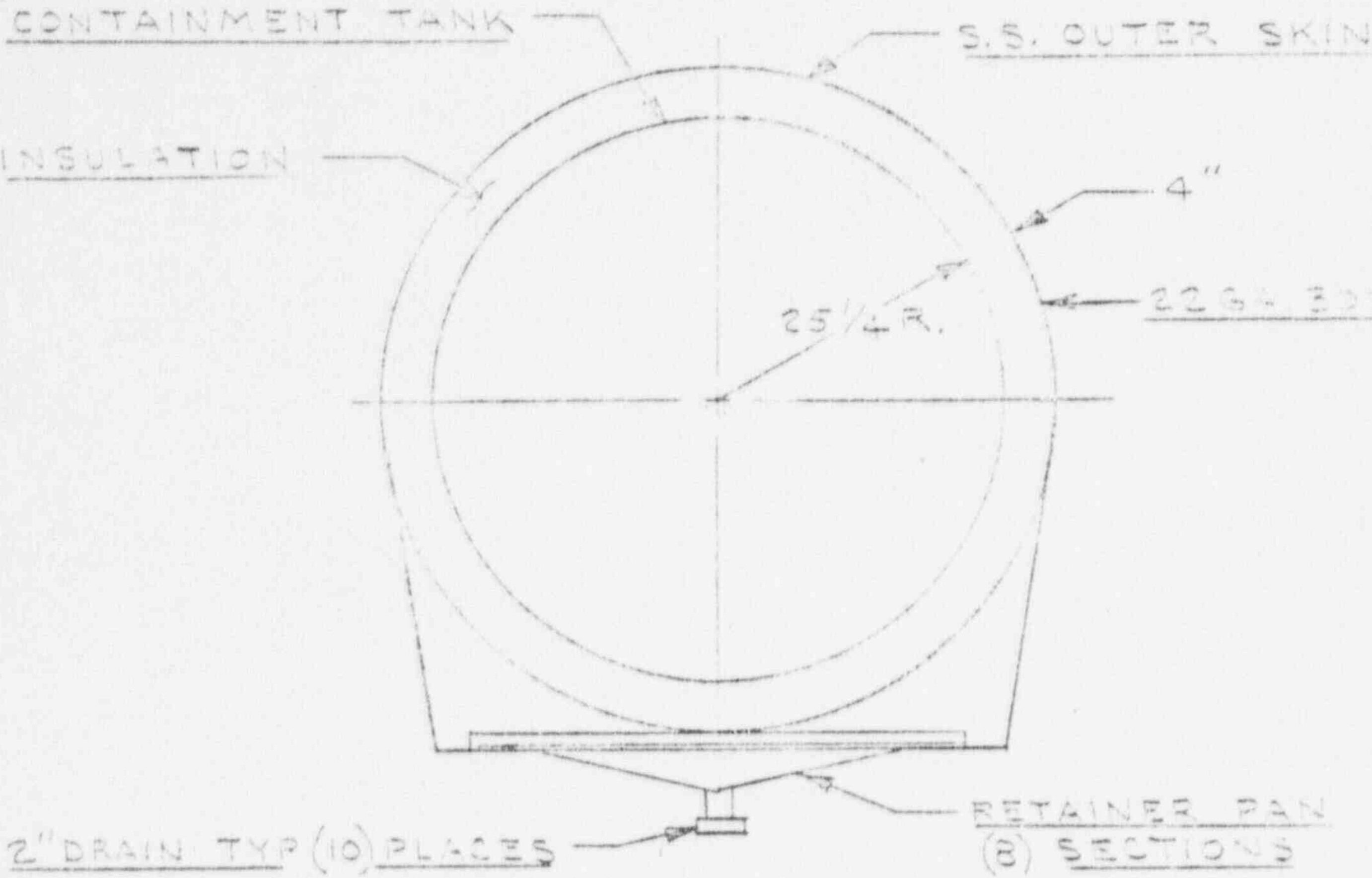
NUCLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

NAME: CONTAINMENT TANK
[illegible] URANYL NITRATE [illegible]

MADE BY	SCALE [illegible]	DATE [illegible]
TRACED BY		
CHECKED BY		
APPROVED BY	DRAWING NO. [illegible]	



1.3 APPENDIX B

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NUCLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

NAME: TANKER-CROSS SECTION

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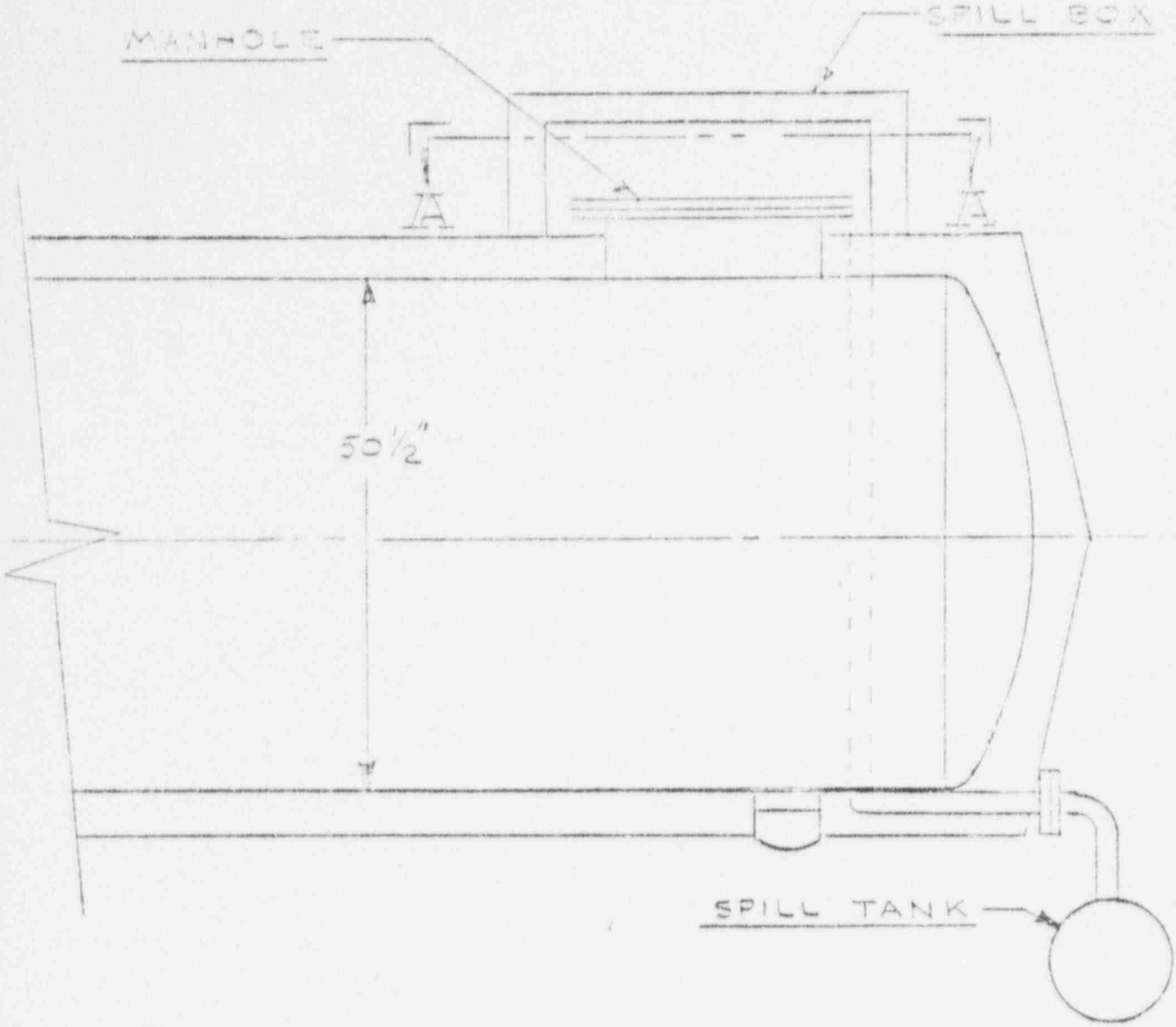
APPROVED BY
SCALE
DATE
DRAWING NO. RMG-779-A



FOR SECTION A-A SEE SHEET 2

1.3 APPENDIX C

BY	DATE	REVISIONS	LET.

NUCLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

NAME: LOADING PORT & SPILL BOX
NFS URANYL NITRATE TANK TRAILER

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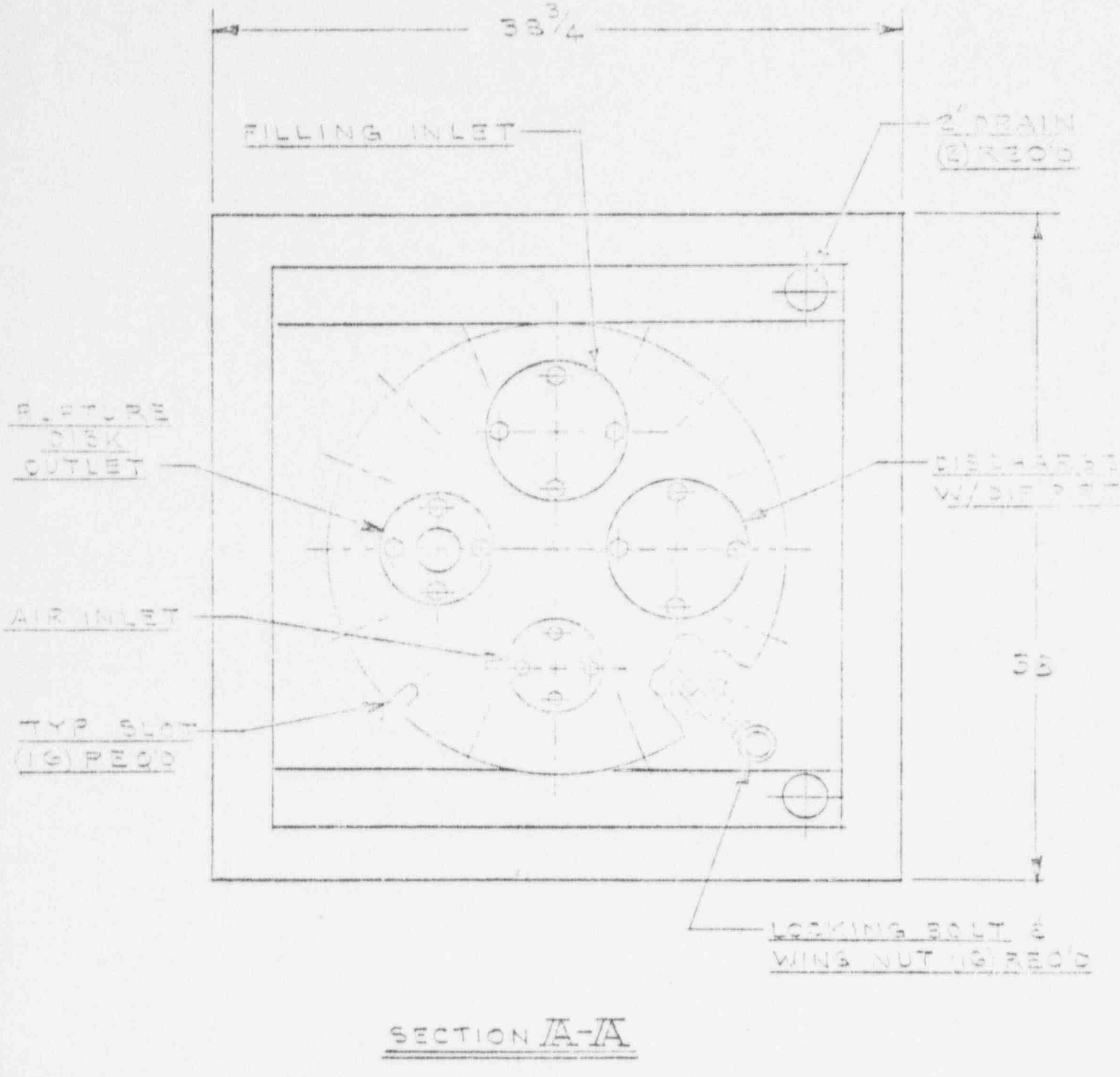
APPROVED BY

SCALE [illegible] DATE [illegible]

DRAWING NO. [illegible]

SHEET 1 OF 2



1.3 APPENDIX C

BY	DATE	REVISIONS	LET.

NUCLEAR FUEL SERVICES, INC.

ERWIN, TENNESSEE

NAME

MADE BY

SCALE

DATE

TRACED BY

CHECKED BY

APPROVED BY

DRAWING NO.

2.0 STRUCTURAL EVALUATION

2.1 Structural Design

2.1.1 Discussion

The tank trailer meets or exceeds the requirement of DOT specification MC-312. Modifications described in 1.2.1 were made in an effort to prevent and control leakage from the tank.

2.1.2 Design Criteria

The tank meets or exceeds the design criteria for DOE specification MC-312 (49 CFR 178.343), cargo tanks. The presence of low enriched uranium does not add any physical or chemical properties to the solution that would require upgrading of these design criteria.

2.2 Weights and Centers of Gravity

Because of the cylindrical shape of the tank, the center of gravity for both a full or empty tank will be the same as the geometric center of the tank. The additional weight of the access port, spill tank and retainer pans do not significantly change the center of gravity. Partial loads, of course, have the effect of lowering the center of gravity. The weights of the tank trailer and contents are given in Section 1.2.1.

2.3 Mechanical Properties of Material

The tank is entirely constructed of type 304 L austenitic stainless steel. In accordance with Specification MC-312, the steel thickness is more than adequate to handle the weight of the uranyl nitrate solution.

2.4 General Standards for all Packages

2.4.1 Chemical and Galvanic Reactions

The 304 stainless steel is more than adequate to withstand the corrosiveness of the nitric acid concentrations present in the Uranyl Nitrate solution. No galvanic or other reactions occur between the tank and the contents.

2.4.2 Positive Closure

The cover assembly is shown in Appendix 1.3. The main cover is held in position by 16 locking bolts. Three small inlets on the main cover, as well as the rupture disc are closed by flanges with 4 bolts to each flange. The main cover is protected on top and all four sides by a stainless steel double walled insulated enclosure which is provided for padlocking.

2.4.3 Lifting Devices

No lifting devices are utilized.

2.4.4 Tiedown Devices

No tiedown devices are utilized. The tank is fixed to the trailer in accordance with specification MC312 requirements.

2.5 Standards for Packaging

Current DOT regulations authorize the shipments of radioactive liquids of specification MC-310, MC-311, MC-312 or MC-331 cargo tanks where the radioactivity concentration does not exceed 10% of Low Specific Activity (LSA) levels. (173.392). The DOT regulations further exempt these cargo tanks from the general requirements for type A packaging (173.393). The contents described in this application can not be shipped in accordance with the requirements because they are classified as fissile material. This application then will demonstrate that the fissile property of the material can be adequately dealt with both under normal and accident conditions.

2.6 Normal Conditions of Transport

The effect that normal conditions of transport have on the nuclear criticality safety of the tank trailer will be examined in this section.

2.6.1 Heat

Heating of the solution in the tanker could cause evaporation of the solution and result in increasing the fissile concentration. Because the trailer is insulated, heat from normal transport has little or no effect on the concentration. The conclusion is made from the results of the calculations in Section 2.7 dealing with the effects of heat under hypothetical accident conditions.

2.6.2 Cold

The normal effect of cold weather poses the only threat to the criticality safety of the tanker. These effects can be easily dealt with. Under certain conditions of uranium concentration, acid concentration, and temperature, it is possible for the uranyl nitrate to crystalize and precipitate.

The effectiveness of the tank insulation as a preventative measure against the solution freezing under cold weather conditions encountered in transport was evaluated. The freezing point of the $UO_2(NO_3)_2 \cdot 6H_2O$ water solution in the concentration range of solution to be shipped varies from $0^{\circ}C$ for very low concentrations to $-15^{\circ}C$ at 20% UNH. These values were taken from Figure 4.7, p. 117, Reactor Handbook, 2nd edition, Volume II, Stoller and Richards. The freezing temperature is further depressed in this concentration range by the presence of HNO_3

up to 0.8M. Above this acid concentration, the freezing point of the highest UNH solution concentration increases from -21°C and reaches 0°C at 2.0M HNO_3. This is shown in Figure 4.8, p. 117 of the Reactor Handbook.

No solution will be shipped that has a combination of UNH, HNO_3 and water resulting in a freezing point higher than 0°C.

The package which consists of stainless steel and glass wool suffers no loss of effectiveness when exposed to temperatures as low as - 45°F, which is twice as severe as the lowest temperatures recorded in the Southeast. A temperature of -22°F was selected as the minimum average day and night temperature that could occur over a four-day period. In practice, solution will not be packaged for shipment when temperatures are below 0°F.

A maximum period of four days of severe weather exposure was selected on the basis that two days is the normal travel time to the farthest destination known at present thus allowing for considerable delay enroute.

A thermowell is provided near the bottom of the tank so that the driver can measure the solution temperature daily if a delay occurs during cold weather. The driver is given written instructions to lay over in a heated garage when the solution temperatures get down to 32°F. He is instructed to lay over until the solution temperature reaches 40°F or until the daytime outside temperature is 32°F or higher.

Under the above conditions, with product loaded at 68°F into the tank which has a minimum of four inches of glass wool insulation as specified, the decrease in solution temperature was determined to be 10°F in four days. This computation is shown in Section 2.9, Appendix A. The large safety factor provided by the insulation is to allow for safe shipment of less than full tanks of solution. As little as 1,300 gallons (1/2 tank) of solution can be safely shipped under the severe weather conditions encountered.

It can be noted that solution can be safely transported at average temperatures as low as -22°F without fear of freezing when controlled as specified in this section.

2.6.3 Other Conditions

At worst, the other applicable normal conditions of transport could result in some leakage from the tanker. Although this leakage would not result in a criticality, it would of course create a contamination problem. The following precautions have been taken to minimize the possibility of such an occurance:

a. The tank wall has been increased in thickness from 10 gauge required by MC-312 specifications to 3/16 inch.

b. The tank and connections are of all welded construction.

c. All tank welds are to be 100% X-rayed.

d. The tank has no bottom outlets.

e. The tank is designed for operation at 35 psig, whereas, the pressure in transit will be essentially atmospheric.

f. The tank is to be tested in accordance with MC-312 and ASME Specifications including a hydrostatic test at 55 psig.

g. The tank will be retested as in (f) after each two years of service instead of every five years as specified in the DOT Regulations.

h. All tank outlets will be securely closed with teflon gaskets and blind flanges while in transit.

i. In the event the tank were to develop a leak, it would probably start as a small leak through a weld. Water-tight retainer pans have been provided underneath the full length of the tank to collect such leakage. There is a capped, drainage and inspection nozzle in the bottom of each pan. These are to be removed and inspected for leakage after each use of the tank. If solution is found, indicating a leak in the tank, the tank trailer will not be reused until it has been repaired and successfully tested as in (f) above.

2.7 Hypothetical Accident Conditions

The only hypothetical accident condition that could possibly result in criticality is heating and evaporation of the solution, thus increasing its uranium concentration. This is examined in this section.

2.7.1 Thermal

The effect of an accident in which the entire 38 feet of tank were exposed to 1475°F for 30 minutes was evaluated. In making this evaluation, it was assumed for conservatism that the external stainless steel wrapper was at 1475°F for the entire period and that heat flow was by conduction. The increase in solution temperature was found to be an insignificant 1°F. This computation is found in section 2.9 Appendix B. Since the lowest boiling temperature of any solution to be shipped is 212°F, it can be stated that an increase in the U-235 concentration by evaporation to the concentration required for a fission reaction to occur under any conditions encountered in transport is not credible. It is recognized that the stainless steel exterior wrapper would probably suffer some distortion from exposure to the 1475°F fire and that the outer surface of the glass wool insulation would lose its effectiveness as insulation during the course of the fire. The glass reacnes the softening point at about 1200°F.

2.7.2 Other Conditions

The other applicable accident conditions were examined to determine if any could result in criticality. This examination resulted in all cases to show that the possibility of criticality is reduced since the fissile concentration rather than increasing remains the same or decreases.

2.8 Special Form

The special form classification is not claimed for the contents of the tank trailer.

2.9 Appendix A

Determination of insulation effectiveness in the prevention of solution crystallization at low temperature in air.

Data:

Tank diameter D = 4 feet

Time exposed 96 hours

Average outside temperatuer $t_o = -22^oF$

Solution temperature initial $t_1 = 68_oF$

Heat transf[illegible] rate of insulation k = 0.024 (BTU)/(hr.)(ft.^{2})(^{o}F)/ft.

Insulation thickness L = 0.33 ft.

Surface area for 1 ft. section = A = D = 12.5 ft.^{2}

Solution weight (W) at sp. gr. of 1 = 780 lbs.

Solution sp. ht. (C_p) = 1
(Reasonably accurate so long as sp. gr. assumed to be that of water for the various concentrations.)

Computations:

Heat transferred = $q = \frac{kA}{L} \Delta t$

$q = \frac{0.024 \times 12.5}{0.33} \Delta t$

$= 0.91 \Delta t$

$\Delta t = t_1 - t_o$

$= 68 - (-22) = 90^oF$
This assumption is conservative since t_1 will decrease

Total q = 0.91 x 90 x 96 = 7,850 BTU

$q = W C_p \Delta t_i$

$\Delta t_i = 10^oF$

Final solution temperature = 68 - 10 = 58^oF

Solution freezing point = $\underline{32^oF}$

2.9 Appendix B

Determination of temperature increase in uranyl nitrate solution in tank exposed to 1,475°F radiant heat for 30 minutes.

Data:

Tank diameter D = 4 feet

Specific heat of solution $C_p = 1$
(Reasonably accurate for the concentrations of interest when specific gravity is assumed not to change.)

Insulation thickness L = 0.33 feet

Thermal conductivity of insulation = 0.024 BTU/(hr.)(ft.^{2})(^{o}F)/ft.

Solution temperature, initial $t_i = 100^{o}F$

Outside temperature $t_o = 1,475^{o}F$

Surface heated $A = \pi D \times 1 = 12.5$ ft.^{2}
(Since cylinder is long - about 38 feet - end effects are ignored and analysis is made of 1 foot wide section.)

Solution weight W at sp. gr. of water = $\frac{\pi D2}{4} \times 62.4 = 780$ lbs.

Computation:

Heat transferred q (assuming conductivity is controlling)

$= \frac{kA}{L} \Delta t$

$= \frac{0.024 \times 12.5}{0.33} \Delta t$

$= 0.91 \Delta t$ BTU/hr.

$\Delta t = t_o - t_i$

$= 1,475 - 100 = 1,375^{o}F$
Assumes no increase in T_i

Total q = 0.5 x 0.91 x 1,375

= 625 BTU during the period of the test

$\Delta t_s = \frac{q}{WC_p}$

$$= \frac{625}{780 \times 1} \, ^oF = 1^oF$$

Final solution temperatures = 100 + 1
= $\underline{101^oF}$

Solution boiling temperature = $\underline{\underline{212^oF}}$

3.0 THERMAL EVALUATION

Because of the possible effects that cold from normal transport conditions and heat from accident conditions have on the nuclear criticality safety of the contents of the package, four inches of insulation is provided for the tank. This protection minimizes these effects.

Because no internal heat is generated from the contents, the tanker trailer does not utilize any cooling systems, expansion tanks, etc.

4.0 CONTAINMENT

This chapter identifies and discusses the package containment.

4.1 Containment Boundary

The containment boundary claimed for the package is the tank shown in Section 1.3 Appendix A.

4.1.1 Containment Vessel

The containment tank is constructed of Type 304L stainless steel. No heat treatment is required. Head and tank wall thickness is 3/16 inch. Materials of construction shall comply with NFS Materials of Construction Standard Engineering Specifications (Section 4.4, Appendix A).

The tank is of all welded construction and contains no baffles.

4.1.2 Containment Penetrations

A 20" diameter manhole is the main penetration in the containment tank. The manhole is located at the rear top of the tank and contains four flanges as follows:

a. 3" filling flange

b. 3" unloading flange with removeable 2" dip tube.

c. A standard 40 pound rupture disk outlet.

d. 1 1/2" flange nozzle for air supply and relief.

All nozzles are furnished with envelope type teflon gaskets and type 304 stainless steel blind flanges.

The manhole cover is secured by swing bolts and wing nuts through which a chain may be run and padlocked to prevent unauthorized access to the tank or connections.

The manhole is protected by an insulated stainless steel spill box. Any leakage into the spill box drains into the spill tank as shown in Section 1.3, Appendix C.

4.1.3 Seals and Welds

All seals are made with envelope type teflon gaskets and type 304 stainless steel blind flanges.

Tank welds are 100% X-rayed, and the tank is hydrostatically tested for leaks in accordance with the ASME Specification, as required by NFS Process Equipment Standards Engineering Specification; Fabrication Requirements for Authentic Stainless Steel Tanks. (Section 4.4, Appendix B).

4.1.4 Closure

The closure devices for the tank are the manhole cover flanges described in Section 4.1.2.

4.2 Requirements for Normal Conditions of Transport

The tank trailer is exempt from these requirements.

4.3 Requirements for Hypothetical Accident Conditions

The tank trailer is exempt from these requirements.

Rev. 0
March 27, 1981

4.4 Appendix A
Nuclear Fuel Services, Inc.

Materials of Construction
Standard Engineering Specification

1. SCOPE

1.1 This Specification covers wrought austenitic stainless steel for use in corrosive services where intergranular corrosion can occur.

1.2 Where clad materials are involved, it is the intent of this Specification that the alloy-clad material shall meet the requirements for this grade as specified.

2. COMPOSITION

2.1 The chemical composition of the alloy covered in this Specification shall conform to the following analyses:

Type: 304L austenitic stainless steel

Chemical Composition (Percent)

Carbon (max.)	0.03
Chromium (min.)	18.0
Nickel (min.)	8.0
Manganese (max.)	2.00
Silicon (max.)	1.00
Sulfur (max.)	0.03
Phosphorus (max.)	0.04

2.2 Chemical analyses of all material purchased shall be supplied.

3. HEAT TREATMENT - Not Required

4. SURFACE FINISH

4.1 All material shall be cleaned of its heat-treatment scale or other foreign surface contamination by sandblasting, salt bath cleaning followed by pickling, or by pickling alone. It is important that the pickling be the final step in cleaning and that the pickling acid be thoroughly washed from the surface of the steel with clean water. Any of the commercially used pickling solutions (except hydrochloric acid or other chlorides) capable of dissolving free iron or iron oxide may be used. The surface shall not be pitted or intergranularly attacked to a degree that would be considered harmful.

5. TOLERANCES

5.1 Plate, sheet, strip, and bar furnished to this Specification shall meet the requirements for variations in dimensions and workmanship listed in the Steel Products Manual, Section 24 (published by American Iron and Steel Institutes, 350 Fifth Avenue, New York 1, New York).

6. INSPECTION

6.1 Inspection, unless specifically waived, shall be made by a NFS representative prior to shipment. Notice shall be given at least 48 hours in advance of the availability of material in order to provide for inspection scheduling and prompt release.

4.4 Appendix B
Nuclear Fuel Services, Inc.

Process Equipment
Standard Engineering Specification

Fabrication Requirements for
Austenitic Stainless Steel Tanks

1. SCOPE

1.1 This Specification covers fabrication and inspection of equipment built of the 300 Series austenitic stainless steel. It is a supplement to the drawings and other specifications included in the order.

2. FABRICATOR'S DRAWINGS

2.1 Fabricator shall submit drawings as specified on other attachments made a part of the order.

2.2 Drawings submitted must be in sufficient detail to show clearly materials of construction, typical weld details, dimensions, tolerances, NFS order number and gasket specifications, weight empty and weight full of water, and other information necessary for checking against all specifications prior to approval. In addition, drawings of pressure vessels will show the design temperature, design pressure, and the test pressure.

2.3 NFS approval of fabricator's drawings does not relieve the fabricator of the responsibility for Code compliance and the intent of this Specification.

3. MATERIALS

3.1 Material by the Fabricator. When the material is supplied by the fabricator, he will accept and carry out the requirements of paragraphs 3.1.1 and 3.1.2 inclusive.

3.1.1 Two copies of all orders for stainless steel material, identified with NFS order number shall be sent to Nuclear Fuel Services, Inc., Box 124, West Valley, New York.

3.1.2 Commercial Grade stainless steel. Inspection of this material by NFS at the mill is not required, and corrosion coupons are not required; however, material must be properly identified and mill test reports showing chemical analysis are to be supplied. When ASME Code requirments must be met, the mill test reports must also show mechanical properties.

4. FABRICATION

4.1 All stainless steel is to be identified throughout fabrication. The identity of "Commercial" stainless steel according to type number is to be maintained throughout fabrication.

4.2 If oxyacetylene powder cutting, metallic electrode arc cutting, or "Arc-Air" is used, the joint edges shall be ground to remove gouges and produce a clean, bright surface. If carbon arc cutting is used, at least 1/16 inch of metal must be subsequently removed from the cut edge by machining or grinding.

4.3 Carbon steel clamps, supports, braces, etc. shall not be welded directly to any interior surfaces of stainless steel units nor directly to the exterior of units which are under 1/4 inch in thickness.

4.4 Distortion. Machined surfaces, such as body and manhole flanges, which are warped or otherwise distorted due to the subsequent welding, heat-treatment, or assembly, are to be remachined after these operations have been completed.

4.5 Material thicknesses, after final machining, shall be as specified on the drawing, the order, or other specifications for those parts.

4.6 Full X-ray of all welded longitudinal and circumferential joints is required on the tank and tank nozzles.

4.7 Fine-grained film shall be employed for X-ray examinations.

4.8 Tolerances. All equipment shall meet the manufacturing tolerances shown on the order or the drawings. The out-of-roundness of all shells or containers shall meet the requirements of the ASME Code for Unfired Pressure Vessels for internal or external pressure, whichever is applicable.

4.9 Machined surfaces must be finished to the smoothness limit specified on the drawing.

5. WELDING

5.1 Only the inert-gas shielded-arc, metallic-arc-coated electrode, or submerged-arc welding processes are to be used. The fabricator is to state in his quotation the type of welding which will be used.

5.2 Welding grade argon (99.99 percent purity) or helium (99.99 percent purity) or dry nitrogen (0.3 percent maximum oxygen, minus 60 degrees C dew point) may be used to back up inert-gas shielded-arc welds. The gas backup technique shall provide a bright, or only slightly tarnished surface on the underside of the joints.

5.3 The welding processes and operators must be qualified prior to fabrication in accordance with Section IX of the ASME Code.

5.4 Full penetration is to be obtained in all butt welds, and in other joints as specified, by back chipping or other means.

5.5 Back chipping, grinding, or gouging is required to obtain full penetration in all double-welded butt seams or other full penetration joints. Back chipping is to be performed with a round-nosed tool having a minimum radius of 1/8 inch and is to be continued until sound metal is reached. In no case is a V-shaped tool to be used, as this results in a V-groove which is difficult to weld without slag inclusions and lack of penetration in the root. When other methods such as grinding are employed, the resulting groove must have a radius of at least 1/8 inch.

5.6 The welding filler metal (wire or electrode) shall conform to ASTM a 298 or a 371 specifications and shall deposit metal comparable in chemical composition and mechanical properties to those of the parent metal. The fabricator is to maintain a system to assure that only the proper welding wire and electrodes are used in the fabrication.

5.7 Welds between stainless steel and carbon steel are to be made with ER-310 (25-20) electrodes. Welding procedures for joining materials of different analysis (dissimilar metals) shall be qualified in accordance with the ASME Code.

5.8 All welds exposed to the inside of the tank shall be made from the inside and shall conform to vendor sample weld.

6. CLEANING

6.1 All equipment fabricated according to this Specification is to be free of weld flux, spatter, arc-burns, gouges, tool marks, oil, grease, and general shop soil.

7. INSPECTION

7.1 All equipment fabricated in accordance with this Specification is subject to NFS inspection. The NFS Inspector shall be permitted free access at all times to such locations as are concerned with the supply or manufacture of the materials or equipment involved. The manufacturer shall furnish such equipment, assistance, and facilities for inspecting, checking, and testing as may be necessary for safely carrying out the complete inspection requirements.

7.2 Final Inspection. After fabrication is complete, a final inspection shall be made which will include examining radiographs and witnessing hydrostatic and other specified tests. For checking "as built" dimensions, alignment of vessel parts, tilt and orientation of nozzels, etc., the equipment shall be leveled and reference points established.

8. TESTING

8.1 The NFS inspector shall be given the opportunity to witness all pressure tests, running tests, or other special tests as required by the ICC or ASME Codes, drawings, order, or specifications.

8.2 All welds are to be sufficiently cleaned prior to hydrostatic testing to permit proper examination for defects.

8.3 The final hydrostatic test pressure shall be held for a minimum of one hour. For equipment requiring a "water-tightness" test, such as drip pans, the units shall be allowed to stand full of water a minimum of four hours.

8.4 Gaskets specified on the order or drawings shall be supplied by the fabricator unless specifically noted otherwise. Gaskets used for test purpose must have the same dimensions and compressibility as the service gaskets. Gasket compounds, pipe dope, or other sealing materials shall not be used under any conditions.

9. PAINTING

9.1 All non-stainless steel structures shall be properly primed and finished with aluminum paint.

5.0 SHIELDING EVALUATION

Since the tank trailers contents are limited to low enriched uranium solutions from unirradiated sources, no shielding is necessary.

6.0 CRITICALITY EVALUATION

The criticality safety of the tank trailer is based on safe concentration. The controls necessary to maintain a safe concentration have been explained in Sections 2.6 and 2.7

6.1 Discussion and Results

The insulation surrounding the tank is the only design feature of the tank trailer that provides for criticality control. The effictiveness of the insulation has been demonstrated in Section 2.9, Appendix A and B. This design feature plus the administrative controls detailed in section 2.6.2 provide adequate criticality control.

Since a shipment will always consist of one tank trailer, designating the shipment as Fissile Class III with a limit of one package per shipment would be appropriate.

7.0 OPERATING PROCEDURES

7.1 Procedure for Loading the Package

Operating procedures for the tank trailer will detail the following requirements prior to loading:

a. Inspect the tank to insure it is empty and clean.

b. Remove drain caps on drainer pans and inspect for leakage.

c. Inspect spill tank for solution.

d. Inspect flanges and gaskets.

e. Take temperature of UNH and insure that temperature is $68^{\circ}F$ or greater.

f. Document all checks and inspections.

After loading the tank trailer:

a. Clean the spill box.

b. Inspect spill tank.

c. Install new teflon gaskets.

d. Inspect all bolts on flanges and manhole.

e. Check retainer pan for leakage and replace drain caps.

f. Document all checks and inspections.

In addition, the operating procedures will require that the containment tank be tested every 24 months in accordance with DOT specification MC-312 and ASME specifications including a 55 PSIG hydrostatic test.

7.2 Procedure for Unloading the Package

Procedures for unloading the tank trailer will include the same checks and inspections as described in Section 7.1.

7.3 Preparation of an Empty Package for Transport

Procedures for preparation of an empty tank trailer for transport must include provision to insure that the tank, retainer pans, and spill tank are empty.

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

This chapter discusses the acceptance test and maintenance program to be used on the packaging.

8.1 Acceptance Tests

8.1.1 Visual Inspection

The containment tank will be visually inspected for alignment of vessel parts, tilt and orientation of nozzles. This inspection is made to insure that no damage had occurred during fabrication. Defects found will be followed by more extensive examination such as additional x-rays.

8.1.2 Structural and Pressure Tests

The containment tank will be hydrostatically tested at 55 PSIG for a minimum of one hour. This pressure test insures that the tank is leak tight. If leaks are detected rewelding or reworking of parts will be required.

8.1.3 Leak Tests

The retainer pans and spill tank will require a water tightness test. These units must stand full of water for a minimum of four hours. Leakage will be corrected by rewelding or replacement of parts.

8.1.4 Component Tests

8.1.4.1 Rupture Disc

The rupture disc used will be a standard off the shelve item with no additional testing required.

8.1.4.2 Gaskets

The teflon gaskets are tested during the hydrostatic test described in Section 8.1.2.

8.2 Maintenance Program

8.2.1 Structural and Pressure Test

The hydrostatic test described in Section 8.1.2 must be performed every two years. The test must be authorized by a certified pressure vessel inspector. If leakage occurs corrective measures must be followed by an acceptable retest prior to further use of the tank trailer.

8.2.2 Leak Tests

Checks for leaks are made prior to each shipment of the tank trailer. If the detection of leakage results in repair to the containment tank the hydrostatic test described in Section 8.2.1 must be performed.

8.2.3 Subsystem Maintenance

The trailer is maintained in accordance with general industry standards. The trailer is inspected for road worthiness prior to each use, and any maintenance required as a result of the inspection is performed before the tank trailer is used.

8.2.4 Rupture Disc and Gaskets on Containment Vessel

The rupture disc is removed every two years during the hydrostatic test. The disc is replaced if any sign of corrosion or wear is observed. Gaskets are replaced whenever flanges are removed or if leakage occurs during the hydrostatic test.