
Implementation of ANSI/ASME NQA-1 for Development of GA-4 and GA-9 Spent Fuel Casks

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INTRODUCTION

Early in 1988, the United States Department of Energy - Idaho Operations Office (DOE-ID) awarded General Atomics (GA) a contract for the Legal Weight Truck (LWT) Cask Development Project. This project is part of a national program for transportation and permanent disposal of spent nuclear fuel and other nuclear wastes, as mandated by the Nuclear Waste Policy Act of 1982 and administered by the Office of Civilian Radioactive Waste Management (OCRWM).

The scope of work covers the prototype development of a Legal Weight Transportation System for highway shipment of spent Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) fuel from existing and proposed reactor facilities to a repository or a monitored retrievable storage facility.

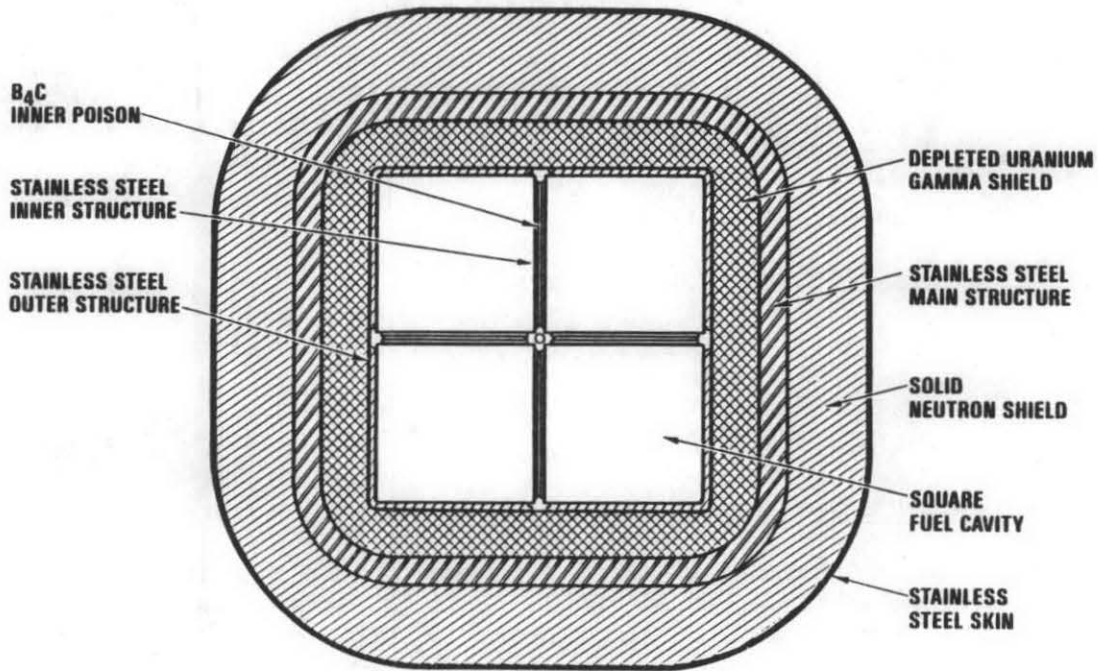
The system consists of a cask, a semi-trailer, and the associated ancillary equipment. The PWR configuration carries four (4) elements and is designated the GA-4 cask (Figure 1). The BWR configuration carries nine (9) elements and is designated the GA-9 cask (Figure 2).

The specific tasks included under the contract are:

- Preliminary and final design of casks and trailers, including design of components and reduced-scale casks used in tests.
- Fabrication of components for engineering tests, reduced-scale casks for design verification tests, and prototype casks and trailers.
- Performance of engineering tests on cask components, design verification tests on reduced-scale casks, and acceptance tests on prototype casks and trailers.

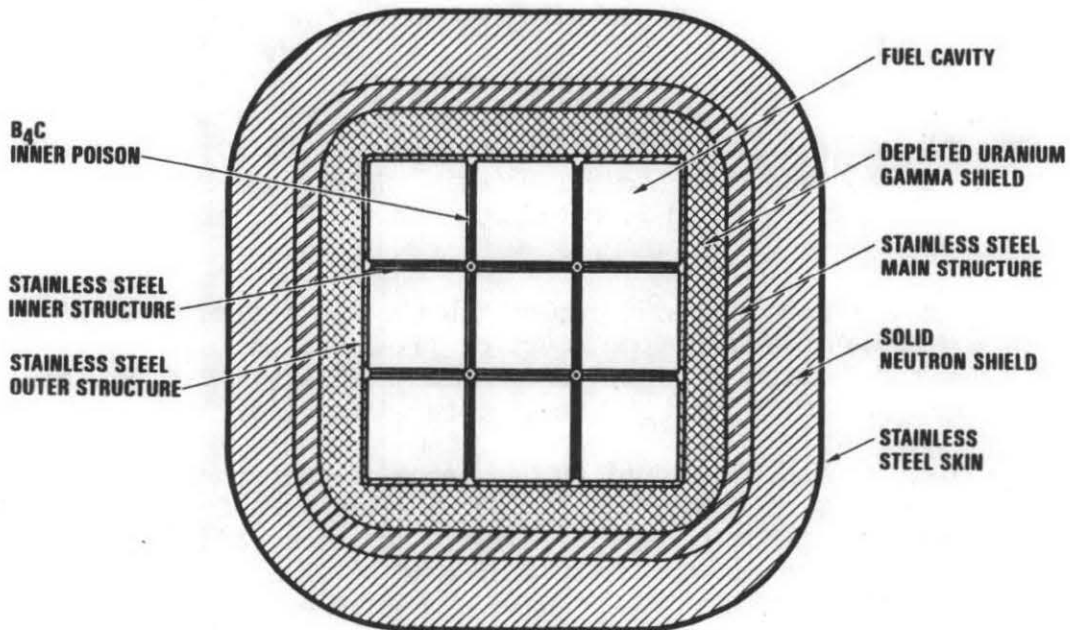
GA-4 CASK MAXIMIZES PAYLOAD FOR LEGAL WEIGHT TRUCK SHIPMENTS OF PWR FUEL

Figure 1



GA-9 LEGAL WEIGHT TRUCK CASK MAXIMIZES BWR SPENT FUEL PAYLOAD WITHOUT BURNUP CREDIT

Figure 2



- o Preparation and submittal of a safety analysis report for packaging (SARP) in order to obtain certification of the transportation system by the Nuclear Regulatory Commission (NRC).

The DOE contract for the GA-4 and GA-9 Legal Weight Truck Cask Development Project stipulated that GA is to establish, maintain, and implement a NRC and DOE-ID-approved QA program that complies with the following documents:

- o 10CFR71, Subpart H, 1/1/87
- o NRC Regulatory Guide 7.10, January 1983
- o ANSI/ASME NQA-1-1986, Addenda 1a-1986, and the associated Supplementary Requirements
- o DOE/ID-10178, June 1988

General Atomics Quality Assurance Program

The GA Quality Assurance Program is a company-wide system prescribed in GA's Quality Assurance Manual (QAM). This QA Program meets the criteria of both 10CFR71, Subpart H and 10CFR50, Appendix B. The QAM defines the procedures for implementing the requirements of ANSI/ASME NQA-1-1983 and its 1a-1983 Addenda as endorsed by NRC Regulatory Guide 1.28, Revision 3.

The GA Quality Assurance Program was originally reviewed and accepted by the NRC Division of Licensee Performance and Quality Evaluation, Office of Nuclear Reactor Regulation in 1974. The latest NRC-acceptance was March 16, 1989. (GA Document No. GA-A13010A, GA-LTR-11, Amendment 10, GA Technologies Quality Assurance Program, December 1988).

The GA QA program for radioactive material packages was approved by the NRC Transportation Certification Branch, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, Approval No. 0030, Revision 3, dated October 4, 1984, expiration date, October 30, 1989.

The GA QA Program additionally implements the requirements of the ASME Boiler and Pressure Vessel Code, Section III-Division 1 and Division 2-Designer and Fabricator (1986 Addenda and earlier); ANSI/ASME N45.2; DOE Standard NE F 2-10; and NRC Regulatory Guide 7.10.

As previously stated, GA's Quality Assurance program complies with Subpart H and Regulatory Guide 7.10. Upon review, GA found that both the 1986 version of NQA-1 and DOE/ID-10178 contained additional/supplementary requirements not presently addressed by GA's QA program. The mechanics of implementing project unique requirements, whether they be additional, supplementary, or modifying, are provided in the GA QA

program through the use of a Quality Assurance Program Document (QAPD). The QAPD is granted the authority to revise the QA program for a specific project, either by addition or modification of requirements, under the signatory approval of the Project Manager and the Director of Quality Assurance. This aspect of the QAPD was employed for the LWT Cask project to implement the additional/supplement requirements for the LWT Cask project.

QAPD for GA-4 and GA-9

The QAPD is the top QA planning document for the GA-4 and GA-9 Cask Project. It describes the QA program and identifies key personnel, functional responsibilities, and authority for QA activities. The QA program elements to be implemented are defined by invoking appropriate GA manuals and procedures in the Quality Assurance Program Index (QAPI), and by specifying unique QA requirements within the QAPD.

The GA Quality Assurance Manual (QAM) states policies, assigns responsibilities, and describes procedures governing activities that affect product quality and work at GA and is basically structured around the eighteen criteria of 10CFR50 Appendix B. The manner in which the QAM Quality Procedures, and approved modifications thereto, apply to the GA-4 and GA-9 Project are defined in the QAPD. The normal controls specified in the QAM are applied to work where the QAPD is not explicit as to how work is to be performed.

General Atomics has adopted the NQA-1-1983 Edition and the 1a-1983 Addenda because that is the current issue endorsed by the NRC. Therefore, the imposition of NQA-1-1986 Edition and the 1a-1986 addenda along with DOE/ID-10178 on this project required that the additional requirements be implemented on the project through the QAPD.

The principle additional requirements invoked by the 1986 version of NQA-1 on GA's Quality Assurance Program are:

- Nonconformances to design requirements dispositioned "use-as-is" or "repair" shall be subject to design control measures with regard to review commensurate with those applied to the original design (i.e., the same types of reviewers who reviewed the design documents have to review the nonconformance disposition when it constitutes a design change).
- The Project Manager shall be responsible for identifying personnel under his cognizance that perform or manage activities affecting quality and assuring that they are indoctrinated and trained to properly perform assigned tasks. Activities affecting quality include designing, purchasing, fabricating, handling, shipping, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying. Personnel shall be indoctrinated in the following subjects as they relate to a particular function:

- general criteria, including applicable codes, standards, and procedures;
- applicable quality assurance program elements;
- job responsibilities and authority.

Training shall be provided, if needed, to:

- achieve initial proficiency;
- maintain proficiency; and
- adapt to changes in technology, methods, or job responsibilities.

Records shall be maintained of indoctrination and training activities. Indoctrination and training planning, and actual indoctrination and training accomplished shall be documented on attendance sheets, training logs, or personnel training records and shall be readily available.

The principle additional requirements invoked by DOE/ID-10178, "Quality Management Plan For The Cask Systems Development Program" on GA's Quality Assurance Program are:

- o DOE/ID-10178 provides Quality Level (QL) Definitions that are somewhat different from the Quality Assurance Level Definitions of the GA QA Program. In order to provide consistency in the implementation of GA's company-wide QA program, a correlation of DOE-ID's QLs and GA's QALs was developed as follows:

| <u>DOE/ID-10178</u> | <u>GA</u> |
|---------------------|-----------|
| QL-1 | QAL-I |
| QL-2 | QAL-IIA |
| QL-3 | QAL-IIB |
| Other | QAL-III |

This change required GA to establish and define a QAL-IIB category to provide consistency with the DOE/ID-10178 QL-3 definition (see Table 1).

- o DOE/ID-10178 additionally requires that design verification for QL-1 (QAL-I) shall be achieved by prototype testing, scale model testing, and/or formal design review. Verification by alternate calculations alone is not allowed for safety-related items.
- o Prior to award of a Purchase Order for QAL-IIA material, equipment, and services, the prospective supplier's QA program shall be reviewed to verify that the vendor is qualified for the specific scope of work.
- o Management Quality Reporting: the Project Quality Engineer provides the following information to the Project Manager for inclusion into the monthly report to DOE-ID, as applicable:

TABLE 1

Definitions of DOE-ID QLs and GA QALs

DOE-ID QUALITY LEVELS

QL 1:
Items or activities assigned this classification are ones where an omission, error, or failure could directly impact public radiological health and safety. From a mechanistic perspective if an adverse radiological effect (exceeding regulatory limits) may be initiated by an omission, error, or failure of an item or activity, then that item or activity must be classified as QL 1.

QL 2:
Items and activities assigned this classification are ones, where an omission, error, or failure could lead to circumstances that could require QL 1 items or activities to perform their safety related function. Therefore, an indirect relationship exists between QL 2 items and activities and adverse radiological effects to public health and safety.

QL 3:
QL 3 is for assignment to activities selectively chosen because of special programmatic importance other than radiological safety. These include mission oriented activities which reflect good technical management practices for the assurance of Quality.

GA QUALITY ASSURANCE LEVELS

QAL I:
QAL-I shall be assigned to items or activities whose omission, error, or failure could directly impact public radiological safety. Specifically, QAL-I shall be assigned to structures, systems and components or parts thereof that perform the following functions under normal and accident conditions as prescribed in 10CFR71: Prevention of a package criticality event; containment of radioactive contents of a package; attenuation of ionizing radiation to satisfy external dose rate limits.

QAL II-A:
QAL II-A shall be assigned to items or activities whose omission, error, or failure could lead to circumstances that could require QAL-I items or activities to perform their safety function. Items or activities assigned this classification are under the direct control of the QA Program.

QAL II-B:
QAL II-B (non-safety related) is for assignment to project activities selectively chosen because of special programmatic importance other than radiological safety. These include reliability in operation of structures, systems, or components whose poor performance could seriously hamper the transportation mission.

QAL III:
Items for noncritical applications. QAL III designs and procurements shall include provisions for inspection and/or appropriate testing. Provisions of this Manual not specifically limited to QAL I and/or QAL II shall apply.

- Quality Status
- Status of Quality Plans and Procedures
- Status of Significant Quality Problems
- Status of Audits and/or Surveillances
- Quality Management Practices and Improvements
- Quality Performance Trends
- Status of Corrective Actions
- Lessons Learned

CONCLUSIONS

The establishment of a Quality Assurance Program for prototype development of a Legal Weight Truck Cask Transportation System proceeded in an orderly fashion with a minimum of unplanned iterations. GA's extensive background in transportation systems for new and spent fuel and irradiated components; and the associated progressive development of appropriate QA Programs for these systems were a major factor in this regard. The QAPD for the LWT Cask Project was initially issued in March 1988 and it described a program based on the 1983 version of NQA-1 without the additional/supplementary requirements of DOE/ID-10178. In July of 1988 the QAPD was revised to include the additional/supplementary requirements associated with the implementation of the 1986 NQA-1 version and the additional requirements imposed in DOE/ID-10178.

The implementation of the Legal Weight Truck Cask Transportation QA Program is reviewed by DOE/ID representatives every two months and has been audited by DOE/ID representatives, with the audit resulting in no findings.

ACKNOWLEDGMENTS

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