ORNL/TM-10855
ORO/TOP-5401.0

ornl

OAK RIDGE NATIONAL LABORATORY

MARTIN MARIETTA

Transportation Operations System Cask Maintenance Facility: Systems Requirements and Description

C. R. Attaway

OPERATED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A04; Microfiche A01

ORNL/TM-10855
ORO/TOP-5401.0
Dist. Categorgy UC-513

TRANSPORTATION OPERATIONS SYSTEM CASK MAINTENANCE FACILITY: SYSTEMS REQUIREMENTS AND DESCRIPTION

C. R. Attaway

Date of Issue - August 1988

Prepared by the
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

CONTENTS

TRANSPORTATION OPERATIONS SYSTEM CASK MAINTENANCE FACILITY: SYSTEMS REQUIREMENTS AND DESCRIPTION

C. R. Attaway

ABSTRACT

The Department of Energy's Office of Civilian Radioactive Waste Management is developing a national repository for spent nuclear fuel and high-level radioactive waste to implement the requirements of the Nuclear Waste Policy Act. As part of this effort, the Transportation Operations Project Office of the Department of Energy in Oak Ridge, Tennessee, has the responsibility of accepting this waste from waste generators and transporting it to appropriate Federal Waste Management System facilities in specially constructed shipping casks.

Maintenance will be required for these shipping casks and the associated supporting equipment. This document defines the requirements of a facility to provide that required cask system maintenance. This document does not define the requirements for vehicle maintenance which will be performed elsewhere.

---

1. INTRODUCTION AND PURPOSE

1.1 BACKGROUND

The U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management (OCRWM) is responsible for the development of the waste management program for the disposition of high-level radioactive waste (HLW) and spent nuclear fuel (SNF). This responsibility is derived from the Nuclear Waste Policy Act (NWPA) of 1982 (Public Law 97-425).

OCRWM is planning, developing, and implementing a national SNF and HLW transportation system. This transportation system will accept spent nuclear reactor fuel and other HLW at the nuclear waste generators (reactors and other facilities). The transportation system will transport the waste in specially designed shipping casks to a national geologic repository for deep permanent disposal. An above-ground monitored retrievable storage (MRS) facility may also be present in the system. If the MRS is present, most of the SNF will be transported from the waste generators to the MRS for prepackaging and interim storage.

The waste will remain at the MRS until a geologic repository is ready to accept it for final disposal. The components of the OCRWM transportation system include (but are not limited to) the interface with the waste generator, the SNF repository interface, the MRS facility interface, the cask system, the transportation support system, and the transportation operations system.

The cask system is one mobile component of the transportation system. It is designed to provide safe transport of SNF between different facilities under both normal and accident conditions. The cask system will consist of heavily shielded casks, the cask transport vehicles (truck trailer or railcar), and any associated ancillary equipment (vacuum drying systems, lifting devices, etc.). The cask and certain parts of the cask system must be operated within the limits imposed by a certificate of compliance (CoC) granted by the Nuclear Regulatory Commission (NRC) and the requirements of the Department of Transportation (DOT).

The cask system must transport SNF safely during the life of the transportation system. To maintain the operational effectiveness and safety of the cask system, each cask and its ancillary equipment and vehicles must be maintained in proper condition. In order to accurately define the functions and costs of this activity, OCRWM has defined a work breakdown structure (WBS) element in the draft "Program Summary Work Breakdown Structure Dictionary" for cask system maintenance. This element is included as a subelement under the Waste Transportation Program Support System as the Cask Maintenance Facility (CMF) (4.01.4.3.2) and is managed by the Transportation Operations Program Office (TOPO) located in the Oak Ridge Operations (ORO) office of DOE at Oak Ridge, Tennessee.

A separate (or integral) facility for service/maintenance of vehicles may also be provided but is beyond the scope of this document. A description of the transportation support system and the transportation operations system will be found in the "Transportation System Requirements and Description" (in preparation).

1.2 POLICY

This document was prepared in accordance with the requirements set by the OCRWM System Engineering Management Plan (SEMP), DOE/RW-0051, and the Program Management System (PMS) Manual, DOE/RW-0093. Specific guidance for the content and organization of this document is given in the SEMP and in the Engineering Procedures used by Oak Ridge National Laboratory (ORNL) for preparation of like documents.

1.3 DOCUMENT PURPOSE

This document provides the functional requirements and description for a CMF to maintain the transportation cask system to be used by the Federal Waste Management System (FWMS). The CMF is a major transportation support system technical element. This document provides the initial technical baseline for that facility. It is subordinate to the Waste Management System Systems Requirements and Description document and the Transportation System Systems Requirements and Description document (both are currently being prepared or revised).

1.4 AUTHORIZED SYSTEM AND IMPROVED PERFORMANCE SYSTEM

The authorized system refers to the currently authorized waste management system in accordance with the Waste Management Systems Requirements and Description (SRD) document. It includes the transportation system and the mined geologic disposal system (MGDS). The improved performance system has been approved by Congress, with a caveat that a suitable site for the MRS should be found. As such, it is the reference system. The improved performance system includes the MRS facility, the transportation system, and the MGDS. This document identifies the cask maintenance requirements for either configuration. Deletion of the MRS will not markedly affect the need for, or the scope of, the CMF activities. Therefore, an addition or deletion of a system element or subsystem in the OCRWM reference system will not have major impact on the requirements and description provided in this document. The authorized system and the improved performance system (i.e., reference system) are defined in the "Waste Management Systems Requirements and Description" (Rev. 1, Sept. 1986).

1.5 REVISION OF REQUIREMENTS AND DESCRIPTIONS

This document will be updated periodically as new requirements develop and as the system design evolves. If there is any conflict between the requirements and the descriptions of this document, the requirements shall take precedence. Requirements are indicated by the terms "shall" and "required"; descriptions are indicated by the terms "may," "will," and "assumed." The term "may" is used to represent items that are the designer's choice or are to be determined later.

1.6 REFERENCES

The following references provide foundation information for the CMF design. Major topics covered in each document are indicated immediately below the reference. They are listed in an approximate order of the amount of information applicable to configuration definition for a CMF.

1. "Fleet Servicing Facilities for Servicing, Maintaining and Testing Rail and Truck Radioactive Waste Transport Systems: Functional Requirements Technical Design Concepts and Options, Cost Estimates and Comparisons," by Allied-General Nuclear Services, for Oak Ridge National Laboratory and DOE WASH. No. ORNL/SUB-79/13866/1.

   - o preliminary plant layout of a previous facility with similar tasks

2. "Interface Criteria for Shipping Casks and Fuel Handling Facilities," by Paul N. McCreery et al., Allied-General Nuclear Services, Report No. Y/OWI/SUB-78/1, Jan. 1979.

3. "Conceptual Design Report for a Remotely Operated Cask Handling System," by Hanford Engineering Development Laboratory, J. A. Yount and J. D. Berger, No. HEDL-7376, Rev. 1, Sept. 1984.

   - o truck washing
   - o gas sampling
   - o cask loading/unloading

4. "N.W.T.S. Transportation Interface Technology Development Priority Report," by Clinton G. Shirley, Sandia National Laboratories, Report No. SAND82-1804, July 1983.

   - o cask handling
   - o cask tipping mechanism
   - o HLW cask design
   - o HLW cask system design

5. "Review and Analysis of French and British Technology and Equipment with Potential Applicability to the Federal Nuclear Management System," by E. R. Johnson Associates, Inc., Report No. JAI-298 (draft), July 1987.

   - o handling equipment
   - o cask drying system
   - o operations diagram

6. "Studies and Research Concerning BNFP; Cask Handling Equipment Standardization," by Paul N. McCreery, Allied-General Nuclear Services, Report No. AGNS-35900-1.1-106, Oct. 1980.

   - o lifting yoke design and standardization
   - o software support
   - o cask processing procedures
   - o cask details
   - o crane operations procedures
   - o radiation surveying and liquid sampling

7. "Studies and Research Concerning BNFP Advanced Cask Handling Studies," Paul N. McCreery, Allied-General Nuclear Services, Report No. AGNS-35900-1.1-49., Oct. 1979.

   - o details of cask operations
   - o video tape narrative

- o maintenance platform design
- o decontamination equipment design

8. "Cask Fleet Operations Study," Nuclear Assurance Corporation, Report No. ORNL/SUB/87-00421/1, Jan. 1988.

- o NAC fleet experience
- o inspection checklists
- o lifting yoke design
- o radiation dose rates
- o basket changeout
- o basket design
- o damaged fuel basket design
- o decontamination agents
- o rail/barge cask design

9. "Cask Fleet Operations Study," TransNuclear Inc., Report No. A-219 rev. 2, Feb. 1988.

- o Transnuclear fleet operations
- o equipment sketches
- o check-off sheets

10. "Waste Management System Requirements and Description (SRD)," by Roy F. Weston, for DOE, contract DE-AC01-83-NE44301, Sept. 1987.

- o cask details
- o cask handling - no details

11. "Current Status and Future Considerations for a Transportation System for Spent Fuel and Radioactive Waste," by Allied-General Nuclear Services, ORNL/SUB/77-42513, Feb. 1978.

- o rail car limitations
- o cask handling

12. "A Review and Analysis of European Industrial Experience in Handling LWR Spent Fuel and Vitrified High-Level Waste," by J. O. Blomeke, Fuel Recycle Div., Oak Ridge National Laboratory, Nov. 1987.

- o European cask details
- o cask transport
- o mobile cask racks
- o cask-handling equipment

13. "Transportation Operations Functions of the Federal Waste Management System," L. B. Shappert, et al.,Oak Ridge National Laboratory, ORNL/TM-10811, ORO/TOP-5403.0, June, 1988.

- o shows how the functions of a CMF fit into the functions of a transportation system, and a definition of the top-level functions of a CMF.

14. "Functions of the Cask Maintenance Facility," by H&R Technical Associates, Inc., Subcontract B-38435C for Oak Ridge National Laboratory, Aug. 1987.

- o cask service and repair
- o cask basket changeout
- o level of decontamination
- o special equipment

15. Request for Proposal: "Development of From-Reactor Casks," by U.S. DOE Idaho Operations Office, DE-RP07-86ID12625, July 1986.

- o cask interface guidelines (details of cask design requirements)
- o fuel assembly sizes
- o loading and unloading requirements
- o cask ports

- o vacuum drying
- o remote operations
- o standardization

16. "A Robotic Radiation Survey and Analysis System," by Siegfrid Thunborg, Sandia National Laboratories, Proceedings, 35th Conference on Remote Systems Technology, 1987.

- o remote radiation surveying of casks, including swiping robot
- o system requirements
- o remote damage survey

17. "Use of Transportable Storage Casks in the Nuclear Waste Management System," by H&R Technical Associates, Inc. and E.R. Johnson Associates, ORNL/SUB/86-SA094/1 and ORNL/SUB/86-SA224/1, for Oak Ridge National Laboratory, Dec. 1988.

- o study of the use of storage casks for transportation both one-way and repeat use

2. PROJECT DEFINITION

This document defines the requirements of a facility to maintain the SNF cask system. This cask system is one portion of the FWMS for the transportation and disposal of SNF and other HLWs. The facility, for which the requirements are defined herein, is designated as the CMF.

Nothing in these requirements shall be construed as prohibiting or precluding ownership and/or operation of the CMF by a private sector entity.

2.1 SITE LOCATION

All cask maintenance functions shall be capable of being performed at a single CMF.

The CMF shall be designed as a stand-alone facility on a "green-field" site.

A stand-alone facility is one in which the DOE owns the land, but no other government-owned facility is available to share in the cost of providing any service or utility.

A green-field site is one on which no utilities (i.e., water, electricity, sanitary sewer, etc.) exist, but they may be available at a reasonable distance from the site.

The CMF may eventually be located adjacent to another facility owned by the DOE and used for other activities. The joint use and cost sharing of services already located at that site would then be possible. The CMF is described as being "co-located" with that facility when this occurs.

The CMF functions may eventually be included as an integral portion of another facility in the FWMS. This would permit the integration of facilities and cost sharing of services already located or planned for that site. The CMF is described as being "integrated" with the other facility when this occurs.

If the co-location or integration option is selected at a later date, this SRD will be revised accordingly.

2.2 SEPARATELY COSTED ITEMS

The CMF shall be designed to permit separate identification of costs for the following subsystems:

1. liquid radiological waste handling, storage, transport, and disposal;
2. services such as security and administration;
3. vehicle storage;
4. vehicle switching equipment; and
5. any other capability or service that could be borrowed from or shared with an integrated or co-located facility.

This will permit the cost savings associated with a co-located or integrated facility to be accurately factored into any future analyses of transportation system alternatives.

2.3 DOCUMENT USE AND REVISION

This document defines the requirements for a CMF. The feasibility study will provide an initial concept of the configuration and cost of the CMF. This shall be done in a manner permitting the data, design, and costs that result from the study to be used in the total transportation system decision-making process. The feasibility study will also provide the foundation for the design used in a Conceptual Design Report (CDR). The CDR will be prepared as a subsequent design refinement of the CMF. The conceptual design of the CMF will be site specific.

Once the feasibility study for the CMF has been completed, this document may require revision, based on the results of that study.

Nothing in this document shall be interpreted to indicate that the CMF is to be a government owned and/or operated facility. The design of the CMF shall be such that private industry shall be used to the fullest extent possible (in compliance with the NWPA).

3. MISSION

The CMF has the specific mission to provide for the servicing, testing, maintenance, repair, modifications, and configuration control of all cask system elements. Vehicles (to the extent that contamination levels permit) shall be maintained elsewhere.

Repair of vehicles may be performed at the CMF if, and only if, possible exposure to radioactive contaminants precludes the repair from being performed elsewhere.

The CMF shall be responsible for decommissioning and disposal of any cask system elements deemed permanently not fit for use.

The CMF shall support the mission of the Transportation Operations System (TOS). The mission of the TOS is to transport SNF from commercial nuclear reactors and HLW from DOE defense facilities to an MRS or MGDS and from the MRS to the MGDS, which includes the following activities:

1. The TOS will accept SNF and solidified HLW from the waste generator sites and storage locations.

2. The TOS will transport SNF and solidified HLW from generator sites and storage locations to the MRS facility and/or the repository.

3. The TOS will operate a support system that will carry out the following functions: route selection; scheduling and management of cask traffic; procurement of the necessary cask systems, transportation vehicles, and carrier services; arrangement for the physical protection of shipments; monitoring of the location and status of cask shipments; provision of capabilities to coordinate and support accident and emergency response operations; arrangement for necessary cask and vehicle inspections and certifications; coordination of transport operations with the appropriate federal, state, tribal, and local agencies; notification of shipments to appropriate authorities; transportation personnel training and management; and records management.

4. The TOS will acquire maintenance and repair capabilities and other related services (through multiple acquisition means) to maintain all transportation system equipment.

4. REQUIREMENTS AND SPECIAL ISSUES

The CMF shall support and/or meet the following TOS requirements only as applicable. These functions are listed so that the CMF may be integrated with the remainder of the transportation system elements. Those functions not specifically defined for the CMF will be performed elsewhere. The major effect of each TOS requirement on the CMF is listed parenthetically where not immediately apparent.

1. The TOS will accept SNF and solidified commercial high-level waste (CHLW) beginning no later than January 31, 1998. (Data provided in order to coordinate construction schedule of CMF.)

2. The TOS will accept SNF and CHLW in accordance with contracts executed pursuant to 10 Code of Federal Regulations (CFR) 961, "Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste."

3. The TOS will accept defense high-level waste (DHLW) in accordance with an acceptance plan (to be developed at a future date) for DHLW.

4. The TOS will transport waste on a schedule consistent with a waste acceptance plan, which is to be developed jointly by DOE and the waste generators, in accordance with 10 CFR 961 and its future modifications (CMF operations schedule).

5. Routes will be selected in accordance with applicable state, DOT, NRC, and DOE criteria.

6. Shipping activities will be scheduled in order to safely meet the aggregate shipment requirements consistent with the waste acceptance plan and the contractual agreements with each of the waste generator sites.

7. Cask system components, other vehicles, and services will be acquired under government procurement regulations. This includes turn-key procurement in order to meet the shipment schedule and minimize transportation system life cycle costs (TSLCC) and system risks.

8. Physical protection of facilities and security in transit shall be provided in accordance with applicable NRC regulations (10 CFR 73, CMF design).

9. The location and status of any loaded or unloaded cask will be verifiable within [to be determined (TBD)] minutes of a submitted inquiry (CMF automatic data processing equipment and procedures).

10. An emergency response plan will be established to cover all credible emergencies associated with the transportation system. Support for the Federal Emergency Management Administration (FEMA), state, and local emergency teams will be available upon request (CMF staffing).

11. A central coordination area and a documentation verification system will be provided, and it shall report the status of the cask system elements and the status of all required inspections and certifications.

12. Proper notice will be provided in accordance with DOE and/or NRC prenotification policy for shipments of unclassified SNF and HLW in effect at the time of operation (CMF waste shipments).

13. Individuals associated with the transportation system shall be properly trained. Adequate proof shall be provided that individuals are qualified to perform their assigned duties proficiently before making any personnel assignment that has the potential to cause a system failure (CMF training facilities, staff, start-up schedule).

14. System operating data shall be acquired and organized such that a proper record of each facility, service, piece of equipment, and activity required of the transportation system will be recorded. These data shall be permanently documented and easily retrievable (CMF record keeping).

15. Cask system and transportation equipment maintenance and inspections shall be performed as needed to ensure compliance with NRC, DOT, and state regulations and to provide for safe and efficient cask loading, unloading, and transport.

16. The capability for scheduled and unscheduled maintenance and repair of transportation equipment shall be provided (CMF throughput).

17. The TOS will be capable of providing all necessary facilities and services to ensure that the transportation equipment is maintained in accordance with specifications and at a level ensuring safe operation of the transportation system and minimizing TSLCC (CMF throughput).

18. Safeguards in accordance with 10 CFR 73 shall be provided (CMF facility configuration, and emergency response planning).

4.1 FUNCTIONAL REQUIREMENTS AND SPECIAL CONSTRAINTS

The CMF is expected to perform the following primary operations.

4.1.1 Cask System Service, Maintenance, and Repair

The CMF shall be responsible for the inspection, servicing, maintenance, and repair of casks and associated ancillary equipment. This includes wear and tear and internal or external operational damage.

The MRS and/or the MGDS will provide for unloading of the casks and will provide certain routine servicing functions in accordance with RW-0090, Appendix B2, and the interface constraints defined therein.

4.1.1.1 Maintenance

A basic maintenance cycle in the CMF, as given in the "Transportation Operations Functions of the Federal Waste Management System" (ORNL/TM-10811, ORO/TOP-5403.0), follows:

1. receive cask and equipment for maintenance;
2. perform premaintenance activities
   - radiological survey,
   - receiving inspection, and
   - separate cask and vehicle;
3. assess equipment needs for unscheduled maintenance
   - repairs and modifications;
4. generate maintenance order;
5. "red tag" the item as "out of service";
6. order out special maintenance equipment and procedures;
7. perform maintenance activities;
8. reassemble equipment/verify operation/remove "red tag";
9. perform required performance verifications and inspections;
10. notify dispatching and return equipment to service;
11. return special equipment and procedures to their source;
12. collect/report problems and trend analysis data
    - to operations analysis and planning,
    - to regulatory compliance, and
    - to transportation operations engineering support;

13. update equipment maintenance file information; and

14. update equipment maintenance reminder file.

4.1.1.2 Repairs

The CMF shall provide, as a minimum, the following cask repair functions.

1. The CMF shall provide the capabilities of repairing damaged O-ring sealing surfaces and replacing any sealing medium used in a cask.

2. The CMF shall provide the capabilities of repairing and/or replacing cask trunnions.

3. The CMF shall provide the capabilities of replacing and/or repairing any valve in the cask system.

4. The CMF shall provide the capabilities of replacing, repairing, and testing any ancillary equipment. This includes items such as tie-downs, lift beams, adapters and fixtures, personnel barriers, and impact limiters or other components such as bearings, helicoil inserts, latches, baskets, cask internal components, and fasteners used in normal cask operations.

5. The CMF shall provide the capabilities of repairing and maintaining any contaminated equipment that is a part of the ancillary equipment used in cask operations, transport, and/or maintenance.

6. The CMF shall maintain a stock of spare repair parts, fixtures, and fixture components, as well as supplies such as bolts, O-rings, gaskets, valves, etc.

7. The CMF shall be capable of replacing and/or repairing instrumentation systems used by the cask system.

8. Records of all maintenance and repair activities shall be maintained on a cask-by-cask or item-specific basis.

4.1.1.3 Specialized Equipment Maintenance

Some reactor facilities will require special interface adaptation equipment to allow a standard cask design to be used at that site. For example, a crane hook or lift-beam adapter that would allow standard cask handling by a nonstandard crane may be necessary. The CMF shall have the capability to inspect, service, load test, store, and repair this special adaption equipment and the special equipment that is a part of the CMF.

4.1.1.4 Spare Parts

The CMF shall maintain a controlled stock of spare parts and special tools.

4.1.1.5 Cask Contents

The CMF shall be capable of handling contaminated casks from which the SNF has been removed. The CMF shall not be required to handle, maintain, repair, or store loaded casks.

CMF personnel may be responsible for some operations on loaded casks in exceptional circumstances (such as a transportation accident). A damaged loaded cask may require special repairs or extreme measures to remove the lids. In such situations, the necessary heavy-shielding hot cell or pool will be provided through a contracted service from another facility, not the CMF.

4.1.2 Maintaining Compliance with the NRC Certification

The CMF shall be responsible for providing all appropriate services and equipment to ensure that casks remain in compliance with the CoC.

SNF shipping casks are operated within the OCRWM system under the authority of a CoC granted by the NRC. The CoC is the primary safety-related quality assurance and control document by which the NRC Division of Safeguards and Transportation permits SNF to be shipped in a specific cask design. The CoC contains a description of the type, form, and maximum quantity of material that can be carried in the cask; any operating restrictions on the cask; and the specifications for or reference to operation, inspection, and maintenance of the cask. A cask that fails to comply with its CoC shall be withdrawn from service. The cask shall remain out of service until all corrective actions to bring the cask into compliance have been completed.

4.1.3 Unplanned Off-Site Repair and Inspection

Operational damage of a cask or its ancillary equipment may require repair at a location away from the CMF. If a cask should require repair away from the CMF, CMF personnel shall be responsible for providing the expertise and equipment to repair the damage and/or supervise the work by others. An example of this kind of damage might be a trunnion-bearing surface gouge sustained during fuel loading at a reactor.

If a transportation accident occurs, the CMF may be requested to provide a team to assist in evaluating cask damage (including on-scene leak testing). The team may also recommend actions needed to allow the cask to be moved to its destination or to a nearby location for further evaluation and repair. The CMF shall provide storage and maintenance for emergency response equipment and supplies to be defined by the cask designer at a later date.

4.1.4 Cask Internal Structure Changeout (Reconfiguration)

Individual casks will be reconfigured occasionally to accept the next waste scheduled for transport. This function will vary from exchanging inserts in cask baskets for the shipment of a different length fuel element to a complete basket changeout for a different type of waste. This reconfiguration function may occur at the repository, the MRS, or the CMF.

The CMF shall be capable of providing all reconfiguration services required for cask operations, including storage of contaminated cask components that have been exchanged during reconfiguration.

Administrative support and record keeping will be required to support this activity.

4.1.5 Decontamination and Waste Streams

The CMF shall decontaminate casks, cask internal structures, and cask ancillary equipment. This will permit CoC inspections and maintenance, meet DOT regulations, and provide compliance with utility cask acceptance criteria.

Provisions for contamination removal from vehicles for compliance with DOT regulations and/or major refurbishment or repair of the vehicle shall be provided by the CMF. Vehicle maintenance functions, where reasonably feasible, shall be separated from cask maintenance operations to avoid possible contamination problems.

All CMF-generated waste shall be monitored to determine final disposition. Radiological measurements and assessments shall be provided for all waste streams.

Provisions shall be made for the disposal of hydraulic fluids (both aqueous and petroleum based) expected to be used in cask-lifting

fixtures. The fluids are a problem waste stream because of the combined possibly radioactive and hazardous handling restrictions.

Disposal means shall be defined for all wastes collected or generated by the CMF.

4.1.6 Transport Cleaning and Painting

Cask systems will require periodic refurbishment during the service lifetime. The refurbishment will include overhaul; testing; cleaning; and repainting of the railcars, trucks, trailers, and personnel barriers. Trace amounts of contamination may be present in the existing paint. Containment of this contamination shall be ensured.

A facility shall be provided in order to remove existing paint before all repainting or welding operations. Repainting or other surface corrosion protective means shall be required to occur before appreciable corrosion occurs.

4.1.7 Maintenance Records Management

The CMF shall provide records management activities, which will include information acquisition, storage and retrieval, report generation, maintenance procedure generation and documentation, and facility operations information handling. Creation and maintenance of extensive quality assurance and control documentation is required to verify that cask systems are maintained within the limits specified by the CoC. Other entities in the waste management system may also require access to these records.

4.1.7.1 Maintenance Planning and Scheduling

The CMF shall provide for adequate cask system maintenance planning and scheduling.

Routine servicing begins with the gathering of data on specific casks, vehicles, and ancillary equipment. This begins as the individual items are procured. All pertinent media such as drawings, specifications, manuals, Safety Analysis Reports, Operating and Maintenance procedures, and the CoC form the basis for maintenance documentation. Some activities support preventive maintenance to prolong the service life of an item. Other service and maintenance activities are mandatory for regulatory compliance. As each piece of equipment is received into the transportation system, its service and maintenance "clocks" will

start, and its maintenance history will be tracked throughout its operational life. Maintenance clocks will be reset as required for periodic maintenance and/or service activities.

Coordination of service and maintenance activities with operations is essential for the uninterrupted supply of qualified equipment for service.

4.1.7.2 Maintenance Scheduling Responsibility

The scheduling of equipment for maintenance is the responsibility of the overall planning function of the TOS. It will be based on input from maintenance organizations. The maintenance organization (CMF) has the responsibility for its internal planning and scheduling, as well as the maintenance records function.

Scheduling of maintenance in the CMF shall be coordinated with and subordinated to TOS scheduling.

4.1.7.3 Record Keeping

The CMF shall maintain all records for the cask system. The records will, as a minimum, include the following for each major component of the cask system:

1. design drawings and specifications;
2. regulatory approval documentation and renewals;
3. operating and maintenance manuals;
4. design changes;
5. repair history;
6. testing history;
7. maintenance history;
8. operational history;
9. modification history; and
10. contamination history.

Detailed short-term records shall also be maintained for each cask system during its cycle through the CMF. Casks will be logged into the facility and tracked through the all stages of decontamination and testing; however, only the portions of these records relating to the design or history of the cask shall be retained for long-term storage.

Duplicate back-up copies of critical records shall be maintained in a secure secondary location.

4.1.7.4 CMF Computer

A cask fleet data base computer system (or subsystem) shall be provided. Provisions shall be made to link it to a transportation system computer (if provided as part of the TOS) to permit scheduling information exchange. This will allow the transportation system to track the current configuration, maintenance, CoC, and cleaning cycles for each cask for integration into the overall TOS data base.

4.1.8 Unscheduled Maintenance

Unscheduled maintenance, although nonroutine, will be handled in a manner similar to scheduled maintenance. Maintenance items cannot always be identified at the onset of routine servicing or during operations. Most maintenance will be performed at the CMF, but occasionally maintenance may be performed elsewhere (such as at the waste generator site). Such off-site maintenance shall be thoroughly documented and verified at both the CMF and the site at which it is performed.

4.1.9 Cask System Modifications

During its lifetime, a cask system may require modification, and the CMF may modify some cask system components as improvements are necessary. The CMF shall provide space but neither additional equipment nor staff to perform cask modifications. Cask modifications may also be performed by subcontractors at off-site facilities.

Modification is regarded as a relatively rare activity compared with routine maintenance and repair. Modification activities will be jointly planned by several different organizations associated with and/or interfacing with the transportation system. A modification has many of the requirements of initial fabrication and is expected to be treated in a similar fashion. This will depend on the equipment that is slated for modification and the complexity of the modification.

Modification records must be entered into the overall maintenance records on a cask-by-cask or item-specific basis.

In order for the CMF to perform a modification on a cask or other item of special equipment, the following activities are suggested (not necessarily in sequential order):

1. obtain regulatory compliance assessment;
2. obtain regulatory (DOE, NRC, DOT, etc.) compliance approval;

3. obtain engineering assessment;
4. obtain modification media (i.e., drawings, specifications);
5. plan modification activities;
6. acquire modification procedures;
7. acquire special equipment and materials;
8. establish quality assurance (QA) requirements;
9. coordinate with the TOS to schedule the activity;
10. finalize modification schedule;
11. receive approval of procedures;
12. move cask or equipment to modification facility;
13. mark cask or equipment as being "out-of-service";
14. perform decontamination, as required;
15. perform modification;
16. inspect and test modifications;
17. record modifications in equipment records; and
18. coordinate with dispatcher for cask pick up.

4.1.10 Cask Decommissioning and Disposal

The CMF shall perform a decommissioning and disposal function for casks as they are removed permanently from service.

4.2 EMERGENCY POWER

The CMF shall provide for the operation of critical equipment during normal electrical power system power outages. Two categories of emergency power shall be provided: reserve and uninterruptible.

Reserve power shall provide backup electrical power for limited use during a normal power outage. Reserve power shall provide the capability to shut down safely certain essential process operations.

An uninterruptible power system (UPS) shall provide continuous operation for critical equipment that cannot tolerate a momentary break in operation.

The following is a preliminary list of systems known to require emergency power and the probable category to be provided for that system:

1. bridge cranes (reserve);
2. critical heating, ventilation and air conditioning (HVAC) dampers (UPS);

3. noncritical HVAC fans and dampers (reserve);
4. secondary lighting in the processing areas (reserve);
5. critical radiation and environmental monitoring (UPS);
6. evacuation lighting (UPS);
7. compressed air supply (reserve);
8. critical alarms (UPS);
9. computer systems (UPS); and
10. in-plant communication systems (reserve or UPS TBD).

The reserve power source will be a standard diesel/generator set. A standard start-up to full operation will be specified to be 90 s. The power source will be sized after the design is completed for the necessary facilities.

The UPS power will consist of battery packs and associated control equipment located with the equipment requiring power during an outage.

4.3 AUTOMATIC SYSTEMS

Automatic systems shall be designed to default to a manual operation, fail-safe mode in the event of a power outage. Automatic operation shall be restorable after the return of power through manual start-up and/or resumption procedures. Automatic systems shall have provisions that prevent uncontrolled or out-of-sequence operation of process equipment. Important operations shall have the capability to be performed manually during equipment outages.

Alternative operations shall be provided for automatic systems for which the justification is considered weak or the cost too high.

Automatic operations may be used wherever the estimated capital cost increase can be justified through lower TSLCC, increased efficiency, and/or measurably improved safety.

Back-up capability is required for all automatic and remote operations to be performed at the CMF.

4.4 UNCERTAINTIES

The following uncertainties have been identified as having an effect on the CMF. It is anticipated that the following list will change as the CMF becomes more well defined.

4.4.1 Shipping Cask Design

The design of the shipping casks will have a major effect on the final details of the CMF. For the feasibility study, the generic cask criteria currently available appear to be sufficient. This area will be expanded as the CMF and cask system designs progress. Data for the feasibility study will be derived from the cask system development program proposals accepted by DOE-Idaho for contracting of cask design.

4.4.2 Shipping Schedule

The scheduling of SNF shipments affects CMF operations to the extent that "efficient" scheduling will minimize the number of basket changeouts. The number and sequence of basket changeouts will be affected by the extent that utilities will elect to exchange shipping rights. This, in turn, will impact cask reconfiguration rates, schedules, and the lead time for notification prior to those changeouts. A single "trade" can result in two reconfiguration visits to the CMF, unless some administrative control is effected.

4.4.3 Cask Reconfiguration

A portion of the cask maintenance operations may involve changing structures inside the casks. This will adapt the shipping casks to specific fuel element configurations. The extent of this activity will be dependent on a wide range of variables. These variables include: locations where changeouts can be performed, frequency of changeouts, scheduling notice for changeouts, and decontamination requirements.

A high percentage of the cask reconfiguration will involve a simple change in the basket to accommodate a change in the length of the fuel assembly. This may be accomplished by adding an insert spacer or moving a stop inside the basket tubes. If these changeouts are performed at the waste generator site, the MRS, or the repository, the throughput of the CMF could be reduced substantially.

A draft document "Preliminary Description of the Transportation Operations System" notes that "it is planned that the MRS, and repository will have selected cask servicing functions, such as fuel basket changeout capability." If this occurs, the CMF throughput requirements may be reduced.

4.4.4 NRC License Requirements

The effects of the NRC requirements for licensing the CMF are not known at this time. The uncertainty is exacerbated by not knowing how much radioactive material is expected to remain in the cask when it arrives at the CMF (see 4.4.5). This area is expected to be continually explored during the facility acquisition phase of the TOS program.

4.4.5 Radiological Contents of Unloaded Casks

The radiological contents of casks as they arrive at the CMF will have a marked effect on the operations and the equipment costs at the CMF. This area will require significant study and input from other participants in the waste management program.

4.4.6 Cask Decommissioning and Disposal

The CMF is expected to perform a decommissioning and disposal function for casks. Additional definition of these activities is needed. If the cask can be decontaminated to a level permitted for release as normal scrap salvage, no special disposal methods will be required. It may be necessary to disassemble certain components for disposal as low-level waste. This area requires further study.

4.4.7 Office and Personnel Space Requirements

The total transportation system has many functions that are not specifically associated with the CMF, but which could be conveniently located in the facility. These functions include the transportation system headquarters, transport vehicle tracking and communications center, and cask storage. Integration of the CMF with the MRS or the repository could also eliminate the need for several functions, which would logically be shared with the other facility. Shared functions could include change houses, administration, health physics, security, waste effluent control and treatment, and general maintenance shops. These factors should be evaluated at a later date.

4.4.8 Existing Casks and Low-Level Waste (LLW) Casks

Some question exists as to whether the CMF will be required to accommodate existing casks used for SNF, HLW and/or LLW.

4.5 INTERFACES AND INTERFACE REQUIREMENTS

4.5.1 Interface Control

Interface control is the process by which the characteristics of two (or more) systems are fixed where those systems meet at an agreed-upon condition. Neither system may be changed to modify those characteristics without the formal written approval of all parties involved.

The following characteristics of the waste transportation system are subject to interface control:

1. Shipping Casks
   - (a) weight empty, fully loaded;
   - (b) capacity intact assemblies, consolidated rods, canisters;
   - (c) external dimensions;
   - (d) internal dimensions;
   - (e) handling features;
   - (f) closure configuration;
   - (g) cask cavity sampling provisions; and
   - (h) ancillary equipment characteristics.

It is recommended that the following items be added to interface control relatively early in the acquisition cycle:

   - (i) exterior and interior surface composition, finish, and decontamination levels;
   - (j) basket design; and
   - (k) interfaces for maintenance of cask systems and ancillary equipment (i.e., who performs cask tie-down maintenance and inspection, vehicle trunnion support maintenance and repair, etc.?).

2. Transportation Vehicles
   - (a) dimensions,
   - (b) gross weight,
     - trailer/tractor
     - tie downs and personnel barriers,
   - (c) wheel loadings,
   - (d) axle loadings,
   - (e) turn radii,
   - (f) arrangement of cask on vehicle, and

(g) tie down features.

3. Cask/Vehicle Fleet

(a) number of types of each cask,

(b) cask utilization rate,

(c) loading times,

(d) unloading times,

(e) cask shipment rates, and

(f) cask decontamination levels.

4.5.2 Equipment Interfacing with CMF (Casks and Vehicles)

Approximately 6 existing cask designs and between 20 and 30 casks are in use in the United States, as of January, 1988. While similar in function and appearance, all vary in important respects, such as lifting features and lid design. Most of the existing casks are smaller than the casks under development as a part of the OCRWM Transportation System Acquisition. The CMF shall be designed to accommodate these existing casks on an occasional basis through the future addition of specific-purpose fixtures.

Each new cask design will have a unique lifting fixture. This should be expected for all future designs because of the substantial differences in size and weight requirements between designs and the difficulties of coordinating various engineering services.

These multiple cask designs impose a requirement on the CMF to have flexible interfaces.

Each cask design will have a unique transport platform and stringent requirements for tie downs and impact limiters. These features lead to integration of the transport vehicle bed and the cask body. Hence, tie-downs and impact limiters will be dedicated to a single cask and vehicle, rather than being generic and interchangeable.

4.5.2.1 Facility Interfacing Requirements

Hot Cells/Storage Pool

The CMF will perform maintenance, repair, and service functions for the internal and external parts of the transport casks. Portions of these casks may be contaminated with radioactive material. Protection from radioactive exposure shall be provided through the use of hot cells

or an operating environment that is submerged in water or other protective fluid.

Lifting Fixture Storage

The CMF shall provide storage and costing for 20 separate lifting fixtures, and this will provide for spares as well as new designs. The fixtures will be designed by others but will be tested and maintained in the CMF.

Lift Capacity

The CMF shall provide for a maximum lifting capacity of 175 tons. This lifting capacity will be in addition to the weight of the fixtures and established factors of safety.

[THE REQUIREMENTS FOR CRANE(S), THEIR CAPACITIES, AND DUTY FACTORS SHALL BE REEVALUATED UPON DEVELOPING AN INITIAL CONFIGURATION FOR THE CMF.]

Transportation System Limitations

The CMF shall be constructed to the specific cask-handling design limits, which are compatible with the practical bounds of the total transportation system. This will include a maximum diameter, length and port diameter, and diagonal dimension of the cask. All future cask designs would be restricted to these limits.

4.5.2.2 Cask Specifications

The prototype cask request for proposal (RFP no. DE-RP07-86ID12625) "Development of From-Reactor Casks" does not deal specifically with the details of the cask design. It does, however, specify the following important characteristics that bear on the CMF design:

1. All interconnecting and joining features must be remotely operable.
2. Envelope sizes for casks are provided:

Cask	Max. cask diam. (ft)	Impact limiter diam. (ft)
LWT, legal-weight truck	6	8
OWT, overweight truck	6	8
100-ton rail	8.5	10
125-ton rail	10	12
150-ton to MRS	11	12

3. Requirements for draining and drying.

4.5.2.3 Cask and Basket Lengths

Most fuel assemblies are 160 to 178 in. long; therefore, the new casks will be designed to carry fuel in this range. There are several fuel assemblies that exceed these dimensions, and these longer fuel assemblies (182 in.) may be handled by adding an extension onto the cask. It is questionable if this would work for a 199 in. assembly.

4.5.2.4 Cask Types

A description of each of the proposed casks to be acquired is given below. The unit ton refers to 2000 lb average CMF shall be capable of processing a minimum of two cask designs for each cask category.

Rail/Barge Casks

The rail/barge cask system will consist of a rail/barge cask with a weight limit of 100 tons, a 4-, 6- or 8-axle railcar, and any support equipment.

Legal-Weight Truck Casks

The legal-weight truck cask system will consist of a truck with a maximum gross vehicle weight of 40 tons, an SNF shipping cask with a weight limit of 28 tons, and any support equipment.

Overweight Truck Casks

The overweight truck cask system will consist of an overweight truck with a maximum gross vehicle weight of 60 (still to be confirmed) tons, an SNF shipping cask with a weight of up to 40 tons, and any support equipment.

Storage/Transportation Casks

An option under consideration for the transport of SNF from reactors is the dual-purpose cask system that can be used either for shipping or storage of SNF. The transporter for this system would be an 8-axle railcar with a gross vehicle weight of approximately 200 tons and a 125-ton limit.

HLW Truck Casks

HLW will also be accepted and transported. Both DHLW and CHLW will be canistered at the point of origin and transported directly to the repositories.

If truck transportation is used, the transporter would be similar to the type of legal-weight truck described previously. The cask expected

for use with truck transport is estimated to weigh about 25 tons, with a capacity for 1 HLW canister.

HLW Rail/Barge Casks

For HLW rail transport, the cask will have a weight limit of 100 tons. The transporter would be a four-, six-, or eight-axle railcar with a cask capacity of four HLW canisters.

From-MRS Rail/Barge Casks

SNF will be transported from the MRS facility to the repository by dedicated trains and, under unusual conditions, by heavy-haul trucks. The dedicated trains would consist of 5 eight-axle railcars, as an upper limit, although a six-axle car is also possible. The cask used in the dedicated rail system will be a 150-ton shipping cask.

In planning for the possible inability to use the rail system, a possible back-up method of transportation from the MRS facility is needed. A heavy-haul truck system is assumed to be used as a temporary contingency. This truck could have from 9 to 13 axles in order to transport the same 150-ton cask as the rail system.

4.6 SPECIAL ANALYSES

Special analyses required for input to the CMF Conceptual Design shall be defined as a part of the Feasibility Study Report. These shall be performed and incorporated into the SRD at a later date.

4.7 HUMAN FACTORS ISSUES

An analysis of the human factors associated with the CMF will require major input from the feasibility study. These analyses will be incorporated into the SRD as they are performed. It is anticipated that human factors analyses shall be postponed until conceptual design has been initiated.

4.8 MAINTENANCE ISSUES

Areas of the CMF that will require special testing or maintenance considerations shall be defined as part of the feasibility study. These considerations shall be incorporated into the SRD after the feasibility study is complete.

4.9 CRITICAL SYSTEMS

Areas of the CMF that could be considered as critical systems shall be identified as part of the feasibility study. The requirements of these systems shall be incorporated into the SRD at a later date.

4.10 TESTING AND INSPECTION REQUIREMENTS

4.10.1 Testing of Individual System Components

The major tests expected to be performed on cask system components in the CMF or supported by CMF personnel and equipment include, but are not limited to, the following:

4.10.1.1 Cask Pressure Test

A pressure test shall be performed for each cask. The cask cavity will be filled with fluid, pressurized, and the pressure variations observed and recorded over a 6-h time period. The cask cavity test pressure is determined by the CoC for the cask. The test is usually considered acceptable if there is no visible leakage at the orifice or at the lid closure, no loss of pressure over a set period of time, and no permanent deformation of the cask.

4.10.1.2 Cask Leak Test

The CMF shall have the capability of leak testing each seal on every cask that is to be maintained at the CMF.

4.10.1.3 Cask Radiographic Inspection

The CMF shall have the capability of performing radiographic tests on critical cask components.

4.10.1.4 Impact Limiter Humidity Test

A humidity test is performed on porous material-filled compartments of the impact limiters (if present in the cask design), as required by the CoC. The test determines the dew point of the balsa wood components.

4.10.1.5 Fusible Plug Test

A fusible-plug leak test shall be performed on fusible plugs (the plugs melt in case of fire to prevent pressure buildup) located on the porous material-filled components (if used in cask design). The test will be performed in conjunction with humidity testing. A typical cask may have approximately 40 plugs.

4.10.1.6 Load Tests

All lifting devices shall be load tested to 1.5 times the maximum load, annually or prior to each use, whichever is the greater time span. This requirement includes cask-handling devices, overhead cranes, and wire ropes. Trunnions, trunnion supports, and tie downs shall be tested.

4.10.1.7 Inspections and Preventative Maintenance

Components that perform a sealing function (lid seal O-rings, valve seats, etc.) are to be replaced on a defined time scale or after a defined number of transport operations. Current industry practice calls for replacement of elastomeric O-rings during the CoC testing cycle and replacement of metal O-rings after every use.

Components subject to mechanical wear (lid bolts, trunnions, etc.) are inspected as a regular program operation and are replaced as necessary.

4.10.1.8 Off-Site Testing

Radiation shielding and package "K_{eff}" testing is required for the cask CoC; however, these tests require that fuel be loaded in the cask cavity. Thus, it is not expected to be performed at the CMF.

A thermal test has previously been required every two years to verify the heat load capacity of the cask. At the present time, this test is not required. However, provisions shall be made to provide heating and measurement equipment and procedures for performing thermal tests, as and if required.

Verification of the shielding and package "K_{eff}" characteristics of a cask shall be made through analysis of data taken during normal shipping operations.

4.10.2 CMF Integrated Testing

An Integrated System Verification Program series of progressively integrated tests of the CMF equipment and facilities shall be performed as a part of the CMF construction acceptance procedures and system readiness tests.

4.10.3 Transportation Operations System Integrated Testing

The integrated testing associated with the CMF shall be coordinated with the testing of the entire TOS, when that testing has been defined.

The testing associated with the TOS will not be defined until after the CMF Feasibility Study Report is completed.

4.11 ASSESSMENTS AND REVIEWS

4.11.1 Safety Review and Documentation

The TOS will be continuously visible to multiple political entities, including state and local officials, Indian tribes, and private specific-purpose citizen groups. Cohesive, coordinated interactions with these groups is a necessary function of the TOS; coordination of these interactions will be performed by DOE-Headquarters.

The nature of the administrative interfaces with the waste generators, the day-to-day operational personnel, and the nature of the material transported by the system will all result in the need for a high level of safety for the public, as well as a public perception of the fact that the high level of safety is being maintained. As such, CMF safety analyses will be coordinated with the safety analysis for each system in the TOS after the feasibility study has been completed.

A preliminary safety and risk evaluation of CMF and its safety-related features shall be performed as a part of the CMF Feasibility Study Report.

4.11.2 Environmental Documentation

A preliminary environmental evaluation of CMF and its environmental-related issues shall be performed as a part of the CMF Feasibility Study Report. This preliminary evaluation shall determine the areas that will require further evaluation and/or policy decisions during conceptual design and later phases of the project.

4.11.3 Project Risk

A preliminary project risk evaluation of the CMF project shall be performed as a part of the CMF feasibility study. This preliminary evaluation shall determine the areas that will require further evaluation and/or policy decisions during conceptual design and later phases of the project.

4.11.4 Project Quality Assurance

Quality assurance will provide confidence that strict compliance to recognized standards has been maintained in the design of each system to

meet the required functions of the CMF. It is important, however, to maintain only that level of assurance warranted by the needs of both the overall TOS and the individual task at hand.

As such, a preliminary evaluation of the level of QA required for the CMF shall be performed using a graded approach in accordance with the requirements of American National Standards Institute Quality Assurance Program Requirements for Nuclear Facilities, (NQA-1) and 10 CFR 971. More stringent requirements shall be imposed on those activities deemed to be more critical to safety or the success of achieving the CMF mission; less stringent QA requirements shall be imposed on those areas where failure of an activity would not have major negative consequences on safety or the accomplishment of the CMF mission. This evaluation will be used for a later QA assessment.

4.11.5 Project Waste Management Assessment

A preliminary waste management evaluation of CMF and its waste streams shall be performed as a part of the CMF Feasibility Study Report. The goal shall be to identify those areas that will require significant attention and/or policy decisions during the CDR and later phases of the project.

4.11.6 Reliability, Availability, and Maintainability

In order to properly fulfill its mission, the TOS must achieve a certain level of total system (TOS) availability. Availability is attained by achieving certain levels of both reliability and maintainability.

Once a feasibility study is completed for each facility in the TOS, the reliability of CMF components, the entire CMF, and the entire TOS will be evaluated and adjustments made to the allocations given to individual TOS components and facilities, so that total TOS reliability meets reasonable criteria, which are yet to be established. The feasibility study for the CMF shall include an initial allocation of reliability for each major subsystem in the CMF, based on an experienced individual's best estimate of reasonably achievable goals.

Maintaining high TOS reliability is insufficient to be assured that a reasonable level of TOS availability is achieved. It is also necessary to restore a component of the system to operational readiness once it

becomes inoperative or requires periodic maintenance. Thus, a reasonable level of maintainability of TOS facilities and components is required. A preliminary allocation of maintainability of each major subsystem in the CMF shall be made, based on an experienced individual's best estimate of reasonably achievable goals.

4.11.7 Software Systems Development

The data processing storage and retrieval functions of the CMF are considered to be significant but not of such a quantity or complexity that would require special software development.

4.11.8 Safeguards and Security Assessment

Safeguards and security evaluations of CMF shall be performed as a part of the CMF Feasibility Study Report. This preliminary evaluation shall determine the areas that will require further evaluation and/or policy decisions during conceptual design and later phases of the project.

4.11.9 Technology Assessment and Development

Areas of concern and uncertainty, which may need development support or some advances in technology, shall be evaluated as a part of the feasibility study and shall be included in the feasibility study.

4.11.10 Technical Reviews

An intermediate and a final review of the CMF Feasibility Study Report design shall be performed.

4.11.11 Transition Plan

A plan for the transition from a capital project to operations shall be provided when an operating contractor and the management configuration to be used in managing the TOS have been defined.

4.11.12 Other Regulatory Assessments

The possible applicability of other regulatory assessments shall be evaluated on a continuous basis and included as a part of the feasibility study.

4.11.13 System Evaluation and Optimization

The CMF shall be internally optimized for its operations as a stand-alone facility during the feasibility study. When the programmatic decision is made concerning its integration into the remainder of the waste management system, a reoptimization may be required.

4.12 PROJECT TERMINATION PLAN

A Project Termination Plan shall be prepared for the performance under any contract that is used to provide services to support the acquisition process for the CMF. The plan can be as short as one sentence or can be several pages long, depending on the complexity and size of the contract. A one-sentence termination plan would be as follows:

> "When given written instructions by the contracting officer, all effort on and cost accrual on this project shall cease as of the effective date in those instructions."

As the scope of the CMF project progresses, each Project Termination Plan shall become more technically oriented.

5. CONFIGURATION CONTROL

5.1 CONFIGURATION CONTROL OF THIS DOCUMENT

All sections of this document shall be controlled in accordance with TOPO program change control procedure, once this document is "issued approved." All sections of this document shall fall under ORNL change control procedures after comments from the "Issue for Comment" version are received, conflicts therein resolved, and the document is "issued for approval."

5.2 CONFIGURATION CONTROL MANAGEMENT PLAN

A configuration control management plan for the CMF is not required for the feasibility study but shall be provided at a later date.

5.3 CONFIGURATION CONTROL REQUIREMENTS

The TOPO program manager, acting on the advice of the ORNL principal engineer, shall be responsible for determining when and if an item should fall under configuration control. Configuration control shall be used if, and only if, the item interfaces with the cask system, is crucial to the CMF configuration, or is a design building block for several design disciplines.

Appendix A
ACRONYMS

Appendix A
ACRONYMS

CFR	Code of Federal Regulations
CHLW	commercial high-level waste
CMF	cask maintenance facility
CoC	certificate of compliance
DHLW	defense high-level waste
DOE	the Department of Energy
DOT	Department of Transportation
FWMS	Federal Waste Management System
HEDL	Hanford Engineering Development Laboratory
HLW	high-level radioactive waste
HVAC	heating, ventilating, and air conditioning
MGDS	mined geologic disposal system
MRS	monitored retrievable storage (facility)
NRC	Nuclear Regulatory Commission
NWPA	Nuclear Waste Policy Act of 1982 (Public Law 97-425)
OCRWM	the Office of Civilian Radioactive Waste Management
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
QA	quality assurance
SNF	spent nuclear fuel
SRD	System Requirements and Description
TBD	to be determined
TOPO	Transportation Operations Project Office
TOS	transportation operations system
TSLCC	total system life cycle cost
UPS	uninterruptible power system

Appendix B
ASSUMPTIONS

Appendix B
ASSUMPTIONS

The rationale for each assumption associated with the CMF is given with that assumption. The assumptions are organized in a general hierarchy according to general design areas affected.

B.1 WASTE TYPES

The waste transportation system will accept shipments of SNF and HLW in accordance with contracts with waste generators and owners. Unloaded casks and related necessary cask-handling equipment will be provided to the waste generator (or owner). The waste generator (or owner) will then be responsible for loading the cask and for preparation of the proper documentation for the shipment. DOE will then take title to the SNF or HLW, will assume the responsibilities of the shipper, and will transport it to the repository or MRS facility.

The types of waste to be accepted include canned intact fuel assemblies, uncanned intact fuel assemblies, consolidated fuel, non-light-water reactor SNF, activated metals, miscellaneous wastes, DHLW, and West Valley HLW.

The CMF shall be capable of performing its specified mission for casks used to transport all of these waste types to and from the MRS and to the repository.

B.2 CASK TYPES

Different casks (or at least different internal configurations) will be required for each of the previously mentioned waste types. In addition, there are different lengths of materials to be shipped in casks. Cask cavities will be modified to accommodate different lengths and cross sections of SNF.

B.3 DECONTAMINATION

B.3.1 Contamination Surveys

Each cask will be surveyed before any decontamination. The normal radiological survey will include both a dose rate determination, with a meter, and a removable contamination survey, with smears.

B.3.2 Cask Contents

It is assumed that casks arriving at the CMF do not contain SNF in the form of intact fuel rods or in significant amounts of fissile material.

Decontamination operations involving the internal cavity of the shipping cask may involve fuel-bundle hardware or particles of SNF. This material will be remote-handled waste. The decontamination wastes generated will be classified similarly.

B.3.3 Exterior Contamination Requirements

The exterior of the cask system shall be a factor of ten lower than DOT contamination limits when it is shipped from the CMF.

The exterior of the cask system normally will be lower than DOT contamination limits when it arrives at the CMF. If not, the exterior shall be decontaminated and administrative procedures initiated.

The MRS or the repository will decontaminate the cask interiors to levels acceptable to the waste generators who will receive the cask or to comparable levels if the cask is to be transferred to the CMF from the MRS or the repository.

THE ABOVE STATEMENT REPRESENTS A POLICY ASSUMPTION THAT IS REQUIRED TO SIZE THE CMF. CHANGES IN THAT ASSUMPTION MAY MARKEDLY AFFECT THE SIZE OF THE CMF AND THE NUMBER OF CASKS IN THE TRANSPORTATION SYSTEM.

B.3.4 CMF Waste Shipping Casks

HLWs discovered in the cask interior or those that arise as a result of CMF operations will be transported to the repository or the MRS in NRC- and DOT-approved shipping casks. Other wastes will be solidified and will be disposed by means yet to be determined.

B.4 TRANSPORTATION SYSTEM OPERATIONAL RATES

The following assumptions affect the operational rates expected for the CMF.

B.4.1 Facility Duty Cycle

Each cask will require a minimum of one cycle per year in the CMF for recertification of compliance. Each cask will require another cycle through the CMF for regular maintenance and cleaning. A third cycle has

been allowed for unscheduled cleaning and/or maintenance that could not be performed routinely at the MRS or repository.

In addition to maintenance and cleaning, the cask processing rate will be dependent on the rate at which the internal baskets must be changed to accommodate different types of fuels. In the worst case, the system will not be able to schedule shipments efficiently and, thus, will require relatively frequent cycling through the CMF solely to accommodate individual shipment requirements on a one-at-a-time basis. An even worse scenario would require basket changeouts immediately before short notice (less than 30 d) pickup. The most likely possibility will require changeouts on a relatively infrequent schedule that would be coordinated with the normal servicing/maintenance/testing cycles. Basket changeouts can be assumed to add from 75 to 150 cycles per year to the facility processing rate.

The following table gives the CMF operational rates assumed at this time, based on an assumed total of 75 active casks in the system.

DESIGN OPERATING RATES

Process	Annual	Monthly	Weekly	Contingency	Annual Total
Receiving, total	225	48	14	33%	300
External cleaning	225	48	14	33%	300
Internal cleaning	150	24	7	33%	200
Basket spacer changeout	150	24	7	33%	200
Major repair (>1 d)	10	2	1	0%	10
Minor repair (<1 d)	75	10	4	33%	100
CoC testing	75	10	4	33%	100
Rework (>1 week)	10	2	1	100%	20

B.4.2 Operating Schedule

The document "Analysis of the Total System Life Cycle Cost for the Civilian Radioactive Waste Management Program," Volume I, Appendix A, offers guidance for the overall transportation system schedule.

The TSLCC assumes that the transportation system will operate 360 d/year.

The TSLCC assumes that the transport vehicles, when on the road, will be in service 24 h/d, but not necessarily moving. (Overweight trucks have major restrictions in this area.)

The CMF will be assumed to operate 15 shifts (5 d, 3 shifts) 52 weeks per year.

Production surges will be handled by extending production to the weekends.

Process equipment maintenance will be handled during scheduled weekend downtime.

A transport receiving area will be operational at all times, including the five recognized holidays.

B.5 TRANSPORTATION EQUIPMENT STORAGE

It is assumed that spare trailers will be required for each type of cask system. The total transportation system will require a surge capacity of extra casks and trailers. The CMF shall be the prime location for storage of these units.

Security of stored casks and cask trailers and railcars will be required.

The transport storage area will require a means of switching casks from one truck trailer to another and from one railcar to another.

The CMF will be capable of processing groups of rail/barge casks at one time. This results in a requirement for multiple railcar storage, motive means for railcars and trailers, and the ability to selectively remove (and replace) each cask from its railcar.

The CMF will have the capability to store approximately TBD casks in a nonoperational area.

All storage and storage equipment will be located inside the security fence of the CMF or co-located facility.

B.6 OTHER TRANSPORTATION SYSTEM ACTIVITIES

Activities such as vehicle tracking, scheduling, dispatching, and communications will not be included at this time as a part of the CMF.

B.7 BARGE CASKS

The CMF will not provide access for barge transport. It will be assumed that barge casks will be transported to the CMF for servicing via rail or heavy-haul truck.

B.8 RECORD KEEPING

Hard-copy records will be required for a majority of the critical records.

Duplicate off-site storage of hard copy will not be costed as part of the CMF.

B.9 AUTOMATIC OPERATIONS

It is assumed that the cask system will be designed for robotic or remote operations. This is based on the cask request for proposal, which specifically requires "remote and remote automatic" compatibility for all important cask features.

The above text is interpreted as follows:

- "Remote mechanical" refers to long-handled tools, special tools, manipulators, and hot cell operation.
- "Robotic" operation is defined as the above tools being operated by robot(s) to replace the human operators.

The entire area of automatic operation is susceptible to change and any assumptions concerning it remain open.

ORNL/TM-10855
ORO/TOP-5401.0

INTERNAL DISTRIBUTION

1-5. C. R. Attaway
6. T. S. Baer
7. A. G. Croff
8. C. W. Forsberg
9. R. K. Genung
10. R. W. Glass
11. R. M. Gove
12. I. G. Harrison
13. V. T. Hinkel
14. E. K. Johnson
15. E. H. Krieg, Jr.
16-20. L. G. Medley
21. J. R. Merriman
22. T. H. Pickel
23-27. R. B. Pope
28-32. J. E. Ratledge
33-37. R. R. Rawl
38. M. J. Rennich
39-41. J. H. Saling
42-46. L. B. Shappert
47. M. G. Stewart
48. W. C. T. Stoddart
49. V. C. A. Vaughen
50-53. W. M. Wankerl
54. A. G. Williamson
55. A. Zucker
56. Central Research Library
57. ORNL-Y-12 Technical Library
Document Reference Section
58-59. Laboratory Records
60. Laboratory Records-RC
61. ORNL Patent Section

EXTERNAL DISTRIBUTION

U.S. Department of Energy, Oak Ridge Operations, Post Office Box 2001, Oak Ridge, TN 37831

62. Office of Assistant Manager for Energy Research and Development

U.S. Department of Energy, Headquarters, RW-32, 1000 Independence Ave., SW, Washington, DC 20585

63. C. Kouts
64. W. Lake
65. R. Stein

U.S. Department of Energy, Chicago Operations, 9800 S. Cass Ave., Argonne, IL 60439

66. J. Holm
67. S. Kouba
68. J. Roberts
69. R. Rothman

U.S. Department of Energy, Defense Programs, DP-121, Washington, DC 20545

70. W. G. Bevan
71. F. Falci
72. R. Garrison
73. L. Harmon
74. J. Passaglia

U.S. Department of Energy, Idaho Operations Office, 550 Second St., Idaho Falls, ID 83401

75. C. Dwight
76. S. Hinschberger
77. T. Rowland

U.S. Department of Energy, Environmental and Health, EH-342, Washington, DC 20545

78. C. A. Caves

Sandia National Laboratories, P. O. Box 5800, Albuquerque, NM 87185

79. G. C. Allen
80. A. W. Dennis
81. J. E. Stiegler

Battelle - BPMD, 505 King Ave., Columbus, OH 43201

82. J. C. Allen
83. W. Pardue
84. R. W. Peterson

EG&G Idaho, Inc., P. O. Box 1625, Idaho Falls, ID 83145

85. A. Anselmo
86. R. Chapman
87. I. Hall
88. M. Ruska

U.S. Department of Transportation, Federal Rail Administration, RRS-32, 400 7th Street, SW, Washington, DC 20590

89. A. W. Carriker
90. M. Wangler

Science Applications International Corporation, P. O. Box 2501, Oak Ridge, TN 37831

91. R. E. Best
92. L. D. Dixon
93-97. S. T. Grady
98. E. O. Rutenkroger

99. P. A. Bolton, Roy F. Weston, Inc., 955 L'Enfant Plaza SW, Washington, DC 20024

100. L. Danese, Nuclear Assurance Corporation, 6251 Crooked Creek Rd., Norcross, GA 30092

101. C. D. Hansen, Westinghouse-Hanford, P. O. Box 1790, G1-35, Richland, WA 99352

102. R. H. Jones, Consultant, P. O. Box 1510, Los Gatos, CA 95031-1510

103. A. K. Jowdy, Ralph M. Parsons Co., 100 West Walnut St., Pasadena, CA 91124

104. S. C. Klein, The S. M. Stoller Corporation, 1919 14th St., Suite 500, Boulder, CO 80302

105. P. N. McCreery, Transnuclear, Inc., Route 2, P. O. Box 777, Aiken, SC 29801

106. L. Rouse, Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC 20555

107. K. J. Schneider, Battelle Pacific Northwest Laboratory, P. O. Box 999, Richland, WA 99352

108. T. E. Tehan, c/o GE-Morris Operations, 7555 East Collins Rd., Morris, IL 60450

109. W. B. Andrews, Science Applications International Corporation, Valley National Bank Bldg., 101 Convention Center Drive, Las Vegas, NV 89209

U.S. Department of Energy, Nevada Operations Office, P. O. Box 98518, Las Vegas, NV 89193-8518

110. E. L. Lundgaard

111. J. K. Robson

112-303. Given distribution as shown in DOE/OSTI-4500 under UC-513, Transportation of Nuclear Materials Category