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RECORD OF REVISIONS

Rev	Date	Description	POC	OIC
0	5/22/02	Initial issue.	Tobin Oruch, <i>FWO-SEM</i>	Kurt Beckman, <i>FWO-SEM</i>
1	6/9/04	Added elevator and crane material from Arch chapter; made standards tables required; other minor changes.	Charles DuPrè, <i>FWO-DECS</i>	Gurinder Grewal, <i>FWO-DO</i>
2	10/27/06	Administrative changes only. Organization and contract reference updates from LANS transition. IMP and ISD number changes based on new Conduct of Engineering IMP 341. Master Spec number/title updates. Other administrative changes.	Charles DuPrè, <i>FM&E-DES</i>	Kirk Christensen, <i>CENG</i>
3	9/29/09	Addressed tanks in rad service; administrative changes.	Charles DuPrè, <i>ES-DE</i>	Larry Goen, <i>ES-DO</i>

CONTACT THE MECHANICAL STANDARDS POC AND COMMITTEE
for upkeep, interpretation, and variance issues

Ch. 6, D10+E10	<u>Mechanical POC and Committee</u>
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D10+E10 GENERAL

NOTE: See [ESM Chapter 1](#) Section Z10 and Mechanical Chapter 6 Section D10-30GEN for additional requirements and definitions.

D10 CONVEYING

D1010 ELEVATORS AND LIFTS

1.0 GENERAL

- A. Refer to ESM Architectural Chapter (*Section C-Interiors*) for additional requirements for elevators (potentially).
- B. Refer to the following LANL Master Specifications:
 - 1. Section 14 2423, Hydraulic Passenger Elevators.
 - 2. Section 14 2413, Hydraulic Freight Elevators.

D1090 OTHER CONVEYING SYSTEMS (PROGRAMMATIC & FACILITY)

1.0 CRANES

- A. Refer to the following LANL Master Specifications:
 - 1. Section 41 2225, Hoists and Trolleys.
 - 2. Section 41 2213.13, Bridge Cranes.
- B. *Guidance: Refer to P101-25, Cranes, Hoists, Lifting Devices, and Rigging Equipment, especially Appendix A, Overhead and Gantry Cranes; Appendix B, Overhead Hoists; and Appendix C, Mobile Cranes, Crawler, Locomotive, and Wheel-Mounted Cranes*
- C. *For crane modifications, the LANL Crane Safety Program Owner in IHS should review proposed modifications that are proposed by a qualified mechanical engineer*

2.0 GENERAL

- A. Follow the standards in Table D1090-1 below when designing/specifying conveying equipment. They represent the minimum acceptable methods. Alternative methods including a graded approach (tailoring) may also acceptable, but approval by the ESM Mechanical POC is required. Any implementation methods selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.

TABLE D1090-1
Standards for Material Handling Equipment

Function/ Component	ML-3/4 General Service	ML-2/ Safety Significant (SS)	ML-1/ Safety Class (SC)
Cranes	CMAA 70/74 without nuclear sections; ASME B30.2 and 30.11; DOE-STD-1090; AISC Standards	CMAA 70/74 without nuclear sections; ASME B30.2, 30.11, and NOG-1; DOE-STD-1090; AISC Standards	CMAA 70/74 with nuclear sections; ASME B30.2, 30.11, and NOG-1; DOE-STD-1090; AISC Standards
Hoists	ASME B30.16, B30.21, and HST series	ASME B30.16, B30.21, and HST series	ASME B30.16, B30.21, and HST series
Other Equipment	AISC Standards	ANSI N14.6; AISC Standards	ANSI N14.6; AISC Standards

Titles for Table D1090-1

ANSI N14.6, Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More

ASME NOG-1, Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)

ASME B30.2, Overhead and Gantry Cranes, Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist

CMAA Specification 70, Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes

ASME B30.11, Monorails and Underhung Cranes

CMAA Specification 74, Specifications for Top Running & Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoists

ASME B30.16, Overhead Hoists (Underhung)

DOE-STD-1090, Hoisting and Rigging

ASME B30.21, Manually Lever Operated Hoists

3.0 SPECIAL REQUIREMENTS FOR NUCLEAR MATERIAL HANDLING EQUIPMENT¹

3.1 General Guidance

- A. *Safety-significant and safety-class handling equipment (cranes, manipulators, etc.) are only classified as such if their failure would create a radiological material release exceeding the guidelines for either classification. The safety-significant classification, as a defense-in-depth provision, is the more common classification for remote material handling equipment.*

3.2 General Requirements

- A. Failure modes for mechanical handling equipment used to move radioactive materials must address mid-operational failures, and designs must include recovery methods for such occurrences.
- B. Designs must accommodate periodic maintenance and inspection.

E10 EQUIPMENT

E1020 INSTITUTIONAL EQUIPMENT (PROGRAMMATIC AND FACILITY)

1.0 GENERAL

- A. Follow the standards in Table E1020-1 when designing/specifying equipment.
- B. Table E1020-1 represents the minimum acceptable methods. Alternative including a graded approach (tailoring) may also be acceptable, but approval by the ESM Mechanical POC is required. Any implementation methods selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.
- C. Follow DOE-STD-1132, Design Considerations, documenting any exceptions taken.
- D. Also refer to Chapter 11, *Hazardous Process* and Chapter 12, *Nuclear* for additional requirements for such equipment.

¹ The glovebox specs were developed in response to the [Type A Accident Investigation of the March 16 2000 Plutonium-238 Multiple Intake Event at the Plutonium Facility Los Alamos National Laboratory New Mexico dated 7/2000.](#)

TABLE E1020-1

Codes and Standards for Process Equipment			
Function/ Component	ML-3/4 General Service	ML-2/ Safety Significant (SS)	ML-1/ Safety Class (SC)
Pressure Vessels	ASME B&PVC, Section VIII; ESM Ch 17	ASME B&PVC, Section VIII; ESM Ch 17	ASME B&PVC, Section III Class II or Section VIII with QA enhancements ² ; ESM Ch 17
Tanks (0-15 psig) See note below table	API 620	API 620; ASME B&PVC Section VIII, Division 1 or 2 (even where they may be exempt due to pressure or other reason).	API 620; ASME B&PVC Section VIII, Division 1 or 2 (even where they may be exempt due to pressure or other reason).
Tanks (>15 psig)	ASME B&PVC Section VIII, Division 1 or 2	API 620; ASME B&PVC Section VIII, Division 1 or 2	API 620; ASME B&PVC Section VIII, Division 1 or 2
Tanks (containing flammable liquids)	API 620 and 650; NFPA 30	API 620 and 650; NFPA 30	API 620 and 650; NFPA 30
Tanks (atmospheric pressure)	API 650; AWWA D100; ASME B96.1	API 650; AWWA D100; ASME B96.1	API 650; AWWA D100; ASME B96.1
Pumps	API series; ASME B73 series; ASME B&PVC, Section VIII; AWWA E101; Hydraulic Institute Standards	API series; ASME B73 series; ASME B&PVC, Section VIII; AWWA E101; Hydraulic Institute Standards	API series; ASME B73 series; ASME B&PVC, Section VIII; AWWA E101; Hydraulic Institute Standards
Piping (also see ESM Chapter 5 Section D20)	ASME B31.3; LANL B31.3 Process Piping Guide	ASME B31.3; LANL B31.3 Process Piping Guide	ASME B31.3; LANL B31.3 Process Piping Guide; ASME-N278.1
Valves	ASME B16.5, B31.3	ASME B16.5, B31.3	ASME B16.5, B31.3
Heat exchangers	ASHRAE Handbook; ASME B&PVC, Section VIII, Division 1; TEMA 1 – Class RCB	ASHRAE Handbook; ASME B&PVC, Section VIII, Division 1; TEMA 1 – Class RCB	ASHRAE Handbook; ASME B&PVC, Section VIII, Division 1; TEMA 1 – Class RCB
Gloveboxes and interfacing systems	AGS Standards	AGS Standards; ASTM C852; NFPA 801	AGS Standards; ASTM C852; NFPA 801

Guidance Note: Use of combustible containment material in nuclear service is discouraged by DOE-STD-1066.

² “Applicability of ASME Sections III and VIII and of B31.1 and B31.3 to DOE Facilities,” George Antaki, Paper for the Fourth DOE Natural Phenomena Hazards Mitigation Conference, October 19-22, 1993, Atlanta. (EMref-18) (Note: EMref refers to an ESM team system for managing hard-to-find reference hardcopies.)

Titles for Table E1020-1

AGS G001, Guideline for Gloveboxes

AGS G002, Standard of Practice for Design and Fabrication of Glovebags

AGS G003, Standard of Practice for the Application of Linings to Gloveboxes

ANS 11.16 on gloveboxes if/when issued

API

610, Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services

620, Design and Construction of Large, Welded, Low-Pressure Storage Tanks

650, Welded Steel Tanks for Oil Storage

674, Positive Displacement Pumps-Reciprocating

675, Positive Displacement Pumps-Controlled Volume

ASME (or ANSI/ASME)

B&PVC – Boiler and Pressure Vessel Code

B16.5, Pipe Flanges and Flanged Fittings

B31.3, Process Piping

B73.1M, Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process

ASME, Con't

B73.2M, Specification for Vertical In-Line Centrifugal Pumps for Chemical Process

B73.5M, Thermoplastic and Thermoset Polymer Material Centrifugal Pumps for Chemical Process

B96.1, Welded Aluminum-Alloy Storage Tanks

N278.1, Self-Operated and Power-Operated Safety-Related Valves Functional Specification Standard

ASTM C 852, Standard Guide for Design Criteria for Plutonium Gloveboxes

AWWA D100, Welded Steel Tanks for Water Storage

AWWA E101, Vertical Turbine Pumps - Line Shaft and Submersible Types

NFPA 30, Flammable and Combustible Liquids Code

NFPA 801, Standard for Fire Protection for Facilities Handling Radioactive Materials (National Fire Codes, vol. 11)

TEMA 1, Standards of the Tubular Exchanger Manufacturer's Association

2.0 GLOVEBOXES

- A. Gloveboxes shall be designed, fabricated, and installed per LANL Master Specification Sections 11 5311.08, 11 5311.10, and 11 5311.12. (for non-nuclear application, delete those sections that do not apply with POC concurrence) ¹

3.0 SPECIAL REQUIREMENTS FOR SAFETY-RELATED PROCESS EQUIPMENT ³

3.1 Confinement Guidance

- A. *The usual safety function of process equipment is to provide primary confinement and prevent or mitigate radioactive and/or hazardous material releases to the environment. Process equipment that would be required to provide primary confinement includes the following: piping, tanks, pressure vessels, pumps, valves, and gloveboxes. These examples represent process system components that could be used to contain radioactive or toxic materials directly.*
- B. *Process equipment for some applications can provide secondary confinement. Examples include double-walled piping systems, double-walled tanks, and gloveboxes.*

3.2 Confinement Requirements

- A. Safety-class and safety-significant process equipment providing passive confinement (piping, tanks, holding vessels, etc.) must be designed to suitably conservative criteria; redundancy in their design is typically not required. The need for redundancy is required to be evaluated to the design of safety-class SSCs that involve active confinement process equipment (e.g., pumps, valves, etc.).
- B. *Guidance: The redundancy criteria should be considered in the design of safety-significant SSCs that involve active confinement process equipment.*

³ All nuclear-related material is based on Section 5.2 of DOE G 420.1-1, Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for use with DOE O 420.1 Facility Safety. The recommended codes and standards tables from G 420.1-1 were updated and expanded to consider Savannah River Site practice.