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page 2 of 2

Subject: SUPPLEMENTAL DESIGN REQUIREMENTS DOCUMENT SOLID WASTE OPERATIONS
COMPLEX W-306

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7. Abstract This document provides additional and supplemental information to the WHC-SD-W112-FDC-001, WHC-SD-W113-FDC-001, and WHC-SD-W100-FDC-001. It provides additional requirements for the design and summarizes Westinghouse Hanford Company key design guidance and establishes the technical baseline agreements to be used for definitive design common to the SWOC Facilities (Project W-112, Project W-113, and WRAP 2A).		
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SUPPLEMENTAL DESIGN REQUIREMENTS DOCUMENT
SOLID WASTE OPERATIONS COMPLEX

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Westinghouse Hanford Company
November 1994

for the
United States Department of Energy, Richland Operations Office
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**SUPPLEMENTAL DESIGN REQUIREMENTS DOCUMENT
SOLID WASTE OPERATIONS COMPLEX**

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ACRONYMS, ABBREVIATIONS AND INITIALIZATIONS

A/E	Architect/Engineer
AGV	Automatic Guided Vehicle
CAM	Continuous Air Monitor
CH	Contact-Handled
DBA	Design Basis Accident
DBF	Design Basis Fire
DMS	Data Management System
DOE	Department of Energy
FACP	Fire Alarm Control Panel
FAP	Fission and Activation Product
FDC	Functional Design Criteria
FM	Factory Mutual
HEPA	High Efficiency Particulate Air
HLAN	Hanford Local Area Network
HPT	Health Physics Technician
I&C	Instrumentation and Control
IEEE	Institute of Electrical and Electronic Engineering
IP	Internet Protocol
IVDTS	Integrated Voice and Data Telecommunications System
LCC	Life Cycle Cost
LIMS	Laboratory Information Management System
MLLW	Mixed Low-Level Waste
LLW	Low-Level Waste
MFP	Mixed Fission Products
MMI	Man-Machine Interface
MTR	Mean Time to Repair
MW	Mixed Waste (hazardous constituents)
NEMA	National Electrical Manufacturers Association
PCS	Plant Control System
PMS	Plant Management System
PSAR	Preliminary Safety Analysis Report
RCA	Radiologically Controlled Area
RCRA	Resource Conservation and Recovery Act
RFAR	Remote Fire Alarm Reporting
SDRD	Supplemental Design Requirements Document
SPC	Special Protective Coatings
SWB	Standard Waste Box
SWITS	Solid Waste Information Tracking System
SWOC	Solid Waste Operations Complex
TCP	Transmission Control Protocol
TRU	Transuranic
TRUM	Transuranic Mix
UL	Underwriters Laboratory
UE&C	United Engineers & Constructors
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant (Carlsbad, NM)
WRAP	Waste Receiving and Processing

**SUPPLEMENTAL DESIGN REQUIREMENTS DOCUMENT
SOLID WASTE MANAGEMENT COMPLEX**

1.0 INTRODUCTION

1.1 BACKGROUND

This Supplemental Design Requirements Document (SDRD) is used to communicate general plant design information common to WRAP 2A, Project W-112, and Project W-113 from Westinghouse Hanford Company (WHC) to the United States Department of Energy (DOE) and the cognizant Architect Engineer (A/E). The SDRD is prepared after the completion of a project Conceptual Design Report (CDR) and prior to the initiation of definitive design.

Information in this SDRD serves two purposes:

1. To consolidate design requirements that are common to WRAP 2A, Project W-112, and Project W-113 Functional Design Criteria (FDC) documents.
2. To serve as a means of change control for design commitments in the Title I and Title II design.

1.2 SCOPE

This document supplements the following SDRDs: WHC-SD-W112-SDRD-001 Revision 0, Enhanced Radioactive Mixed Waste Storage Phase V, Project W-112, WHC-SD-W113-SDRD-001 Revision 0, Solid Waste Retrieval Facility Phase 1, Project W-113, and WHC-SD-W100-SDRD-001 Revision 0, Waste Receiving and Processing Facility Module 2A. As an extension of the SDRDs, the information in this SDRD shall not conflict with the SDRDs. The FDC shall govern if contradictions occur. The SDRD provides additional requirements, summarizes key WHC design guidance and establishes baseline technical agreements to be used in definitive design of the WRAP 2A, W-112, and W-113 facilities.

The requirements provided in this document do not relieve the A/E of any design initiative or responsibility. The information contained herein represents the WHC technical position based on experience with similar facilities and is in the interest of consistency with other DOE facilities, where possible.

This document contains design bases and supplemental requirements which, if changed, could impact project cost or schedule. Therefore, deviations from this guidance must be made with WHC concurrence. Changes to this document will constitute a Level II change in accordance with established WHC change control procedures.

1.3 CODES AND STANDARDS

Hanford Plant Standards often can be used to provide compatibility with existing plant features and operations practices at Hanford. Hanford Plant Standards shall be used where specified herein by incorporating directly into the contract drawings and/or specifications or attached as an Appendix instead of being referenced on construction drawings or specifications for an offsite contractor.

The WRAP 2A, Project W-112, and Project W-113 facilities shall conform to applicable WHC manuals, as specified herein, and the latest revision of the Functional Design Criteria for each respective project.

The DOE Orders, regulations, codes and standards, and references listed in the latest revision of the Functional Design Criteria for each respective project shall apply to the engineering and construction of the projects. The latest editions of the DOE Orders, regulations, codes and standards, and references, at the start of definitive design, shall be used.

1.4 PROJECT INTERFACES

Refer to Solid Waste Management Complex Site Development Plan, WHC-SD-W112-ES-006 Rev.0 (Campbell & Nash, 1994), for the conceptual locations of WRAP 2A, Project W-112, and Project W-113 with respect to each other.

1.4.1 Project W-112 Interface With WRAP 1

Drums of contact handled (CH) waste will be received and stored in Phase V until WRAP 1 is ready to process them. Drums will consist of newly generated waste and retrieved waste, that will be managed under RCRA requirements. After being received in the Phase V receiving area, the drums will be identified by the bar code reader and batched by waste type as much as possible at this time. An automated guided vehicle will transport the drums to the automated storage building to be stored until the drums are ready to be processed at WRAP 1.

When WRAP 1 is available for processing, an automated guided vehicle will retrieve the drums from Phase V storage and transport it to the unloading station in WRAP 1.

After processing at WRAP 1, the individual drums will be picked up by a Phase V automated guided vehicle and transported to the automated storage building. The TRU waste will be taken to the head gas sampling station to be sampled prior to shipment to WIPP. When ready, the LLW will be taken to the Phase V shipping area to be shipped to its final disposal site. The TRU waste will be returned to WRAP 1 to be packed in the TRUPAC and sent on to WIPP.

The WRAP 1 SDRD established flowrates that state 70 TRU SWBs will be received and processed every year. The SWBs may be received into the Phase V box storage area or into the WRAP 1 receiving area. They will be transported to the headgas sampling station through the corridor by forktruck and returned to the WRAP 1 area for temporary storage. The Phase V automated storage

building will not accommodate SWBs. Any SWBs that will be stored for a period of more than a few weeks will be transported to the Phase V box storage area.

1.4.2 Project W-112 Interface With WRAP 2A

Drums of CH MLLW will be received into the Phase V receiving area, identified by bar code reader and batched by waste type as much as possible. An automated vehicle will transport the drums to automated storage to be stored until WRAP 2A calls for them.

A cure storage area utilized for product containers delivered from WRAP 2A will be provided by Project W-112.

When WRAP 2A is available for processing, an automated vehicle will retrieve drums from the storage area and transport them to the WRAP 2A receiving area. Boxes up to 5' x 5' x 9' dimensions will be retrieved from storage by Project W-112 and transported for receiving at WRAP 2A. New empty drums and product boxes that are required for processing will not be transported through the corridor but will be received directly at a WRAP 2A loading dock.

Waste drums will be taken from the storage area to WRAP 2A for sampling purposes and returned back to storage.

When processed at WRAP 2A, the waste is loaded into 4'x4'x4' product containers. Phase V automated vehicles or manually controlled vehicles (forklifts) will pick up the product containers and transport them to the cure storage area. When curing is complete, the product containers will be taken by automated vehicles or manually controlled vehicles (forklifts) to the Phase V shipping area to be sent to the final disposal site. An alternative method would be for the treated product containers to be shipped directly out of the storage area rather than being routed through W-112 Shipping/Receiving area.

1.4.3 Project W-112 Interface With Project W-113

Project W-113 retrieved waste containers shall be sent to Project W-112 for interim storage. The retrieved waste containers will ultimately be a feedstream for the Waste Receiving and Processing Facilities.

2.0 GENERAL DESIGN REQUIREMENTS

2.1 DESIGN FORMAT

- A. All contract drawings, field reference points, and as-built drawings shall be referenced to the Hanford Site coordinate system except for in-plant dimensions which can be referenced from a building column or grid lines.
- B. Automatic sprinkler system drawings, underground fire main drawings, materials and test certificates shall be stamped and signed by the holder of a current State of Washington Fire Sprinkler Certificate of Competency.

- C. A grounding system drawing which shows the location and method of attaching grounding cables to structural members, grounding rods, and other grounding electrodes shall be provided.
- D. A building fire alarm system layout drawings showing conduit runs with wire counts and size, and device locations with individual device indicating zone shall be provided. Fire alarm control panel point-to-point wiring diagram showing the interconnecting wiring in the panel and connecting wiring to the field devices shall also provided.
- E. Drawings for telecommunication systems showing the location of poles, underground conduit runs or duct banks, manholes, etc., by coordinates or by distance from permanent markers shall be provided. The layout, elevation, slope, and length of ducts shall be shown. The telecommunication and instrumentation raceway system layout required for each building shall be shown on building plans.
- F. Drawings for underground power distribution systems showing the location of underground conduit runs or duct banks, manholes, risers, etc., by coordinates or by distance from permanent markers shall be provided. The elevation of conduits, manhole floors, and manhole covers shall be shown. All special construction details shall be completely detailed. Cable terminations and splices shall be shown or referenced to manufacturer's instructions.
- G. Drawings, sketches, and/or diagrams shall be provided to clearly identify WHC designated Safety Class 1 or 2 systems (if any) and their boundaries.
- H. Vendor drawings for commercial items may be furnished on the vendor's format and shall be exempt from the drawing requirements of WHC-CM-6-3.
- I. Symbols used on engineering drawings shall be those shown in the Hanford Plant Standards, but if the symbology are not available, the symbols should follow the guidance of national consensus standards.
- J. Component numbers provided on schematic type drawings shall consist of the equipment acronym combined with alpha and/or numeric component(s) to provide unique identification for the equipment within the facility.
- K. Protective device/relay settings based on the electrical coordination study for each respective project's electrical distribution system shall be provided at the time of final turnover or acceptance testing. Protective device/relay settings shall be on a drawing or supporting document that is in a usable format for use by the facility electrical maintenance craftsmen.

- L. Lightning protection system drawings showing the air terminals, conductors, ground terminals, interconnecting conductors, and other connectors or fittings to complete the system shall be provided for each building where lightning protection is required.

2.2 FIRE PROTECTION SYSTEM

- A. The design of fire protection systems shall comply with the latest revisions of the following orders, codes, standards, and other applicable documents:

NOTE: The requirements listed were selected for re-emphasis based on past design review experiences on fire protection systems. These requirements were often omitted or not considered during the definitive design stage.

1. DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards
2. DOE Order 5480.7A, Fire Protection
 - a. Buildings shall be of noncombustible or fire resistive construction.
 - b. A graded FHA, that reflects the risks from fire in a facility, shall be performed for new facilities as directed by DOE 6430.1A.
 - c. Halon systems shall not be installed.
 - d. Design shall include features for control/containment of fire water runoff. **NOTE:** A waiver request for Project W-113 has been approved by DOE/RL for the design features variance proposed to control/contain internal fire water runoff for the trench enclosure building. The deviation provides relief from the requirements of DOE Order 6430.1A, Section 1540.99.0.2, Water Collection System.
3. DOE Order 6430.1A, General Design Criteria
 - a. Automatic fire sprinkler protection shall be provided where required.
 - b. Hydrants shall be placed so that hose lays from hydrants to the exterior portions of the protected buildings are no more than 300 feet. Hydrants shall not be closer to the buildings being protected by more than 50 feet. Water supplies provided by these projects shall include provision of a minimum of two fire hydrants within 300 ft. of each building.

- c. Portable fire extinguishers shall be provided throughout each building based upon the requirements of NFPA 10.
 - d. All equipment shall be UL Listed or FM approved for the purpose intended.
 - e. Sprinkler supply lead-ins shall be at least 6 inches except 4 inch lead-ins may be used when substantiated by hydraulic calculations. In no case shall the lead-in be less than the riser size.
 - f. Fire protection sprinkler feed mains will be controlled by PIVs.
 - g. Fire walls installed for separating occupancies as defined in NFPA 101 of non-compatible groups shall be rated at 2 hours or better and designed as required by NFPA codes.
4. DOE RLIP 5480.4C, Environmental Protection, Safety, and Health Protection Standards for RL
 5. DOE/EP-0108, Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems
 6. NFPA 10, Standard for Portable Fire Extinguishers
 7. NFPA 13, Standard for the Installation of Sprinkler Systems (1991)
 8. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances
 9. NFPA 30, Flammable and Combustible Liquids Code
 10. NFPA 70, National Electrical Code (1993)
 11. NFPA 101, Life Safety Code (1991)
 12. NFPA 231, Standard for General Storage
 13. NFPA 231C, Standard for Rack Storage of Materials
 14. NFPA 1221, Installation, Maintenance, and Use of Public Fire Service Communication System (1991)
 15. RLID 5480.7, Fire Protection
 - a. Distribution mains, either sanitary or raw water, shall be at least 12 inches in diameter.
 - b. Also, in accordance with the Tri-Party Agreement, WAC 173-303-630 (8) specifies use of the Uniform Fire Code for ignitable and reactive waste.

- c. Sectional valves shall be installed in accordance with a point system, such that no more than six points accumulate between sectional valves. The points for this arrangement are; one point for a fire hydrant, and two points for an automatic sprinkler system.
 - d. All distribution systems shall be of the looped grid type providing two-way flow.
 - e. Fire walls used to limit the Maximum Possible Fire loss to below \$150,000,000, shall be installed in accordance with FM Data Sheet 1-22, Maximum Foreseeable Loss Fire Walls. These loss limitation type walls shall be designed to remain standing even with the loss of the building on one side due to an uncontrolled fire.
 - f. Final HEPA filter housings shall be protected by fire rated barriers or by locating the housings in a separate structure of noncombustible construction with noncombustible contents per DOE Filter Plenum Fire Protection Standard March 1993, Draft Rev.4.
16. WAC 173-303, Washington Administrative Code
17. WAC 248-54, Washington Administrative Code
- The use of a double-check backflow prevention assembly at the base of sprinkler system risers shall be approved by the 200 Area WHC Water Purveyor.
18. WHC-CM-4-41, Fire Protection Program Manual
- a. All areas where fire protection systems are installed shall be provided with sufficient heat and/or noncombustible insulation to prevent freezing and/or equipment damage.
 - b. The fire protection system riser room ambient temperature shall be monitored by a system that includes a mechanism to transmit a trouble alarm to the Hanford Fire department if the riser room ambient temperature drops below 40 degree F.
 - c. Heat tape for freeze protection shall not be used for new fire protection system designs.
 - d. All fire barrier penetrations shall be provided with approved through-penetration firestops and/or protected by approved operable fire door(s), fire damper(s), or fire window(s) having the appropriate fire resistance rating.

- e. Wall, floor, and ceiling assemblies shall be tested and rated for their fire resistance by UL or similarly accredited testing laboratories, or shall be listed for their fire resistance as approved by Factory Mutual (FM) or similar national insurance organization.
 - f. The fire hydrants to be installed shall be of type approved by WHC Fire Protection Engineering.
19. American Waterworks Association (AWWA) Pacific Northwest Section Accepted Procedure and Practice in Cross Connection Control Manual
20. Hanford Plant Standard, SDC-7.8, Standard Electrical Design Criteria for Fire Alarm Systems
- Wet sprinkler systems designed without mechanical waterflow bells shall be equipped with electric non-silenceable waterflow bells. The bell shall be continuous ringing, mounted on the building exterior, 24 Vdc, and powered by the FACP. Bell shall be activated by the second pole of the water flowswitch (first pole shall activate the FACP zone alarm).
21. Hanford Plant Standards, Architectural-Civil Standards, Section AC-5 - BARRICADES AND MARKERS
- Traffic protecting posts around fire hydrants and post indicator valves shall be provided. Identification signs shall be provided for all control valves and post indicator valves.
22. HANFORD CHAPTER to the DOE FIRE PROTECTION RESOURCE MANUAL guidelines for the design of fire protection systems:
- a. Hydraulically designed sprinkler systems shall have a pressure factor that is a minimum of 10 percent below the water supply curve. This design shall include the basic 500 gpm hose stream allowance and any additional hosestream allowances and other water demands that may be part of the requirements, such as in-rack sprinkler demand or other process demand.
 - b. FM Loss Prevention Data Sheets 2-84 provide maximum velocities for sprinkler piping and should be consulted. Avoid turbulent velocities in piping.
 - c. An alarm check valve is needed on all new wet pipe sprinkler systems in permanent facilities that have 20 or more heads.

- d. Water flow test data is required and shall be included in the design of facilities that will have fire suppression systems installed. WHC will provide the water flow data upon request prior to the definitive design. Water flow test data are based on the annual testing of fire hydrants and recording of flow data of the fire hydrants in the area where they are located.
 - e. Sprinkler systems shall be designed to NFPA 13 Ordinary Hazard Group 2 Occupancy minimum. The density may be higher depending on the degree of hazard. A density lower than the Ordinary Hazard Group 2 density may be used only when specified by DOE approved project documents. For WRAP 2A, administrative areas shall be designed to NFPA 13 Ordinary Hazard Group 1 Occupancy.
 - f. Automatic sprinkler system drawings, underground fire main drawings and the Contractor's Materials and Test Certificates that are produced by a Off-Site Contractor are required to be stamped and signed by the holder of a current State of Washington Fire Sprinkler Certificate of Competency. This requirement is per WAC 196-24-050 and RCW Chapter 1843.
 - g. Sprinkler systems having air or other gases in the piping (dry, pre-action, or deluge) shall be designed using internally and external galvanized piping. A "C" factor of 120 shall be used in the calculations.
 - h. Air compressors installed on dry systems under 150 gallon capacity shall be UL listed.
 - i. Trim valves and accessories of alarm check valves, dry pipe valves, deluge valves etc. must be approved or listed for intended use as part of the approved trim package as supplied by the manufacturer.
- B. Miscellaneous specific requirements based on Hanford Site engineering practices:
- 1. Exit signs shall be illuminated with a white background and green letters.
 - 2. Provide early warning air sampling smoke detection systems similar to the "VESDA" system for all non-reactor nuclear facilities. Other smoke detection systems that the off-site A/E proposes as a substitute or equivalent will be accepted upon review and approval of WHC Fire Protection Engineering.

2.3 FIRE HAZARDS ANALYSIS

- A. A preliminary Fire Hazards Analysis (FHA) shall be completed and submitted as a portion of the Title I Design Package. A final FHA shall be submitted at the end of construction. The FHA shall be performed under the direction of a qualified Fire Protection Engineer.
- B. The approved FHA fire protection recommendations for each project (WRAP 2A, W-112, and W-113) must be incorporated in the design.
- C. The FHA shall, as a minimum, address the following items listed in the Fire Hazards Analysis Requirements, Section 3.4 of the WHC-CM-4-41, Fire Protection Program Manual:
 - 1. description of construction
 - 2. safety class systems
 - 3. fire protection features
 - 4. description of fire hazards
 - 5. life safety considerations
 - 6. critical process equipment
 - 7. high value property
 - 8. damage potential: maximum possible fire loss (MPFL) and maximum credible fire loss (MCFL)
 - 9. fire department/brigade response
 - 10. recovery potential
 - 11. potential for toxic, biological, and/or radiological incident due to fire
 - 12. emergency planning
 - 13. security and safeguards considerations related to fire protection
 - 14. natural hazards (earthquake, flood, wind) impact on fire safety
 - 15. exposure fire potentials

2.4 FIRE ALARM SYSTEM

A. The following HANFORD CHAPTER to the DOE FIRE PROTECTION RESOURCE MANUAL guidelines for the design of fire alarm systems shall be considered:

1. The fire alarm systems shall detect the operation of any signal-initiating device such as a flowswitch, manual pull station, detector, or tamper device and shall initiate a signal through the local fire alarm panel which will alarm locally and transmit a coded signal to the 200 Area Fire Station via the Fire Alarm Reporting (RFAR) box.
2. The Fire Alarm Control Panel (FACP) alarm zones shall be assigned numbers beginning with zone one(1). Waterflow alarm zones shall be assigned the lowest ordinal numbers (i.e., 1, 2, 3 etc.).
3. Supervisory/trouble zones shall be assigned zone numbers beginning with the highest zone number available within the FACP. They shall be collectively signalled to the RFAR via the FACP system trouble contacts. Supervisory zones shall be configured per NFPA 72, 1990, with initiation switches wired in parallel and circuits supervised.
4. Fire alarm zones, as much as practical, shall be assigned with emphasis on geographic location within the facility. This implies that different types of initiating devices shall be included on a single zone if they indicate an alarm within a defined and logical geographic zone. However, each waterflow signal shall be assigned a unique zone.
5. FACP zone assignment shall be coordinated with the Hanford Fire Department and approved by Fire Protection Engineering.
6. The FACP system TROUBLE signal to the RFAR shall be fed directly from the panel system trouble contacts.
7. FACP shall be provided with alarm zone disconnect switches, if provided by the manufacturer. (Disconnect switches shall initiate a trouble condition when activated.)
8. The system design shall include a bell bypass switch mounted within the locked enclosure of the FACP. Operation of the bell bypass feature shall initiate a system trouble condition.
9. Operation of any remote function (such as HVAC or computer shutdown) in response to a fire condition detector shall be processed by the FACP. The remote function initiation circuit shall include a function bypass switch which shall initiate a trouble condition when activated.

- B. NFPA 72, Installation Maintenance and Use of Protective Signaling Systems (1993)
 - 1. Smoke detectors shall be installed at the recommended distance away from HVAC supply and exhaust air grills into the room or spaces to avoid nuisance alarms.
 - 2. FACP batteries shall be sized for a backup duration of 60 hours.
- C. Hanford Plant Standard, SDC-7.8, Standard Electrical Design Criteria for Fire Alarm Systems
 - 1. The fire alarm systems shall be designed and constructed in accordance with the Hanford Plant Standard SDC-7.8, Standard Electrical Design Criteria for Fire Alarm Systems.
 - 2. FACP design shall include spare alarm/supervisory zones whose number shall be one, or 20% of existing zones, whichever is greater.

2.5 ELECTRICAL SYSTEM

2.5.1 Electrical Utilization Voltages

- A. Electrical utilization voltages shall be provided at 480V, 3 phase, 3 wire; 480Y/277V, 3 phase, 4 wire; 208Y/120V, 3 phase, 3 wire; and 120/240V, 1 phase, 3 wire, as required.
- B. WRAP 2A building's utilization voltage shall be metered and a loss of power alarm signal shall be sent to the control room for power loss/recovery procedures.
- C. Lightning and surge protection shall be provided on the incoming 13.8 Kv primary service.
- D. An overall voltage drop of 5% per NEC 210-19 (FPN No. 4), NEC 215-2 (FPN) No. 2), and NEC 310-15(b) FPN No. 3) is acceptable.
- E. An overall power factor for Project WRAP 2A of not less than 95% shall be achieved using switched capacitor banks.

2.5.2 Electrical Grounding

- A. A building grounding electrode that is in compliance with NEC Art. 250-81 shall be provided where the secondary neutral point of dry type transformers shall be connected.
- B. A separate equipment "green" ground wire shall be provided for each feeder and branch circuit conductors and terminated in the factory installed ground bus, bar, or terminal lug that shall be provided for all the electrical distribution equipment.

- C. A grounding plate(s) connected to the building ground grid shall be installed in the electrical closet(s), telecommunication room(s), central control room(s), and computer room(s).
- D. A grounding conductor shall be included in the concrete envelope of the electrical duct banks (not in a duct) and connected to an existing ground, preferably at the power source.
- E. A ground grid shall be provided around the outdoor power transformers pad.
- F. Auxiliary (external) bonding of the enclosures or frames of electrical equipment to adjacent metal members shall be considered where personnel hazards may exist.
- G. An isolated grounding grid shall be established for the WRAP 2A Facility PCS System similar to the WRAP 1 isolated grounding grid (see WRAP 1 SDRD Section 2.12.2.2, Grounding).

2.5.3 Equipment Nameplates

- A. An equipment nameplate shall be provided on the front face plate of all the electrical distribution equipment which will include the following information: equipment number designation, feeder power source, and system voltage.
- B. Service equipment number designations shall be provided by WHC obtained through its onsite electrical utility subcontractor (ICF Kaiser Hanford Company).

2.5.4 Equipment Provisions for Future Expansion

- A. The equipment rating for the following shall include a 25% extra capacity [NOTE: After all definitive design loads are determined] for future expansion: power and dry type transformers, power and lighting panelboards, switchgears, switchboards, UPS, and motor control centers.
- B. Allow enough space at the end of switchgears, switchboards, and motor control centers where they are to be installed to allow enough floor space and working clearances for additional future vertical section(s), minimum of one (1) vertical section.
- C. Spare conduits in electrical and telecommunication duct banks shall be provided for future use. As a minimum, the number of spare conduits to be provided shall not be less than 25% of the active electrical and telecommunication conduits, but not less than 1 spare. Plug or cap spare raceways.
- D. Provide spaces only (space and busing for future use) for breakers or motor starters that may be added on later to the following electrical equipment: power and lighting panelboards, motor control centers, switchgears, and switchboards. As a minimum, the number of spaces to be provided shall not be less than 25% of the active breakers or motor starters.

2.5.5 NEC Hazardous Locations

- A. The need for "hazardous locations" evaluation for areas handling, processing, transferring, or storing flammable liquids or gases shall be done during the design such that the electrical installation shall comply with the NEC requirements for areas classified as "hazardous locations," if any.
- B. UL listed or FM approved explosion-proof and intrinsically safe electrical devices shall be used as needed.

2.5.6 Electrical Duct Banks

- A. Power and telecommunication cables shall not be run in a common duct and manhole systems. Power and communication duct banks shall have their own manhole systems.
- B. Drainage of all duct runs must be provided. Ducts shall be sloped a minimum of three (3) inches per 100 feet between adjacent manholes or from a high point in the duct to the manhole openings. Low points in the duct run should be avoided. If such construction is necessary, the low point must be adequately drained.
- C. A minimum of three (3) inches of concrete shall be placed on all sides of the duct and two (2) inches between individual conduits for unreinforced duct banks.
- D. Duct runs shall be marked with marker posts placed at each angle or turn and approximately 150 feet apart on straight runs.
- E. Manholes shall be prefabricated type, not smaller than five (5) feet wide by eight (8) feet long on the inside and shall have at least six (6) feet clear inside height.

2.5.7 Power Transformers

- A. Primary and secondary protection shall be provided as required by the NESC for transformers rated over 600V.
- B. Traffic protecting posts shall be provided, if transformer pad is accessible to vehicular traffic.
- C. Power transformer's construction shall be suitable for outdoor installation.
- D. The WRAP 2A power transformers (sized such that 1 transformer alone will not carry the entire building's load) to be used to step down the primary 13.8 Kv primary service to the building's utilization voltage shall have all the auxiliary equipment (except the cooling fans) for future forced air cooling.

2.5.8 Switchgear/Switchboard

- A. The WRAP 2A low voltage switchgear that will distribute 480V service to the motor control centers shall be arranged in a split bus configuration with non-automatic, normally open tie breaker(s) to prevent automatic paralleling of loads without first shedding non-critical loads in order to prevent overloading of the power transformers. A metering section shall be provided.
- B. Projects W-112 will use switchboards for distributing 480V service to equipment.

2.5.9 Motor Control Centers

- A. The motor control centers construction shall be a NEMA Class I, Type B, wherein the starter units control leads are brought out to separate terminal blocks for customer wiring. Mechanical and electrical interlocking is to be provided for reversing and multi-speed starter units.
- B. A control/ladder diagram showing the schematic wiring from remote field mounted devices and any interlocking wiring with other process equipment controllers to the motor control center starter unit of each major piece of process equipment shall be provided.
- C. Unit compartments shall have mechanical interlocking provisions to prevent removal or reinsertion of a unit starter or circuit breaker when the disconnect is in the ON position. Also, a padlocking arrangement that will permit locking the disconnect in the OFF position shall be provided.

2.5.10 Power Panelboards

- A. Where the power panelboard is supplied through a transformer, the main overcurrent protection rating to be provided on the panelboard shall not exceed the overcurrent protection rating required for the secondary of the transformer.
- B. Projects W-113 will use power panelboards for distributing 480V service to equipment.
- C. Power panelboards shall be located such that voltage drop to the farthest electrical load served is limited to a voltage drop as permitted by NEC 215-2 (FPN No. 2).

2.5.11 Dry Type Transformers

- A. The secondary neutral point of the transformer shall be connected to the building grounding electrode via a grounding plate installed near the transformer.
- B. An equipment nameplate on the dry type transformer shall be provided per NEC 450-11.

2.5.12 Lighting Panelboards

- A. Where the lighting panelboard is supplied through a transformer, the main overcurrent protection rating to be provided on the panelboard shall not exceed the overcurrent protection rating required for the secondary of the transformer.
- B. Panelboard shall be located such that voltage drop to the farthest electrical load served is limited to a voltage drop as permitted by NEC 210-19 (FPN No. 4).

2.5.13 Motor Controllers

- A. Factory installed auxiliary contacts (in addition to the holding circuit contact), at least two (2) N.O. contacts and two (2) N.C. contacts, shall be provided.
- B. Factory installed control circuit transformers with two (2) fuses in the primary and one (1) fuse in the secondary, shall be provided.
- C. Motor controller required minimum NEMA size shall be Size 1.
- D. Manual motor starters used for equipment loads shall be provided with low voltage protection such that no automatic start-up after a power loss will occur for personnel safety reasons. Manual motor starters must be manually reset after a power loss.
- E. Motor overload assembly heater elements shall be sized on the actual motor nameplate full load current rating, manufacturer's recommended heater size, motor operating ambient temperatures and motor service factors.
- F. Adjustable speed drives for motors provided with a manual mode of backup operation with shall be sized at 150% of the maximum horsepower requirements. Manual mode of backup operation means providing the capability of operating the motor from a built-in by-pass across the line motor controller if the adjustable speed drive fails to start, shutdown due to a fault, or shutdown for both unscheduled/scheduled maintenance/repair. By-pass of the variable frequency motor control does not imply that motors are to automatically go to full speed.

2.5.14 Motor Enclosures

Motor enclosures shall be of the following type:

- A. outdoors or in wet locations : totally enclosed, fan cooled (TEFC)
- B. indoors or dry locations : open drip-proof
- C. NEC classified hazardous locations : explosion-proof

2.5.15 Equipment Enclosures

Equipment enclosures shall be of the following type:

- A. NEMA Type 1, general purpose enclosure, for inside installation in the support buildings used for administrative purposes.
- B. NEMA Type 4, dust tight and water tight, for outside installation exposed to the weather and in WRAP 2A Zone 1 and 2 process areas.
- C. NEMA Type 12, dust tight and drip tight for industrial use, for inside installation in the process buildings, except in WRAP 2A Zone 1 and Zone 2 process areas.
- D. For hazardous location installations, the NEMA Type enclosure to be provided shall be specifically approved for the NEC class and division hazardous classification.
- E. Electrical equipment enclosures (NEMA Type 4X) shall be either stainless steel, fiber glass, or fiber glass reinforced polyester material when used in corrosive locations.

2.5.16 Disconnect Switches

Each electrical equipment located outdoors or roof mounted shall be provided with a local, non-fused, hp-rated and heavy duty disconnect switch, if none is provided with the equipment as manufactured.

2.5.17 Packaged Unit Distribution Center

- A. Electrostatic shielding shall be provided to packaged unit distribution center's transformer where a complete electrical isolation from the normal supply source and attenuation of some of the source line interference is required for the electrical equipment or instruments.
- B. The electrostatic shielding shall be factory connected to an isolated terminal marked "SHIELD" and shall be connected to the building grounding electrode via a grounding plate installed near the transformer.
- C. Isolated grounding receptacles with separate equipment grounding conductors shall be used.

2.5.18 Electric Heaters

- A. Electric unit heater(s) or baseboard heaters with thermostatic control shall be provided at the building's mechanical/electrical/maintenance/fire riser room(s) .
- B. An automatically controlled electrical heat tracing system using self-limiting heating cable shall be provided for all outside tanks and associated piping as required, except for new Fire Protection Systems.

2.5.19 Lighting

2.5.19.1 Emergency Lighting

- A. For emergency lighting unit equipment used for emergency illumination, the branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches.
- B. Emergency fluorescent fixtures ballast shall be provided with a battery backup power source with automatic recharge capability.
- C. Non-fluorescent areas shall be provided with battery operated, automatic recharging emergency lighting unit equipment.
- D. Emergency exit lights shall be provided with battery backup source with automatic recharge capability.

2.5.19.2 Exterior Lighting

- A. Exterior wall mounted lighting fixture(s) on photo-cell control that will illuminate the area around the buildings exterior doors shall be provided.
- B. Roadway/parking lot lighting standards to be provided shall have:
 - 1. a grounding equipment wire terminated on a terminal lug to which the branch circuit equipment grounding conductor can be connected
 - 2. an overall height that shall withstand the Hanford Site design wind velocity conditions
 - 3. the branch circuit is from a panelboard located inside a nearby building
- C. To preserve the low stray light environment of the Hanford area which is being used for scientific research in aeronomy and astronomy by facilities on top of Rattlesnake Mountain, the following are exterior lighting design requirements:
 - 1. Lighting for buildings, streets, fences, etc., shall be designed as close to the minimum requirements as practicable.
 - 2. The required exterior illumination source shall be clear mercury vapor or low-pressure sodium (LPS).
- D. Street and walkway lighting shall be provided in areas where there is pedestrian traffic after dark.

2.5.19.3 Interior Lighting

- A. For high ceiling areas, where high-intensity discharge (HID) lighting fixtures are used, selected fixtures shall include integral quartz backup lamp(s) to provide lighting during the HID lighting fixtures restrike time.
- B. Where the illumination levels required for a task exceeds the applicable recommended levels of the Illuminating Engineering Society (IES), design shall consider providing local or task-supplemental lighting to minimize general overhead lighting requirements.

2.5.20 Feeder Circuits

- A. The manufacturer's recommended maximum overcurrent protection for certain electrical equipment shall not be exceeded.
- B. A full size neutral wire shall be provided with the feeder conductors.
- C. Power feeders shall not be mixed with control, instrument, or alarm wiring.
- D. A larger size wire shall be used in order to limit voltage drop in a circuit rather than based on the circuit ampacity required.
- E. Tabulated conduit and circuit schedule drawings showing the identification number, routing, number and type of conductors used in the facilities shall be provided.
- F. Clear and permanent identification and marking of every conductor at every termination point in every circuit shall be provided.
- G. Spare conduit systems with pulling string installed in the conduit(s) shall be identified for future use at both ends.
- H. Cables installed in radioactive environments shall be rated for the maximum anticipated radiation exposure.
- I. Non-computer equipment shall not be served by feeders or branch circuits serving central control room(s), computer, and telecommunication equipment.
- J. Aluminum conduits shall not be used.
- K. No direct burial type cable shall be used except for temporary construction power and lighting services.

2.5.21 Branch Circuits

- A. Branch circuiting for the single phase 120 V and 277 V electrical loads shall be such that the panelboards bus phases are as closely balanced in load as possible.

- B. Branch circuiting for the lighting circuits shall be so arranged, such that loss of a single lighting circuit does not deprive an entire area of illumination.
- C. 230 V and 240 V motors shall not be used on 208 V systems. Instead motors specifically wound for 208 V shall be specified.
- D. Branch circuiting for the electrical outlets shall be so arranged, such that a loss of a single electrical outlet circuit does not deprive an entire area of power.
- E. The maximum number of electrical outlets on a 20 amp general use branch circuit shall not exceed eight (8).
- F. In view of increasingly heavy loads of office machines, these electrical outlets shall be circuited at no more than six (6), and less if the equipment to be fed so dictates.
- G. Each of the following branch circuit loads shall be provided with its own dedicated power: through-the-wall packaged air conditioning units and electric baseboard heaters.
- H. One (1) electrical outlet for every 40 sq ft of floor space or ten (10) linear feet of wall space in small offices shall be provided whichever provides the greatest number of outlets.
- I. Exposed conduit runs crossing building expansion joints shall be provided with conduit expansion joint fittings.
- J. Specification grade wiring devices shall be provided.
- K. Each circuit and/or wire shall be identified at each end and in all junction, terminal and pull boxes with an identifying number. Identifying permanent non-weathering type labels shall be firmly attached to the cable, wire, or wires.
- L. An individual wire shall have the same assigned number at each end and at the location where it is terminated.
- M. A larger size wire shall be used in order to limit voltage drop in a circuit rather than based on the circuit ampacity required.
- N. Spare empty conduits stubbed out and capped above the suspended ceiling for future branch circuits shall be provided from flush or recessed mounted panelboards. As a minimum, the number of spare empty conduits shall not be less than 25% of the active electrical conduits, but not less than three (3) - 3/4 inch conduits.
- O. Critical equipment not hard-wired shall be provided with cord plugs and outlets that are of the "twist-lock" type.
- P. An underfloor raceway system for electrical, data, and communication cabling shall be used for the administrative areas open bay offices.

- Q. Telecommunication rooms shall be provided with dedicated electrical outlets required for the equipment.
- R. Aluminum conduits shall not be used.

2.5.22 Control and Alarm Circuits

- A. All control systems shall be designed for safe failure positions in the event of a complete loss of electrical power, instrument/plant air systems, or hydraulic power.
- B. Human engineering practices in accordance with MIL-STD-1472D shall be used when designing man-machine interfaces.
- C. All devices requiring periodic operator adjustment shall be accessible without exposing operator to exposed live electrical parts.
- D. Indicating push-to-test pilot lights shall be provided to indicate both normal and abnormal equipment or system operating status.
- E. Indicating pilot lights color indication (lamp on) shall be per HPS E-14-10, Colors for Indicator Lamps, Rev.1.
- F. The following emergency alarms with the corresponding audible sound generating equipment (the sounds for these alarms shall not be used for any other alarming or signaling purposes) are uniformly used at the Hanford Site:
 - 1. fire alarm: sound of a metallic bell being struck at a frequency of two strokes per second
 - 2. critical radiation alarm: "AH-OO-GAH" sound generated by a motor-driven howler
 - 3. evacuation alarm: steady "ON" siren signal generated by a motor driven siren
 - 4. telephone crash alarm: continuously ringing bell
 - 5. take cover alarm: wailing siren signal generated by a motor-driven siren
- G. Audible alarms sound levels shall be a minimum of 80 dB and distinctly audible above the ambient background noise sound level from ten (10) feet away. These alarms shall not subject personnel to sound levels greater than 125 decibels.
- H. Equipment enclosures for relays and controls shall be provided with breather or drain fittings.
- I. All terminal boxes and control panels shall be provided with a minimum of 25% spare terminal points.

- J. Control relays contacts shall be rated 10 amps minimum continuous at rated contact voltage. Relays shall have two (2) spare convertible contacts in addition to the contacts required by the control system.
- K. Liquid spill collection devices shall have provisions for a fail-safe high level detection and alarm system.
- L. Aluminum conduits shall not be used.

2.5.23 Electrical Closets

Electrical closets shall have in general, a minimum of 42" of clear working space in front of panels, switches, and other electrical apparatus.

2.5.24 Electrical Backup Power

2.5.24.1 Uninterruptible Power Supply

- A. The WRAP 2A uninterruptible power supply (UPS) to be provided shall consist of a rectifier/charger, inverter, static bypass switch, maintenance bypass switch, battery circuit breaker and battery.
 - 1. The AC output of the UPS shall be connected to a separately mounted UPS power panel serving the loads requiring uninterruptible power.
 - 2. The battery shall be internally mounted and connected to the DC input through the battery circuit breaker.
 - 3. Utility AC power shall be connected to the normal source AC input of the UPS.
 - 4. A power receptacle shall be provided on the outside wall of the UPS room where a WHC furnished portable 45 Kw diesel-generator can be plugged in as the bypass AC power source to the UPS. NOTE: This power receptacle is applicable only to the WRAP 2A Project. This will be needed in the event of an overload or degradation of the inverter's performance and the static bypass switch, rectifier/charger and inverter are electrically isolated for maintenance.
 - 5. The UPS shall be forced air cooled with air inlets provided with filters that are changeable without opening the cabinet doors.
 - 6. The UPS audible noise level is to be less than the noise exposure limits in Occupational safety and Health Administration (OSHA) standard 1910.95.
 - 7. The UPS enclosure maintenance access to the UPS electronics and batteries shall be through hinged doors requiring a special tool to open.

8. The UPS with bypass shall have a minimum of 100,000 hours mean-time-between-failure and a maximum of one (1) hour mean-time-to-repair based on spare parts being available on-site.
9. Sufficient ventilation shall be provided in the UPS room to prevent electrical tripping out on high operating equipment temperature.

- B. Project W-112 and W-113 shall have UPS power supplied to sensitive electronics and control systems (i.e. PCS and DMS).

2.5.24.2 Back-up Generator

- A. A power receptacle shall be provided on the outside wall of the building where a WHC furnished portable diesel-generator can be plugged in as the backup AC power source to the building electrical system. NOTE: As intended to be shown by the Project W-112 CDR drawing SK-2-58826, Rev.0. A manual transfer switch shall also be provided on the opposite inside wall of the building.
- B. Project W-113 will not require a standby generator as described in Item A above. control systems (i.e. PCS and DMS).

2.5.25 Lightning Protection

- A. Lightning protection systems shall be considered for buildings:
 1. containing facilities for the use, processing, and storage of radioactive, explosive, and similarly hazardous materials
 2. over 50 feet in height
 3. containing valuable equipment
- B. A risk assessment using the guide in Appendix I of NFPA 780 shall be made of the WRAP 2A, Project W-112, and Project W-113 buildings to determine the risk of loss due to lightning.

2.5.26 Cabling/Raceway

- A. Telecommunication and instrumentation cables shall be routed to avoid areas containing strong electromagnetic fields such as those generated by electric motors, generators, radio frequency equipment, or arc or inductive welding equipment. Where cables are routed in areas of possible contamination, cable trays shall be enclosed (provided with covers).
- B. Solid or ladder type cable trays shall be steel for maximum physical protection and good ground continuity. If steel covers are to be used, the cover contact shall be made positive with straps, clamps or fasteners.

- C. Communication cables run in a bank of stacked cable trays containing instrumentation and controls cabling shall be located in the lowest tray levels of the stack.
- D. Cable shields shall be electrically continuous. An adjacent point on the terminal block shall be used for connecting the shields when two (2) lengths of shielded cable are connected together at a terminal block.
- E. Shielded wires shall contain no splices between terminating points.
- F. Cable shields shall be grounded at the same point as the signal circuit and only at that point.
- G. Low-level instrumentation wiring shall be 600 volt, 2/c, 3/c or 4/c twisted, and/or twisted shielded cable not less than #16 AWG stranded tin-coated copper conductor.
- H. Cable trays and conduits shall be able to support the weights of all telecommunication cables expected to be run to the telecommunications room plus 100% for future expansion.
- I. Polyvinyl chloride (PVC) coated rigid steel conduits shall be used for all communications cabling in process areas. Cable trays, if used, shall be made of corrosion-resistant material, or if made of metal, shall be adequately protected against corrosion.

2.6 TELECOMMUNICATIONS

2.6.1 General Requirements

The guidelines for the design, engineering, construction, and installation of telecommunications systems as described in the WHC-SD-GN-DGS-30009, Planning and Engineering Guidelines for Solid Waste Projects Telecommunication Systems and Facilities, Rev.0, (R.C.Poe 1993) shall be used. This design guide provides a compilation of the existing Hanford Site telecommunication engineering standards, practices, policies and procedures to ensure that telecommunications construction and installations are compatible with the existing and planned Hanford Site telecommunication systems.

2.7 HEATING, VENTILATION, AND AIR CONDITIONING

2.7.1 General HVAC Requirements

- A. Standard commercial HVAC systems designed to meet the energy conservation requirements of DOE 6430.1A, 10 CFR Part 435, and Washington State Energy Code (1994 Nonresidential Manual) shall be provided as required.

- B. Provide adequate heating and cooling as described in DOE 6430.1A, Section 1550, including adequate air conditioning for all temperature, humidity, or dust-sensitive equipment (e.g., computers and analytical equipment).
- C. Humidity controls shall be provided only when required for equipment with a specified humidity control range.
- D. Variable air volume boxes shall not be used except for normally occupied spaces at the facility perimeter if justifiable by Life Cycle Cost analysis.
- E. Ambient weather conditions for this plant are specified in Hanford Plant Standard SDC-5.1. Temperatures and humidity shall be controlled per the requirements of DOE Order 6430.1A. The requirements of WHC-CM-4-3, Guide W-6 should be considered pertaining to temperature limits in work areas.
- F. Ventilation systems for employee occupied areas shall comply with ASHRAE 62-1981, "Ventilation for Acceptable Indoor Air Quality" and ASHRAE, "Heating Ventilation Air Conditioning Design Guide for DOE Facilities," ISBN 1-883413-03-6, 1993.
- G. The HVAC systems requirements for establishing zones and pressure relationships can be found in WHC-SD-GN-DGS-30011, Radiological Design Guide (R.A. Evans 1994) and WHC-CM-7-5 (Environmental Compliance) to control airborne radioactive and hazardous contamination. An atmospheric pressure reference header shall be provided and used as the reference point for control of zone pressures.
- H. HVAC systems shall be designed in accordance with NFPA 90A or 90B as applicable.

2.7.2 Process Area HVAC Requirements

- A. If confinement zones are required, airlocks shall be provided to separate zones. Air locks shall be designed per ASHRAE VA-89-18-4, "Combined Air Ventilation Method" including the 10 ft length and 500 cfm minimum requirements per WHC-SD-GN-DGS-30011, Radiological Design Guide (R.A. Evans 1994).
- B. A neutral pressure differential should be provided at the interface points with other WRAP facilities. If not feasible, airlocks with automated controls for AGV passage shall be provided.
- C. Post DBA configuration of HVAC systems shall be total shutdown. Zone integrity (including exhaust ducting) shall be maintained up to the Zone 2 boundary. The exhaust system shall fail open. Backflow prevention for confinement supply systems shall be provided per DOE 6430.1A. Air handlers servicing confinement zones shall be provided with 90% efficient filtration. The supply system shall fail closed.

- D. Air flowing through the maximum credible breach into the Zone 1 enclosure shall be sufficient to provide a face velocity of 125 ± 25 feet per minute. The maximum credible breach of a Zone 1 barrier shall be determined by analysis of the definitive design glovebox and other enclosures design. At a minimum this will be a single gloveport.
- E. In the event of ventilation system failure, stack monitoring/sampling systems (if required) shall continue to sample at a flow rate that would be isokinetic at the minimum detectable stack flow rate.

2.8 RADIATION AND AIR MONITORING

All facility exhaust from waste storage and handling areas shall meet the requirements identified in WHC-CM-7-5, Environmental Compliance Manual, Section 2.0.

2.9 PLANT MANAGEMENT SYSTEM

2.9.1 Overview

The Plant Management System (PMS) shall provide the means to integrate process control, data management, and other management systems, for cohesive operations within the Solid Waste Operations Complex (SWOC). The PMS consists of two subsystems: the Plant Control System (PCS) and the Data Management System (DMS). The PCS will provide the interface for operations, control and monitoring functions for operating the facility. The DMS will provide the interface for receiving and transmitting data needed to comply with regulatory and legal requirements to the Solid Waste Information and Tracking System (SWITS). The DMS will also have the storage capability for facility operating data that is not of interest to SWITS.

The SWOC Projects WRAP 2A, W-112, and W-113 will all have their own Plant Control System (PCS) and Data Management System (DMS). External support to coordinate interfacility operations shall be provided via the Solid Waste Information and Tracking System (SWITS), and also by other computer systems, including DMS systems located at other facilities, as shown in Figure 1.

2.9.1.1 Software

- A. All custom software developed for this application shall be developed in accordance with the following standards:
 1. ANSI/ANS-10.4-1987, Guidelines for Verification and Validation
 2. IEEE Std 730-1989, IEEE Standard for Software Quality Assurance Plans
 3. IEEE Std 828-1990, IEEE Standard for Software Configuration Management Plan

Figure 1 Computer Architecture

4. IEEE Std 829-1983, IEEE Standard for Software Test Documentation
5. IEEE Std 983-1986, IEEE Guide to Software Quality Assurance Planning
6. IEEE Std 1028-1988, IEEE Standard for Software Reviews and Audits
7. IEEE Std 1042-1987, IEEE Guide to Software Configuration Management
8. IEEE Std 1063-1987, Standard for Software User Documentation

- B. Source programming shall be included for software and configuration programming that is not ordinarily off-the-shelf. All tools required to create, debug, maintain and manage the source programming shall be included. All source programming shall be delivered on media readable by the computer hardware delivered.

2.9.1.2 Hardware

- A. Computer hardware and software shall be similar to the other computer systems in the WRAP 1 facility [i.e., a UNIX system with the DMS (Oracle based) and the PCS (RTAP based)]. Hewlett Packard workstations (for the PCS and DMS) and Allen Bradley Programmable Logic Controllers (PLCs) are required to maintain commonality between facilities.
- B. Vendors of equipment using proprietary control systems shall be required to provide communications drivers such that all architectural levels shall be capable of communicating. **NOTE:** Other communications standards may be used for control systems communication if required to meet data throughput requirements or to support competitive bidding requirements. Clear source listings and documentation for all software must be provided, so that a WHC programmer can modify and upgrade the systems as needed.

2.9.1.3 Communication Interfaces

- A. The communications interface for all DMS equipment and all equipment interfacing to the DMS shall conform to the following standards:
 1. ANSI/EIA/TIA-232-E, Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 2. ANSI/IEEE Std 488.1, IEEE Standard Digital Interface for Programmable Instrumentation

3. ANSI/IEEE Std 802.3, Information Technology - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
 4. EIA-RS-449, General Purpose 37-Position and 9-position Interface For Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 5. EIA/TIA-530, High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment
 6. EIA/TIA-561, Simple 8-Position Non-Synchronous Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 7. EIA/TIA-574, 9-Position Non-Synchronous Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
- B. The communications interface between the DMS and SWITS shall be the Hanford Local Area Network (HLAN) and shall be Ethernet Version 2 and configured per IEEE 802.3. Communications meeting IEEE-802.3 are required for consistency with existing site standards.
- C. WRAP 2A, Project W-112, and Project W-113 shall have an internal Local Area Network (LAN), in addition to HLAN, which permits control function communications within all applicable areas of each respective facility.
- D. The control systems LAN shall not directly communicate with the HLAN. The facilities HLAN connection will provide the data exchange interface between WRAP 1, WRAP 2A, Project W-112, Retrieval Project W-113, SWITS, and other facilities of the Solid Waste Operations Complex.
- E. The facility shall be protected from unauthorized external access via HLAN. A router will only allow HLAN connected devices with authorized network addresses to access systems within the facility that are connected to the internal LAN.
- F. Administrative workstations shall be provided, as required, to permit data input and preparation of such hardcopy items as off-line reports, shipping papers, and bar code labels. Administrative workstations will communicate over a local area network and over HLAN, both complying to Ethernet Version 2 and configured per IEEE 802.3.
- G. A diagram of showing the computers/devices grouped in a logical fashion (such as grouping PCS and DMS devices) and how they are networked together shall be developed during the definitive design.

- H. Diagrams and text shall be developed during definitive design to show equipment functions at the Work Centers [See Fig.1] that requires PCS and DMS interfaces.

2.9.1.5 System Reliability

- A. The PCS and DMS shall be designed to support plant operation such that:
 - 1. plant downtime due to systems problems shall be less than 1% of the scheduled plant operating time
 - 2. a system failure shall not degrade the availability of interfacing systems
 - 3. the failure of the PCS shall not cause loss of local control of subsystems, nor shall the failure of one subsystem shall cause the loss of local control of other subsystems
- B. The PCS and DMS shall be designed for ease of maintenance such that:
 - 1. plug-in module replacement will correct system failures and module repairs can be performed in a shop environment
 - 2. software diagnostics can be used to determine system state-of-health and to localize failed hardware modules
 - 3. maintenance and troubleshooting procedures can be performed without requiring total shutdown of the facility
 - 4. where there is hardware redundancy it shall be possible to perform maintenance and repair on failed components without requiring system shutdown
 - 5. the PCS shall be designed to minimize the need for calibration. Built-in calibration capability is preferred, but where required, portable calibration equipment shall be used.

2.9.1.6 Miscellaneous Requirements

- A. The computer systems shall accommodate a minimum future expansion of 25% of initial capability, without replacing existing hardware, software, or firmware components.
- B. The computer systems shall contain a clock which will provide current date and time for all hard copy, video monitor, CCTV and other displays. This time-of-day clock shall be the master clock for the facility, shall be controlled by the master system clock via the HLAN, and shall provide update signals as required.
- C. Software changes to the PCS and DMS shall be controlled by password or keylock controls.

- D. All vendor documentation including users guide, operation and maintenance manuals, software language reference manuals, operating systems documentation, logic flow design drawings, and other documentation needed to maintain the PCS and DMS or reconfigure the operating system shall be delivered.
- E. Onsite training shall be provided for operation of the delivered PCS and DMS operating software.

2.9.2 Plant Control System

The PCS shall be an integrated control system based upon a modular, flexible and distributed architecture that shall provide a supervisory and control function over the facility processes and subsystems. A complete set of supervisory and control functions shall be developed for each the facility processes and subsystems. Independent local control shall be provided by the Work Centers [See Fig.1] located near their respective processes and systems. All supervisory level man-machine interface (MMI) shall be located in the central control room of each respective facility.]

- A. A PCS block diagram(s) down to component/tag number showing interfaces (supervisory and control functions) to the following Projects WRAP 2A, W-112, and W-113 processes and subsystems shall be developed during the definitive design:

NOTE: The PCS block diagram(s) will show the following functions of the PCS: monitor process systems alarms and trends, supervise and control internal transport of waste packages, automate and control process equipment, data acquisition/storage of facility operations data and surveillance of facility utilities

- WRAP 2A: debris processing, box breakdown, particulate/sludge processing, grout powder, vibro grout, sludge/particulate grout, polyethylene encapsulation, liquid waste, drum compaction, sample management, utilities [electrical, fire protection system, radiation/air monitoring, liquid spill monitoring and HVAC], bar code readers, and shipping/receiving
- W-112: automated guided vehicles, drum inspection, head gas sampling, utilities [fire protection system, radiation/air monitoring, liquid spill monitoring and HVAC], bar code readers, and shipping/receiving
- W-113: alarm and annunciation [NOTE: W-113 PCS will be used mainly for monitoring and annunciating selected facility alarm conditions: fire protection system riser rooms and module work face ambient temperature, radiation/air monitoring, CVS equipment exhaust stack monitoring system, retrieval staff change building septic tank liquid level detection system, and the trench enclosure building ventilation system exhaust sampling system]

- B. A PCS/DMS Interface Definition Document shall be developed Projects WRAP 2A, W-112, and W-113 during the definitive design.
- C. A systems integrator shall be provided for the simulation testing of the PCS of each respective facility.

2.9.3 Data Management System

- A. A top level Data Flow Diagram(s) shall be developed for the Projects WRAP 2A, W-112, and W-113 DMS during the definitive design that will show the data handling and storage requirements for the following DMS functions:
 - 1. communicate with the SWITS database to receive initial waste package data applicable records
 - 2. provide waste package data to the PCS [NOTE: except for Project W-113], SWITS, other DMS systems and plant personnel workstations
 - 3. upload data describing the waste package certification documentation/data back into SWITS when the processing of the waste package is completed and leaves the facility
 - 4. generate all required permanent and backup WRAP 2A, W-112, and W-113 plant operating records
 - 5. gather information through local data input terminals, analyzers, and field input/output data via the PCS [NOTE: except for Project W-113]
 - 6. capability of being queried by other DMS computers over the HLAN
 - 7. track status of all incoming waste packages as they are processed through the facility
 - 8. identify location of all waste packages within the facility by interfacing with the barcode readers system
- B. A Software Requirements Document shall be developed for the Projects WRAP 2A, W-112, and W-113 DMS during the definitive design.
- C. The DMS for WRAP 2A, Project W-112, and Project W-113 shall each have two (2) hard disc drives for data storage:
 - 1. The redundant drives shall be configured such that data is written to both drives but normally read only from one. This redundancy is intended to provide data backup in case of a single drive failure.
 - 2. Each drive shall provide the same capacity, no less than 600 Megabytes each, able to contain the data storage requirement when fully utilized.

3. System software may or may not reside on a separate hard disc drive.

2.9.4 Other Management System

Other Management Systems will be developed as needed by WHC that shall support the day-to-day operations of the facilities:

1. management functions needed to operate the facility and coordinate activities between facilities
2. scheduling, batching, and provide "real-time" status of work in progress, as related to the work plan/schedule
3. resource planning, procedure management, training records, and maintenance planning.

2.10 WHC SAFETY CLASSIFICATION

The design, analysis, procurement, and QA criteria associated with WHC safety and non-safety systems, components, and structures shall be in accordance with WHC-CM-1-3, MRP 5.46 "Safety Classification of Systems, Components, and Structures; WHC-CM-4-2, "Quality Assurance Manual" and DOE Order 6430.1A.

2.11 NATURAL FORCES CRITERIA

Natural phenomena hazard forces design criteria associated with WHC safety and non-safety class systems, components, and structures shall be in accordance with SDC-4.1 (HPS 1993).

2.12 MAINTENANCE

- A. The flexibility and limits of material handling and lifting devices shall be considered for their maintenance utility, i.e., reach, load capacities and clearances.
- B. Definition of commercially available equipment and parts which shall be used to the greatest extent practical. Reliability and interchangeability shall be part of all specifications and design requirements.
- C. To simplify maintenance and minimize inventory requirements, where similar functions are being performed, a single type and size of device should be selected for all locations to the maximum extent practical.
- D. Complex components or those having a high probability of failure shall be located outside of normally contaminated and radiation zone areas to the extent possible.

- E. Instrumentation and monitoring equipment systems shall be specified and designed to facilitate troubleshooting and replacement.
- F. The complexity of the repair and maintenance activities shall be commensurate with the skill level of maintenance personnel, who work primarily to detailed written procedures.
- G. Maintenance planning which shall define space requirements, special routing, tools and handling equipment.
- H. A plan shall be developed in preliminary design for removal, repair or disposal of failed equipment. The plan shall include a determination of methods, special tools and facility features needed for lay-down and for access to and transport of failed equipment.
- I. Remote operated mechanical arms will not be installed for maintenance purposes.
- J. The design basis for maintenance within process enclosures shall be personnel working through gloved penetrations. Human factor limitations (reach, strength, endurance, and dexterity) shall be carefully considered where gloved hand personnel involvement is required. Also, the following maintenance requirements shall be provided:
 - 1. Handling enclosure equipment, e.g. installed in enclosures, shall be modular for convenient removal and replacement. Where practicable, modules shall be sized to fit into 208 liter drums or 4' x 4' x 4' boxes for removal from enclosures.
 - 2. To minimize the chance of operator injury, modules requiring removal shall be provided with smooth surfaces, rounded edges and corners, and good visibility of interfacing elements.
 - 3. Equipment modules shall be configured for ease of removal by simple lateral or vertical motions; have easily accessible lifting device attachment points; provided with ample wrench access to keeper-type bolts; and provided with round and diamond pilot pins to simplify reinstallation.
 - 4. Adequate visual access shall be provided to support maintenance through proper lighting and placement of windows or CCTV cameras for direct viewing. Use of mirrors is not acceptable.
 - 5. Process enclosure installed devices shall permit component-level trouble shooting by extending wiring leads outside the enclosure. Independent functioning modules are exempt from this requirement where trouble shooting to the module level can be performed

6. A Cost Benefit Analysis for obtaining ALARA levels of radiation exposure must be addressed as a maintenance design basis.
- K. Equipment shall be located and space envelopes designed to provide access for removal and reinstallation.
- L. Low-accessibility equipment shall be selected and designed to minimize the need for in-place preventive maintenance, adjustment or lubrication during the expected useful life.

2.12.1 Equipment Reliability Criteria

- A. Pumps which may be damaged under no flow conditions shall be interlocked with the process to prevent dry running. Priming capability is required for all pumps which need priming to start.
- B. Lubrication points shall be fitted with grease fittings, as applicable. These shall be designed so they do not drip on the floor.
- C. Corrosive environment protection shall be provided as appropriate.
- D. Equipment shall be positioned away from potential leaks (such as water, oil, and other process liquids) or provided with shielding.
- E. Protective coatings shall be used on all exposed carbon steel components when the equipment is located in a corrosive environment.
- F. Electrical conduit and conduit terminations shall meet the requirements of the National Electrical Manufacturing Association. No exposed electrical wire terminals or connectors shall be used.
- G. Power transmission devices (mechanical couplings, shafts, linear actuators, bearings, etc.) shall be selected to operate at 75% or less of their design rating.
- H. Use of limit switches to control mechanical movement shall be minimized. Where it is necessary to use limit switches for positive stop or position indication, the limit switch shall be mounted in a stationary position and the actuator shall be mounted to the movable member. The limit switch shall be protected to preclude damage from inadvertent bumping. The positioning and configuration of the limit actuator shall prevent damage to the limit switch and actuator in the event of over travel, misalignment or malfunction. Fine adjustment of the actuator shall include a positive means of securing the final position.
- I. Pressure measuring instruments shall be equipped with an isolation valve assembly and capped or plugged test ports for easy calibration.

- J. All pressure measuring instruments shall be selected so that the normal operating pressure is between 25 and 75 percent of the instruments calibrated range.
- K. All instruments shall be fully capable of calibration over their entire range.
- L. All instruments that provide outputs to the process controls, shall have non-loop interrupting output test jacks.
- M. Temperature measuring devices shall be installed into thermal wells so that periodic removal for calibration/maintenance can be performed without shutting down or depressurizing the system.
- N. Selection of individual pieces of equipment and components shall provide reliability sufficient to ensure an interactive system (plant) availability of at least 90%. Achievement of this requirement shall be assisted and verified by performing appropriate failure modes analysis in conjunction with the application of mean-time-to-repair (MTTR) data and system simulation studies.

2.13 DECONTAMINATION AND DECOMMISSIONING

- A. Decontamination and decommissioning of structures, systems, and components that are may be reusable for future applications shall be considered and defined during the definitive design for equipment removal paths and plant features.
- B. Manual decontamination shall be used in conjunction with maintenance and operation under the following conditions:
 - 1. the cost of replacement is substantially higher than the cost of decontamination and repair
 - 2. equipment delivery times would impose substantial operational constraints on the plant
 - 3. decontamination would reduce worker exposure within ALARA
- D. The decontamination function shall provide at least the following capabilities:
 - 1. designed to minimize the generation of secondary wastes, mostly spent decontamination materials
 - 2. provide decontamination materials necessary for removal of alpha and beta-gamma contamination from metallic surfaces including carbon steel, painted carbon steel, galvanized carbon steel, and stainless steel
 - 3. collection, confinement, and treatment for disposal of all radioactive, hazardous, or mixed spent decontamination materials

4. take smears and monitor for radiation dose rates and removable contamination levels of decontaminated items

2.14 SPECIAL PROTECTIVE COATINGS

- A. Project requirements for special protective coatings (SPC) and painting shall be developed during the definitive design to assure correct vendor/contractor packaging to avoid rework later during construction.
- B. The NFPA Code 101, Section 6-5 is applicable if coating thicknesses must exceed 0.09 cm.
- C. Painting requirements for room areas subject to decontamination solutions, acids, corrosive chemicals, and washdowns will vary considerably from those requiring only an architectural aesthetic finish. The room finish schedule along with detailed painting specifications should clearly and completely address these varying requirements.
- D. Finish callouts are required for miscellaneous metal work, stairs, ladders, platforms, doors and frames, armor angle and miscellaneous embeds, conduit and boxes, field routed piping, tubing and instrument runs, and miscellaneous hangers and supports.
- E. Criteria used to determine coating requirements may be HVAC zoning, radiological conditions, decontamination requirements, chemical or corrosive material usage.
- F. Undercoat shall not be yellow and finish coat shall be a different color from the undercoat to facilitate identification of chipped and worn paint.
- G. The project specifications should address, in detail, surface preparation requirements for each type of coating system: architectural type paint, epoxy paint, and special protective coating.
- H. Concrete surface preparation and finish requirements must be coordinated between the concrete specification and the painting specifications regarding patching of surface defects, form removal, tie hole patching, and a once-over, steel trowel finish. sandblasting and any other surface profile criteria must be identified.
- I. Surface proof of compatibility is required between the concrete curing compounds and form release agents and the SPC system through test results or documented recommendations by the coating system manufacturer.
- J. The coating specifications should require objective tests to assure acceptable dryness of the concrete surfaces that will be coated.

- K. The SPC contracts shall require the preparation of a demonstration test wall at least 3 meters x 3 meters that has 1/3 left as concrete with acceptable surface preparation, 1/3 left with an acceptable application of SPC surfacer, and 1/3 painted with an acceptable SPC finish coat. This method not only establishes acceptance standards of quality of the SPC finish, but identifies the level of effort required to achieve finish results.
- L. Painting specifications should identify the maximum and minimum required mil thickness (minimum 30 mil thickness), application temperature restrictions, curing temperatures, and relative humidity requirements.
- M. Specific priming requirements for gypsum wall boards must be addressed to assure compatibility with the specific SPC finish.
- N. The final coating of all painted and SPC surfaces should be semi-gloss. Office or administrative areas are acceptable exceptions.
- O. Shop priming for pre-fabricated components must be compatible with field-applied finish coats.
- P. Coating system callouts must avoid use of different types of paints for adjacent surfaces as much as possible. If special wall coatings shall be provided for ease of decontamination of walls, floors and ceilings. Two coats with differing colors shall be used to identify chipped paint.
- Q. The extent of coverage must be defined when SPCs are required. If all surfaces must be covered (floors, walls, ceilings, miscellaneous metal appurtenances), then all concrete areas in the room must be coated prior to start of follow-on mechanical, electrical or equipment contractor work.
- R. Painted surfaces that are damaged during follow-on work must be recoated and touched up at the end of the project. Specifications must clearly define the extent of recoating expected. Project planning and cost estimates must account for the expected work.
- S. Floor areas are to be recoated at the last stages of the project. Repair of surface damage from heavy construction activities should be included.
- T. Miscellaneous metal and concrete embed specifications must coordinate primer requirements with SPC coating specifications for embedded metal work where concrete shall receive SPC.
- U. Special protective coating materials to be used shall be of non-hazardous materials, in order to minimize newly generated hazardous waste in the process.

2.15 CORROSION PROTECTION

Corrosion protection for underground tanks and piping shall comply with the following:

1. NACE RP-01-69 (1983 Rev.), National association of Corrosion Engineers, "Recommended Practice: Control of External Corrosion on Underground or Submerged Piping"
2. WAC-173-303-640, Washington Administrative Code, "Dangerous Waste Regulations, Tank Systems"

2.16 INDUSTRIAL SAFETY

- A. The industrial safety requirements for providing a safe workplace for WRAP 2A, Project W-112, and Project W-113 shall include the following chapters of WAC 296-155:
 1. Occupational health and environmental control as stated in Part B.
 2. Personal protective equipment as delineated in Part C.
 3. A fall protection plan as required by Part C-1.
 4. Fire protection measures as stated in Part D.
 5. The storage, handling, use, and disposal of hazardous materials must meet requirements of Part F as well as WAC 173-303 "Dangerous Waste Regulations" and the NFPA.
 6. The excavation, trenching, and shoring requirements are contained in Part N.
 7. Access controls over activities shall be provided as required by signs, warnings, and barricades as stated in Part E.
- B. The hoisting and rigging requirements are as specified in the DOE-RL-92-36 "Hanford Site Hoisting and Rigging Manual."
- C. The specifics of the industrial safety requirements as well as other considerations shall be dependent upon existing conditions during the operations of each project.
- D. Some of the general industrial safety requirements that are to be considered as common to WRAP 2A, Project W-112, and Project W-113 are:
 1. Interlocks and alarms shall be provided on all systems or components to prevent operation in a manner that will affect personnel safety or be detrimental to the equipment operation.

2. SWOC and trench retrieval operations site shall be accessible to emergency vehicles and emergency evacuation routes are unobstructed.
3. Exposure of personnel to radiological and other hazardous materials associated with loading, closure, tiedown, transport, off-loading, and any operation associated with handling the drum and box overpacks shall be minimized to ALARA levels by the performance of a cost benefit analysis.
4. Emergency eye washes, emergency showers, or combination eye-wash/showers shall be provided in areas where corrosive or other skin or eye irritants chemicals are stored, handled, used or dispensed. Equipment shall comply with ANSI Z358.1 and be serviced by the potable water system.

2.17 SITE PREPARATION

- A. Soil tests to determine allowable soil loading shall be done for the Project W-113 along the length of each side of the Trench 04 of the 218-W-4C burial ground.
- B. Site excavations during initial site preparation shall be shored or sloped as appropriate to prevent accidental collapse.
- C. Excavation, trenching, and shoring shall comply with the requirements in WHC-CM-4-3, Vol.1, Standard CM-8, WAC Washington Industrial Safety and Health Act Title 296 and Labor and Industries, Part N "Excavation Trenching and Shoring".
- D. The location of existing utility installations, such as sewer, telephone, fuel, electric, water lines, or any underground installations shall be determined prior to site preparation. The SWOC site specifically includes the area bounded by 16th Street on the south, 23rd Street on the north, Dayton Avenue on the east, future Eugene Avenue on the west, and the smaller area between Eugene Avenue and the 23rd Street loop.
- E. All areas cleared and grubbed shall be stabilized appropriately to prevent soil erosion and minimize blowing dirt.
- F. Grading will be performed to ensure surface drainage to Eugene and Dayton Avenues and south to 16th Street, from where runoff will be directed to the lower terrain to the southwest.
- G. Construction temporary power and lighting will be installed during site preparation and shall be provided to the various project contractors. Installation drawings shall be reviewed and approved by WHC onsite utility subcontractor (ICF Kaiser Hanford Company) prior to installation.

2.18 INFRASTRUCTURE UPGRADES

- A. Project W-112 will provide the infrastructure upgrades to the SWOC facilities including the roads/railroads, electrical and telecommunications duct banks, sanitary and raw water mains, septic systems and drain fields for sanitary waste, sewer mains, and the telecommunications hub building. Refer to Solid Waste Management Complex Site Development Plan, WHC-SD-W112-ES-006 Rev.0 (Campbell & Nash, 1994), for the conceptual location of infrastructure upgrades.
- B. All infrastructure items are installed along roads within the utility easements.
- C. Specific WRAP 2A, Project W-112 and W-113 utilities requirements shall be identified during the design and coordinated with the Project W-112 infrastructure upgrades to confirm specific tie-in locations. Facility tie-in shall be done by the individual projects as required.

2.18.1 Roads/Railroads

- A. Two new roads will be added, Denver Avenue and Eugene Avenue. Primary access roads will be paved.
- B. A rail spur will be provided into the SWOC site from the northwest and will integrate with WRAP 2B and W-5 burial ground plans.

2.18.2 Utilities

2.18.2.1 Electrical

- A. The electrical distribution system shall be installed per ANSI C.2 requirements. Project W-112 will install the main electrical distribution system.
- B. WRAP 2A will get its power from the sectionalizing cabinet located at the electrical manhole provided by Project W-112.
- C. Power for Project W-113 shall be obtained by extending the existing 13.8 Kv circuit C8-L15 south from 19th Street to the trench site.

2.18.2.2 Water

- A. Sanitary water design shall be coordinated with the Project W-112 infrastructure upgrades, the existing 200W Area water supply system for specific location of tie-in points, and existing 218-W-4C Trench 04 underground utilities.
- B. Potable (sanitary) water shall be utilized for process and non-process water applications, including human consumption, rest rooms, lunch rooms, eyewash/shower stations and hose bibs.

- C. Water lines shall incorporate means to prevent piping from freezing.
- D. The water flow rates and flow duration for the new facilities shall be coordinated with the Project W-112 infrastructure upgrades and the existing 200W area water supply systems, in order to meet the DOE-prescribed alternate water supply to meet the required water pressure.
- E. Non-potable (raw) water lines/systems shall be isolated from potable water lines/systems by an approved backflow prevention assembly or air gap.
- F. There is currently no raw water available at the SWOC site. A new raw water line will be brought to Dayton Avenue from the 282W reservoir.

2.18.2.3 Sewer

- A. Sewer design shall be coordinated with the Project W-112 infrastructure upgrades for specific location of tie-in points and other 218-W-4C trench 04 existing underground utilities. See exception in Item B.
- B. Sewer piping, from 5 feet beyond any support building, shall be drained to the sewer system provided by the Project W-112 infrastructure upgrades. **EXCEPTION:** Project W-113 will use a septic holding tank for the Retrieval Change Building and a new septic field for the General Office Building.

2.18.2.4 Telecommunications

- A. Telecommunication cables tie-in shall be coordinated with the Project W-112 infrastructure upgrades, the existing power and telecommunication lines to the west of Dayton Avenue, and other existing underground utilities within the burial ground 218-W-4C Trench 04.
- B. An additional PC-based computer system connected to HLAN shall be provided for personnel radiation tracking through the WHC Access Control Entry System (ACES) for WRAP 2A, Project W-112, and Project W-113.
- C. The HLAN and telephone telecommunication hub will be at the telecommunications hub building to be provided by Project W-112. Data network design and installation shall provide interoperability and interconnectivity with the other data networks currently being used in the Hanford Site.
- D. The local operating telephone contractor shall install their facilities to a demarcation point within the telecommunication equipment rooms. The projects shall provide for all telecommunication facilities from this demarcation point.

2.19 SAFEGUARDS AND SECURITY

- A. There will be no alarms or CCTV signals sent to any security post or security alarm monitoring system.
- B. Existing safeguards and security measures will not be impacted by this project. No new measures beyond current practices will be required.
- C. Security space for patrol stations is not required within the facilities.

3.0 EQUIPMENT DESIGN REQUIREMENTS

3.1 CRANES AND HOISTS

The following design requirements shall be used in the procurement specification of cranes and hoists:

- A. A CMAA crane and hoist class shall be established after an assessment of the requirements and risks are made.
- B. The normal calculated performance shall not exceed 75% of the rated capacity.
- C. The speed range shall be selected by requiring that normal operating speed be between 50% and 60% of the available speed range.
- D. Infinitely variable speed control capabilities are preferred, with the operator interface having four or five preselected speed detents.
- E. Protection against load drop shall be provided in the design for all cranes and hoist required to lift and transport radioactive waste containers.
- F. In the event of power failure, bridge and trolley motion shall go the freewheeling mode, and hoist on all systems handling radioactive waste containers shall stop and hold the suspended load.
- G. In the event of power failure, means shall be provided to assure manual positioning cranes for maintenance work. These means are expected to fall within normal crane practices.
- H. Accessibility to crane bridge and trolley shall be provided for corrective and routine maintenance.
- I. Space shall be provided for replacement of wire ropes and hooks.
- J. Crane shall be of the swing free design.

- K. Crane service in each area shall be carefully defined to determine the advisability of providing auxiliary hoist capability.
- L. Appropriate sections from the following codes shall be applied in determining hoisting equipment requirements:
 - 1. ANSI/NOG-1
 - 2. CMAA-70
 - 3. CMAA-74
 - 4. ANSI/ASME B-30-2
 - 5. ANSI/ASME B-30-11
 - 6. ANSI/ASME B-30-16
 - 7. ANSI/ASME B-30-17
 - 8. ANSI/ASME B-30-18
- N. Other hoisting and rigging requirements are as specified in the DOE-RL-92-36 "Hanford Site Hoisting and Rigging Manual".

3.2 BAR CODE SYSTEM

The following design requirements shall be used in the procurement specification of bar code system:

- A. All bar code equipment shall meet WHC standards. All bar code information shall have data identifiers assigned per WHC-CM-2-6, Section 3.4, "Bar Code Identifier Standards."
- B. The bar code scanners shall:
 - 1. be hand held programmable units with key pads or remotely controllable through a computer that can provide realtime feedback as data is gathered
 - 2. have visual readout and audible alarm capability for providing feedback, error detection, and messages to the operator
- C. Bar code labels shall:
 - 1. have (4) lines of entry spaced at least 2 inches long beneath the unique barcode number to allow manual data entry pertaining to safety and precautions
 - 2. be medium to low density Code 39 barcode symbology per MIL-SAD-11898 in characters at least 1 inch high and alphanumeric characters at least 1/2 inch high

3. meet label durability requirements of MIL-L-61002
4. be similar to the ones used in the WRAP 1 facility.

3.3 ELECTRIC FORKLIFT TRUCKS

The following design requirements shall be used in the procurement specification of electric forklift trucks:

- A. Electric forklift truck is provided with either a 12V or 24V battery system.
- B. The front-end handling attachment provided with the electric forklift truck shall:
 1. be suitable for a single 55 - gallon drum, a single 85 - gallon overpack drum or a pallet with four drums
 2. grab "gently" and not damage the drum or pallet
 3. be clearly marked to indicate rated capacity
 4. be rated up to 12,000-lb rated capacity in order to handle the 4'x4'x4' WRAP 2A product containers and other boxes
- C. The load capacity of the front-end handling attachment shall be verified by the manufacturer or by a load test at 100 percent capacity to be performed on-site.
- D. Electric forklift trucks to be used in hazardous (classified) areas shall have the manufacturer's label or some other identifying mark indicating that it is listed or approved for the intended use by Underwriter's Laboratories, Inc., or Factory Mutual Engineering Corporation.
- E. Frequent (preuse) inspection instruction is attached to the electric forklift truck or otherwise readily available to the operator.

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