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2 of 2

Volume III

Part 2

Conceptual Design
for the

Waste Receiving And Processing Facility Module 2A

Outline Specifications

Prepared for
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
Richland, Washington

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Western Operations

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WRAP MODULE 2A

DIVISION 16 - ELECTRICAL

TABLE OF CONTENTS

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SECTION 16050

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16050 BASIC ELECTRICAL MATERIALS AND METHODS

TABLE OF CONTENTS

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for materials and methods that are common to more than one Section of Division 16.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 2 PRODUCTS

2.02 MATERIALS

A. All electrical equipment and materials shall be new, free of defects, identified as to suitability for a specific purpose, environment or application by a qualified testing laboratory, inspection agency or other product evaluating organization, such as Underwriters Laboratories, Inc., acceptable to the authority having jurisdiction and concerned with product evaluation.

1. Equipment or materials identification shall consist of an attached identifying label and/or inclusion of the equipment in a list published by the product evaluating organization.

B. Manufacturer's name and/or trademark shall be placed on all equipment installed along with other applicable markings, such as voltage, current, wattage and similar related items.

C. Select transformers, contractors, light fixtures and other equipment for quietness of operation.

1. Any equipment which produces objectionable noise shall be adjusted and/or insulated so as to eliminate the noise, or shall be removed and replaced with satisfactory equipment.

2.02 SUBSTITUTIONS

A. Electrical work is specified as standard construction practice, and these items are to be installed as specified.

B. <u>Acceptable Equipment</u>: Products specified by several manufacturer's names are for the convenience of the Contractor, and are intended to be Contractor's choice.

1. Products specified without reference to a specific manufacturer may be of any manufacturer provided that such products shall have cast, stamped or indelibly marked on them the manufacturer's name or mark, as well as other applicable information as required.

C. It shall be the responsibility of the Contractor to ensure that Contractor's chosen products and alternate approved products comply with the Drawings and Specifications as to space requirements performance, capacities, configuration, accessories and materials of construction.

D. Contractor shall be responsible for and bear the cost of all changes made necessary by the use of approved products other than those listed.

2.03 EQUIPMENT

2.04 COMPONENTS

A. Expansion and Toggle Bolts

1. Where necessary to make attachment of any material, fixture or equipment which may be bolted to masonry and concrete walls and floors, properly embed bolts in masonry or concrete for such attachment, wherever possible.

2. Where bolting is not practical, use suitable expansion anchors, such as Ackerman Johnson, Rawl Star or approved equal.

3. Do not use wood or plastic plugs or fiber expansion shields under any circumstances.

B. Junction, Terminal and Pull Boxes

1. Junction and pull boxes shall be sized as indicated on the Drawings.

   Where not specifically sized on the Drawings, all boxes shall be sized in accordance with Article 370 of the NEC.

2. Junction and pull boxes located indoors in nonhazardous areas shall be code gauge galvanized sheet steel, welded construction, with conduit knockouts or raceway openings, and hinged or screwed covers as noted on the Drawings.

   Boxes located outdoors shall have screwed, gasketed covers and watertight hubs.

3. Terminal boxes shall be provided with a removable panel for mounting relays, wiring devices and terminal blocks.

C. Device and Outlet Boxes

1. Device and outlet boxes shall be pressed steel, zinc or cadmium coated unless otherwise specified on the Drawings.

2. Outlet boxes shall not be smaller than 4 inches octagon by 1.5 inches deep and shall be provided with the proper size knockouts for the conduits used.

   All unused knockouts shall remain closed or shall be sealed with knockout closures.

3. Device or utility boxes shall be of unit construction of a size required for the number of switches or outlets called for on the Drawings. No sectional device boxes will be permitted.

4. Outlet or utility boxes concealed in the construction shall be firmly secured in place, set true, square and flush with the finish surfaces for the application f or the appropriate cover plate.

   Where required, boxes shall be provided with plastering rings.

5. Surface mounted outlet boxes for receptacles, switches, etc., located in industrial areas shall be cast type.

D. Cover Plates for installation on receptacles, switches, etc., shall be as specified on the Drawings.

E. Conduit Fittings

1. Cast malleable iron or steel conduit fittings used with rigid steel or IMBC conduit shall be thoroughly coated with metallic zinc or cadmium inside and outside after all machine work is completed.

2. Cast conduit outlets used with rigid steel or IMC conduit shall be made of rust resisting alloys of iron or steel or shall be made of nonferrous materials with threaded hubs for heavy wall rigid conduit.

   Fittings shall be Crouse-Hinds, Appleton or Killark.

3. Nonmetallic insulating type bushings shall be used on rigid steel conduit.

F. Labeling: Label all switches, panelboards, MCCs, panels with a white plastic nameplate engraved with 0.25 inch black letters designating the item for load served as shown on the Drawings.

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SECTION 16110

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16110 RACEWAYS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16110

RACEWAYS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for the types of raceways, and their installation for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 2 PRODUCTS

2.02 MATERIALS

A. Rigid Galvanized Steel Conduit (RGS): Comply with all applicable requirements of the latest revisions of the following:

- ANSI C80.1
- FS WW-C-0581
- NEC Article 346-15

B. PVC Externally Plastic Coated Rigid Galvanized Steel Conduit: Shall be conduit conforming to the requirements for RGS and complying with NEMA Standard Publication No. RN-1, with a coating of polyvinylchloride of minimum thickness of 30 mils.

Use PVC externally coated RGS sleeves and elbows passing through concrete, or spiral wrap RGS sleeves and elbows with one half lap of plastic electrical tape.

C. Intermediate Metal Conduit: Comply with all applicable requirements of the latest revisions of the following:

- ANSI C80.1
- FS WW-C-581
- NEC Article 345-16

D. Electrical Metallic Tubing (EMT): Comply with all applicable requirements of the latest revisions of the following:

- ANSI C80.3
- FS WW-C-563
- NEC Article 345-15

E. Rigid Nonmetallic Conduit: Comply with Schedule 40 thermoplastic conduit rated for 90°C and meet all applicable requirements of the latest revisions of the following:

- NEMA Standard TC-2
- ANSI C33.91
- FS W-C-1094
- NEC Article 347-17

F. Flexible Metal Conduit: Shall be Type 2 zinc coated steel, spirally wound upon itself and interlocked in such a manner as to provide a round cross-section of high mechanical strength and flexibility.

Comply with all applicable requirements of latest revisions of the following:

- FS WS-C-566
- NEC Article 350

Flexible Metal Conduit Fittings: Comply with FS W-F-406, Type 1, Class 1, and Style A.

G. Liquid-Tight Flexible Metal Conduit: Shall be flexible metal conduit provided with a flame and abrasion resistant polyvinyl chloride jacket to form a liquid tight flexible conduit assembly and shall comply with all applicable requirements of the latest revisions of NEC Article 351.

Liquid-Tight Flexible Metal Conduit Fittings: Comply with FS W-F-406, Type 1, Class 3, Style G.

H. Wireway: Shall consist of a sheet metal trough with a hinged or screw cover providing a full lay-in feature throughout its length.

Finish shall be a gray enamel inside and out over rust resistant primer or treatment, and shall meet the requirements of NEC Article 362.

I. Underground PVC Plastic Utilities Duct: NEMA TC 6, Type 1 for encased burial in concrete, Type II for direct burial.

J. PVC and ABS Plastic Utilities Duct Fittings: NEMA TC 9, mate and match to duct type and material.

K. Minimum conduit size shall be .75 inch.

L. Cable Trays

1. Cable tray system shall be made of straight sections, fittings and accessories as defined in the latest NEMA Standards Publication VE-1. The cable tray shall be UL classified as equipment grounding conductors.

2. Cable trays shall be steel or aluminum as specified on the drawings. Tray types shall be ladder, trough or solid bottom as specified on the drawings.

3. Steel straight sections, fittings, side rails and rungs shall meet the minimum mechanical properties of ASTM A570, Grade 33 for 14 gauge and heavier, ASTM A611, Grade C for 16 gauge and lighter. The cable tray shall be hot-dip galvanized after fabrication in accordance with ASTM A386.

4. Aluminum straight section and fitting side walls and rungs shall be extruded Aluminum, Association Alloy 6063. Fabricated parts shall be made from Alloy 5052.

5. Trays shall have an overall nominal depth of 6 inches with a usable loading depth of 5 inches.

6. Straight sections side rails shall be I Beam, C Rail or Z Rail. All straight section shall be supplied in standard lengths of 12 feet; widths shall be 18 or 24 inches or as shown on the drawings or bill of materials.

7. Splice plates shall be the bolted type using either square neck or ribbed neck carriage bolts and serrated flange lock nuts. the resistance of fixed splice connections between an adjacent section of tray shall not exceed 0.00033 ohm. Expansion splice plates shall be installed per the drawings for thermal expansion and contraction.

8. Cable tray covers shall be installed after cable installation. Covers shall be of the solid flanged type and secured in place by heavy duty cover clamps sized for the tray width.

9. Cable tray shall be capable of carrying the allowable cable load with a safety factor of 2.0 and in addition will support a 200 pound concentrated load without failure.

10. Cable tray shall be made to manufacturing tolerances as specified by NEMA VE1-2-03 and VE1-2-04.

PART 3 EXECUTION

3.02 ERECTION, INSTALLATION AND APPLICATION

A. Application

1. <u>RGS Conduit</u>: Utilize in the following areas:

- Above grade including where exposed to mechanical damage.
- Below grade where maximum mechanical protection is required.
- Where underground runs emerge through floor slabs on grade.
- Where specifically required by the NEC.
- In concrete not containing additives that could cause erosion or damage to the conduit zinc coating.
- Do not use threadless couplings and connectors.

2. <u>Plastic Coated Rigid Galvanized Steel Conduit</u>: Utilize in the following areas:

   - In concrete containing additives that could cause corrosion or damage to the conduit zinc coating.
   - Below grade, direct buried.
   - Below grade, concrete encased.

3. <u>Rigid Aluminum Conduit</u>: Utilize in the following areas:

   - Outdoor above-grade installations.
   - All indoor installations.

4. <u>Intermediate Metal Conduit</u>: Utilize in the following areas:

   - Above grade.
   - Below grade.
   - Where underground runs emerge through floor slabs on grade.
   - Where specifically required by the NEC.
   - Embedded in concrete not containing additives that could cause corrosion or damage to the zinc coating.

5. <u>Electrical Metallic Tubing (EMT)</u>: Utilize in the following areas:

   - Concealed locations in furred walls and ceilings, and in space above suspended ceilings.
   - Exposed in unfinished areas where not exposed to mechanical damage.
   - Embedded in concrete slabs, not laid on earth.

6. Rigid Nonmetallic Conduit: Utilize in the following areas:

   - Underground by direct burial.

   - Underground with concrete encasement.

   - Embedded in concrete slabs.

7. Flexible Metal Conduit: Utilize in dry locations for the connection of equipment subject to vibration or displacement.

8. Liquid Tight Flexible Metal Conduit: Install in wet or dry locations for the connection of equipment subject to vibration or displacement.

9. Wireway: Install in exposed, unfinished areas where not subject to mechanical damage.

B. Installation

1. General: Install raceways as indicated in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation".

   Install units plumb and level, and maintain manufacturer's recommended clearances.

2. Coordinate with other work including wires/cables, boxes and panel work, as necessary to interface installation of electrical raceways and components with other work.

3. Install all raceways concealed in building structure except that exposed raceways may be used for the following:

   - Motor and equipment connections.

   - Electrical, telephone and mechanical equipment rooms and closets.

   - Unfinished areas which may have painted walls and ceilings consisting of the basic building structure.

- Finished laboratories where the raceway will be concealed when laboratory furniture is installed.

4. Concealed raceways shall be run in a direct line, and where possible with long sweep bends and offsets.

5. Route exposed raceways parallel or perpendicular to building lines with right-angle turns and symmetrical concentric bends.

6. <u>Exposed Conduit</u>: Shall have supports per NEC Chapter 3.

   Support all raceways on approved types of wall brackets, ceiling trapeze hangers, clip-type fastening devices or malleable iron straps.

   a. Plumbers perforated straps are not permitted as a means of support.

   b. Do not support raceways or equipment from steam, water or other piping or ductwork, but support independently.

   c. Secure supporting members by means of toggle bolts in hollow masonry; expansion bolts in solid masonry and concrete; machine screws, bolts or welding on metal surfaces; and screws, lag bolts or through bolts on wood construction.

      - Obtain permission from the Construction Manager for use of powder-actuated anchorage devices.

      - Do not drill, pierce or weld structural members without Construction Manager's approval.

7. <u>Underground Installation of Conduit</u>: Shall be installed to exceed the minimum cover requirements of NEC Table 300-5 or Table 710-3(b).

8. Below grade raceways terminated under main service equipment, pad-mounted transformers and similar related items, above floor slabs and equipment foundations shall project 2 inches minimum above the floor or foundation finish to prevent water entry.

9. Provide flashing and counterflashing or pitch pockets for waterproofing all raceways, outlets, fittings, roof jacks and similar related items which penetrate the roof.

   Pitch pocket shall receive prior approval by Construction Manager.

10. If required, core drilling of concrete walls and floor slabs for passage of raceways will require approval of the Construction Manager before any drilling is done.

11. Install all raceways a minimum of 6 inches from ducts, hot water pipes or other heated lines.

12. <u>RGS, IMC and/or EMT Conduit Bends Made in Field</u>: Make with approved hickey or conduit bending machine.

13. <u>Crushed or Deformed Conduit</u>: Shall not be used.

14. <u>Rough-In Work</u>: Complete before wires are pulled into conduits.

    a. Clean out conduits by first pulling a swab through, prior to pulling wires.

    b. <u>Wire Pulling</u>: No oil or grease shall be used to lubricate wire other than approved Soapstone, Wire Lube, Yellow 77 or other similar lubricating materials reviewed by Construction Manager where required to facilitate wire pulling.

15. <u>Raceway Sizes Not Shown on Drawings</u>: Size in accordance with requirements of NEC for the quantities and sizes of wire installed therein.

    <u>Raceways Utilized for Home Runs</u>: .75 inch minimum trade size.

16. <u>Raceway Expansion Joints</u>: provide raceway expansion joints with necessary bonding conductor at building expansion joints and where required to compensate for raceway or building thermal expansion and contraction.

17. <u>Raceways Serving Any Electrical System Inside of Building</u>

    a. Do not install in topping of precast concrete floor tees where less than 1 inch of concrete cover over the raceway cannot be provided.

    b. Do not install in topping of concrete roof tee deck, in roof slabs or above the roof thermal and moisture protection system.

    c. Do not install in concrete slab which is less than 3 inches thick.

    d. Conduit outside diameter larger than one third of the slab thickness is not permitted.

    e. Install conduits approximately at the center of the slab.

    f. Aluminum conduit is not permitted in concrete.

18. <u>Ducts</u>: Arrange in tiers and at elevations as noted on the duct bank cross-sections.

    a. <u>Separators</u>: Provide a minimum of 2 inch spacing between conduits and install at 5 feet intervals.

        1) Conduits shall be held securely in place to prevent movement when backfilling or floating when placing concrete slurry for encasement.

        2) Before closing ends of ducts, swab clean and pull a mandrel of proper conduit inside diameter through each duct to assure integrity of the raceway.

19. <u>Duct Joints</u>: Waterproof all duct joints.

    a. <u>PVC Conduit Joints</u>: Solvent weld in accordance with manufacturer's instructions.

    b. <u>PVC Conduit Bends and Elbows</u>: Make with required heat box or use factory-fabricated elbows of radius as specified.

    c. <u>Bends and Elbows For Underground Ducts</u>: Shall have a minimum radius of 24 inches.

d. Bends and Elbows In Underground Ducts For Telephone Circuits: Shall have a minimum radius of 48 inches.

20. Wherever a change in direction is made in the underground duct run and PVC bends or elbows are used, a concrete slurry shall be placed around the ducts and shall extend at least 6 inches beyond the edges of any duct on all edges.

a. Installation of concrete slurry into formed duct bank shall be done with a minimum of free drop, and deflection shall be provided to prevent direct drops onto the PVC ducts.

b. Exercise extreme care in tamping or vibration to eliminate voids so that PVC ducts are not damaged.

21. Excavation For Electrical Ducts: Extend an adequate distance from the work area to allow sufficient space as required for construction operations and for inspection of the Work.

a. Where excavations are made to greater depth than required, fill excess cuts and compact to backfill density as specified for backfilling below.

b. Excavation work shall be timed to immediately precede the placing of ducts.

c. Before placing of ducts, remove rocks, debris and other objectionable materials subject to termite attack, rot or corrosion.

d. Coordination with other underground work is required to avoid conflict with other underground utility installations and to prevent undermining of installed duct runs.

22. Backfilling: Shall not start until all construction below grade has been approved.

a. Compaction: Minimum of 95 percent of optimum density as determined by ASTM D 698 or ASTM D 1557. In place density testing to be performed per ASTM D 1556.

b. Lifts: Not greater than 6 inches when compacted.

c. Install an underground tape warning system, approximately 1 foot below finished grade, on top of all underground duct banks.

Tape to be a minimum of 6 inches wide, of polyethylene material, color-coded green for telephone and yellow for electric duct banks, and with printing to identify type of lines installed below the tape.

23. Empty Raceway Systems: Provide a pulling string such as installed by a jetline gun or equivalent in all empty conduit runs.

a. Identify conduit use at opposite end termination point with suitable tag attached to line at each end and held in position with plastic bushing penny and plastic bushing.

b. Plug or seal empty raceways from underground duct banks to prevent drainage or gas from entering any manhole or building.

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SECTION 16120

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16120 WIRE AND CABLES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16120

WIRE AND CABLES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements to provide and install cables, wires and wiring connectors of sizes, ratings, materials and types as shown on the drawings for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 3 EXECUTION

3.02 ERECTION, INSTALLATION AND APPLICATION

A. **Low Voltage Wire and Cable:** Shall include wire and cable for use on power systems rated at less than 600 volts.

Conductors: Copper for all branch circuits, control circuits and feeder circuits.

1. All circuits on the Drawings are based on copper conductors.

2. Conductors No. 10 and smaller shall be solid; No. 8 and larger shall be stranded, except No. 14 stranded shall be utilized for control circuits.

<u>Insulation</u>: Shall be 600 volt, 70°C.

1. Type XHHW for No. 4 AWG and larger conductors.

2. Type THWN/THHN for sizes smaller than No. 4 AWG.

<u>Color Coding</u>: Grounded conductors and grounding conductors shall be color coded in accordance with NEC Article 200, 210, 250 and 310.

1. Power circuit conductor color shall be:

   - A Phase — Red
   - B Phase — Yellow or Orange
   - C Phase — Blue or Black
   - Neutral — White
   - Ground — Green or Bare

2. Where insulation pigmentation and/or coding is not available for large conductor sizes, colored plastic tape applied in a spiral half-lap manner may be used to identify the exposed portions of the conductors.

3. The above coding shall be maintained throughout the power systems including service, feeders and all branch circuits that supply utilization equipment.

B. **<u>Grounding Conductors</u>**: Stranded Copper--When insulated, shall be 600 volt, green, Type TW.

C. **<u>600 Volt Control and Instrument Cables</u>**

1. Multiconductor control cables shall be moisture resistant, small diameter type unless otherwise specified on the Drawings.

   Cables shall meet NEMA WC-5 standards and be approved by Underwriters' Laboratories, Inc., for conduit, cable tray and underground duct installations.

2. Conductors shall be stranded copper with heat and moisture resistant PVC insulation, 15 mile thick minimum, and covered with clear nylon jacket, 5 mile thick minimum.

   a. Conductors shall be color coded in accordance with NEMA WC-5 Method 1.

   b. Cables shall have an overall flame-resistant sheath of PVC, 45 mile thick minimum.

3. The number and size of conductors and the exact color coding requirements shall be as specified on the Drawings, and as in 2a above.

4. Cables shall be rated for 600 volts and 75°C operation.

D. For all conductor sizes, green, gray or white colors are reserved exclusively for grounding and grounded conductors, except:

1. Multiconductor cables used for low voltage circuits as defined in NEC Article 725-16 will not be restricted in the use of green, gray or white color coded insulated conductors whether these colors are used as the main color, in pairs or as tracers.

2. These colors shall not be used in any way to identify an ungrounded conductor.

   a. Green shall only be used to identify a grounding conductor.

   b. Gray or white, as required by the appropriate color code, shall be used only for the grounded or neutral conductor identification.

   c. Painting, taping or other alteration of the color of green, white or gray colored conductors is prohibited.

E. Color coding for conductors in sizes No. 8 and smaller shall be by means of colored insulation or jacket.

F. For conductors larger than No. 8 AWG not generally furnished with colored insulation, identification shall be achieved by the use of plastic tape or sleeves of the appropriate color. Yellow phase tape shall consist of two separate bands at each application point in order to avoid confusion with white, gray or orange after aging. All wire markers and phase tape shall be covered by clear shrink sleeving. Colored phase tape shall not cover wire markers.

G. All wire and cable markers shall be permanent. All conductors shall be identified with self-adhering, oil and moisture vinyl labels, covered with clear heat shrink tubing or white heat shrink tubing with black typed on letter with nonsmear ink as manufactured by Brady, T&B or approved equal. Hand lettered labels shall not be used. All conductors shall be labeled with point-to-point destination as shown on the drawings.

H. Wire and cable markers shall be located at origin and destination. Wire markers shall be within 3 inches of a termination or splice. Cable markers shall be within 3 inches of the spread, cable end, penetration or box exit. Cable markers may be stamped or embossed on stainless steel or plastic tags attached by plastic tie wraps. Wire markers shall not cover colored phase tape. A minimum of 0.5 inch of colored tape shall remain exposed.

I. **General**: Install electrical cable and wire, as indicated on the drawings, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure products serve intended functions.

J. Coordinate cable and wire installation work with electrical raceway and equipment installation work as necessary for proper interface.

K. Pull conductors together where more than one is being installed in a raceway. Do not exceed the conductor manufacturer's recommended pulling tension.

L. Use pulling compound or lubricant where necessary; compound must not deteriorate conductor or insulation.

M. Use pulling means including fish tape, cable or rope which cannot damage raceway.

N. No splices are allowed except in lighting and receptacle conductors. If splicing is necessary, it shall e done in an accessible pull, junction or outlet box.

O. **Heat and Radiation Resistant Cable**: Cables installed in radioactive environments shall be rated for the maximum anticipated exposure. Specially fabricated flexible heat and radiation resistant cables rated up to 1,500°F at 600 volts are produced by Boston Insulated Wire and Cable

Company under the "Bostrad" trade name. Multiconductor cables rated 2" x 10" RADS and 90°C operating temperature may be obtained from Rockbestos products, Cerro Wire and Cable Company listed under the "Firewall" trade name.

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SECTION 16123

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16123 15KV CONDUCTORS

TABLE OF CONTENTS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of 15KV conductors for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 2 PRODUCTS

2.02 MATERIALS

A. Conductor

1. Conductors shall be bare, soft drawn copper complying with ASTM B3-74 (1985).

2. Conductors shall be Class B, concentric strand in accordance with ASTM B8.

B. Conductor Strand Screen

1. An extruded layer of semiconducting ethylene-propylene rubber compound with volume resistivity not in excess of 50,000 ohm-cm at 90°C shall be applied.

a. Compound shall have a minimum elongation after an oven air test at 121°C for 168 hours of 100 percent and a brittleness temperature not warmer than minus 30°C.

b. Compound shall be free stripping from the conductor and thickness shall be as follows:

- Conductor Size AWG/KCMIL: #2 minimum
- Conductor Screen Thickness:
  Minimum Average: 25 mils
  Minimum at any Point: 20 mils

C. Insulation

1. Insulation shall be an ethylene-propylene rubber meeting the electrical and physical requirements of AEIC CS6-82 and S-68-516.

2. Minimum average insulation thickness shall be 220 mils.

   Minimum thickness at any cross section of the insulation shall be not less than 90 percent of the average thickness.

3. Insulation shall be suitable for operation in wet or dry locations at conductor temperatures not exceeding 90°C for normal operations, 130°C for emergency overload conditions 250°C for short-circuit conditions.

4. Insulation level shall be 133 percent for use on an ungrounded neutral system.

5. Insulation shall be fully bonded to the conductor screen

D. Insulation Screen

1. The insulation screen shall be extruded semiconducting EPR with a volume resistivity not in excess of 50,000 ohm-cm at 90°C when tested per AEIC No. CS-6-82.

2. The peel strength of the extruded screen from the insulation shall be between 4 to 28 pounds per 0.5 inch width when tested per AEIC CS-6-82.

Compound shall have a minimum elongation after an air oven test at 121°C for 168 hours of 100 percent and a brittleness temperature not warmer than minus 30°C.

3. Thickness of the extruded insulation screen shall be as follows:

   - Conductor: #2 minimum
   - Conductor Screen Thickness:
     Minimum Average: 40 mils
     Minimum at any Point: 32 mils

4. Outer surface of the insulation screen shall be printed with white ink - "Semiconducting-Remove when Splicing or Terminating".

E. Metallic Shield

1. A bare copper tape, 5 mils in thickness, shall be helically applied over the insulation screen with a minimum 12.5 percent overlap.

2. Shield tape shall be electrically continuous throughout each cable length and shall be in contact with the insulation screen.

3. Shield tape shall be applied in such a manner that electrical continuity or contiguity will not be distorted or disrupted during normal installation.

F. Jacket

1. <u>Nonmetallic Thermoplastic Jacket</u>: Shall be polyvinylchloride and shall meet the physical requirements of Part 4, ICEA S-68-516 for this type of jacket.

2. <u>Jacket Thickness</u>

   - Conductor Size: #2 minimum
   - Jacket Thickness--Minimum Average: 80 mils

G. Identification

1. A permanent marker indicating "The manufacturing company, year of manufacture and sequential footage number" repeated each foot shall be inserted under the copper shield tape.

2. Print every 24 inches on the jacket the name of manufacturer, plant number, type of material, insulation thickness, conductor size, rated voltage and year of manufacturer.

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SECTION 16141

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16141 SWITCHES, RECEPTABLES AND ACCESSORIES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16141

SWITCHES, RECEPTACLES AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of switches, receptacles and accessories for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. Switches, receptacles and accessories are for operating and providing power to related electrical equipment and lighting.

PART 2 PRODUCTS

2.02 MATERIALS

A. Switches

1. <u>Toggle Switches for Lighting Circuits</u>: Shall be single-pole single-throw or three way, manufacturer's Specification Grade, 120-277 volt AC, with grounding means, grounding screw, grounding pigtail or self-grounding strap.

    a. 15 Ampere: Hubbell No. 1200-G Series
    b. 20 Ampere: Hubbell No. 1220-G Series
    c. Switch handle Colors: Shall be as follows:

- Finished Areas: Ivory
- Unfinished Areas: Brown

2. Toggle Switch Lighted Type: Same switch specification as specified in above Paragraph 1, except with neon light illuminated translucent handle.

   a. Ivory Handle Lights: When load is off:

      - 15 Ampere: Hubbell No. 1200-IL Series
      - 20 Ampere: Hubbell No. 1220-IL Series

   b. Red Handle Lights: When load is on:

      - 15 Ampere: Hubbell No. 1200-IL Series
      - 20 Ampere: Hubbell No. 1220-IL Series

B. Receptacles

1. Convenience Receptacles for 115 Volt, Single-Phase Wall Outlets: Shall be manufacturer's Specification Grade, 2 pole, 3 wire, grounding type, 125 volts AC or DC, NEMA configuration No. 5-15 or 5-20.

   a. 15 Ampere: Hubbell No. 5260 Series
   b. 20 Ampere: Hubbell No. 5360 Series
   c. Color of Receptacles: Ivory for finished areas and brown for unfinished areas.

2. Convenience Receptacles for Voltages Above 115 Volts, Single- and Three-Phase: Shall be single, grounding type, manufacturer's Specification Grade of the NEMA configuration number as specified on Drawings.

   Color of Receptacle: Black

C. Cover Plates for Surface-Mounted Devices in Plant Areas: Shall be stainless steel.

D. Cover Plates for Wiring Devices in Outdoor and Indoor Damp Locations: Shall e of cast material and equipped with a neoprene gasketed spring door.

E. Cover Plates for Flush Mounted Devices in Finished Areas: Shall be stainless steel in general occupancies and in laboratories and restrooms.

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SECTION 16152

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16152 ELECTRICAL--PACKAGED MECHANICAL EQUIPMENT

TABLE OF CONTENTS

SECTION 16152

ELECTRICAL--PACKAGED MECHANICAL EQUIPMENT

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification describes material and work to be performed in the electrical design and construction of packaged mechancial equipment.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. National Electrical Manufacturer's Association (NEMA).

B. Institute of Electrical and Electronic Engineers (IEEE).

C. American National Standards Institute (ANSI).

D. National Electrical Code (NEC) - 1990.

E. Occupational Safety and Health Act (OSHA).

F. American Welding Society (AWS)

G. American Society of Testing Materials (ASTM)

H. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

I. Air Moving and Conditioning Association (AMCA)

J. Air Diffusion Council (ADC)

K. Air Conditioning and Refrigeration Institute (ARI)

L. Underwriters' Laboratories Inc. (UL)

M. Joint Industry Council (JIC)

N. Insulated Cable Engineers Association (ICEA)

O. The packaged mechanical equipment shall be designed, completely factory assembled, wired and tested in accordance with the latest applicable standards of the above.

P. If there is an apparent discrepancy between any of the requirements of this Specification and the standards and requirements stipulated in Paragraph A. above, or of any applicable statute, ordinance or code, then the most stringent requirements shall apply.

1.04 SYSTEM DESCRIPTION

A. The intent of this specification is to present reference standards as to quality of electrical material and workmanship. This specification is not all inclusive and the specific specification for the packaged unit involved will cover more detailed requirements. In case of conflict, the mechanical equipment specification will normally control.

B. General

1. Complete items as required on the Equipment Data Sheets.

2. Each equipment furnished shall be a complete assembly.

   a. Installation of the packaged equipment shall require only setting in place, coupling to the driven equipment and making power and control cable connections.

3. When packaged equipment is factory assembled and coupled to the driven equipment, installation of each unit assembly shall require only setting in place and making power and control cable connections.

4. Accessible external surfaces of the equipment which operate at surface temperatures exceeding 60°C (140°F) shall be physically guarded, isolated or thermally insulated to protect against contact by personnel.

C. All electrical equipment shall be new and the complete unit shall be designed, constructed, installed and tested in accordance with the latest provisions of ANSI, IEEE, NEMA, JIC, UL, OSHA, ICEA and NEC. All equipment shall be guaranteed to be free of defects in materials and workmanship.

D. All electrical material and equipment shall be listed or labeled by Underwriters' Laboratories, Factory Mutual or equivalent testing laboratory for the service in which it is used, and shall bear their label or listing. Material and equipment not available with such label or listing shall be built in accordance with the latest published standards of UL, FM or equivalent testing laboratory.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electrical Equipment and Material List

1. Electrical items required for the package shall be selected from the following list or equal. This list is presented to identify equipment of high quality and availability, and is intended to be used as a guide for other devices either not listed or, which must be substituted.

2. <u>Relays</u>: Auxiliary relay and timer contact developments shall be in accordance with the applicable schematic diagrams. Relays shall be mounted inside the control panels or in separate relay cabinets. Relays shall have convertible contacts rated 600-V ac or 250-V dc insulation class, as appropriate, except if system design dictates otherwise. The number of contacts required shall be in accordance with appropriate control and/or alarm systems. The contacts shall be rated for an interrupting duty in inductive circuits of 10 A at 120-V ac and 1 A at 125-V dc.

Circuit Breakers	(Westinghouse, General Electric, ITE, Allen Bradley, or Asea Brown Bouveri)
• Control Fuses	For all applications (Gould Shawmut, Bussman)
• Enclosures	Control panel, operators panel (Hoffman)--NEMA 1 and 4

	Junction boxes--JIC Type (Hoffman, Carlon)--NEMA 1 and 4
	Junction boxes--NEMA Type 1 and 4, (Hoffman, Carlon)
Control Devices	
• Push Buttons	Heavy Duty, (Crouse-Hinds Allen Bradley) NEMA 1 and 4
120 Volt Manual Motor Starters	
• Outdoor	(Allen Bradley-Bulletin 600, Crouse-Hinds Type NSS)
• All Others	(Allen Bradley-Bulletin 600, Crouse-Hinds Type NFS)

Note: All momentary contacts shall be rocker-arm type.

Relays, Nontime Delay	A.C.: Industrial control type- Allen Bradley Bulletin 700 Type P, Westinghouse Type AR, G.E. Type CR, Cutler Hammer Type M-600
	D.C.: Allen-Bradley Bulletin 700 Type N, Westinghouse Type ARD.
	A.C./D.C.: hermetically sealed contact type - Allen-Bradley Type R
Relays, Time Delay	Pneumatic time delay relays of an industrial grade having temperature compensation with plug-in headers Agastat Series 7000, Allen Bradley Bulletin 849
	Solid state timing relays of an industrial grade having temperature compensation with plug-in headers, similar and equal to Agastat Series 9000, Allen Bradley Bullet in 852S
Sequence Timers	ATC Series 2400 motor driven contact type or equal

120-Volt Receptacles	125V A.C., 20 amp, 3-wire grounding type, Hubbell, Leviton or equal. (In PVC box with cover)
Panelboards (Nonhazardous)	Crouse-Hinds, General Electric or Westinghouse
Transformers--Dry Type	Energy efficient Westinghouse Type DT-3, ACME OPTI-MISER with encapsulated windings 3 phase, 60 HZ or approved equal
Wire Markers	Brady or Thomas and Betts all temperature or sleeve type
Terminal Blocks	With saddle terminal points, G.E. Type CR151B, CINCH Series 142, Kulka 602 series or approved equal
Wire Lugs	Compression Type (T&B--Stakon, Burndy YAEV-RS)
Ground Lugs	Mechanical Type (Burndy, T&B)

2.02 MATERIALS

2.03 EQUIPMENT

A. Electrical equipment installed shall be in accordance with the following:

1. Contractor shall furnish, prepipe and prewire all components necessary for the complete and proper operation of packaged equipment.

2. Motor starters and contactors shall not be furnished for mechanical equipment packages unless specifically requested in the mechanical package.

B. All devices requiring external connections shall be routed to terminals in a junction terminal box or control panel. Separate terminal boxes shall be provided for:

1. 120-volt power and control circuits wired to a separate control terminal box.

2. Thermocouple circuits which shall be wired to a separate Thermocouple Terminal Box. Shields shall be wired to separate terminal points.

3. DC Analog, AC Analog, RTD's, Digital signal or measurement circuits may occupy the same Instrumentation Terminal Box, but shall be terminated on separate terminal blocks. Shields shall be wired to separate terminal points.

4. 480-Volt power and control circuits wired to a separate control box.

C. Power Supplies and Voltages

1. Nominal ratings of power supplies available to supply the packaged equipment are as follows:

   - 120 volts, 1-phase, 60 Hertz (Preferred)
   - 208Y/120 volts, 3-phase, 60 Hertz
   - 480 volts, 3-phase, 60 Hertz (Preferred)

2. Incoming power to main control panel of equipment package shall terminate at a main breaker.

3. Motors shall be rated as shown on the Motor Data Sheets and in general comply with the following:

   a. Motors, fractional horsepower greater than 1/2 HP and up to but not including 200 HP will be controlled by the Plant Control System shall be powered from Motor Control Centers provided by others and be rated 460V, 3 phase, 60 Hertz.

   b. Fractional horsepower loads 1/2 HP and less, rated 120/208 VAC controlled by the Plant Control System will be provided a 3 ampere make and break 120/208 VAC nonmotor rated contact from an interposing relay by the Plant Control System. The Contractor shall provide interfacing terminal box with terminal blocks to accept this dry contact and in addition terminals to accept the 120/208 VAC power circuit. The terminal box shall have 25 percent spare for use by others.

   c. Fractional Horsepower loads 1/2 HP and less and not controlled by the Plant Control System may be rated 120/230 VAC. The Contractor shall provide all necessary control and switching equipment for these drives.

d. 120-Volt motors shall be heavy duty or explosion proof type enclosure for long life and dependability.

4. The Contractor shall supply the necessary transformers and associated switching and protection equipment for voltages other than those listed above.

5. Control circuits shall be 120 volts, AC, 60 Hertz, grounded neutral.

6. The voltage to ground on any instrument device for control and/or indication shall not exceed 120 volts. Normal instrument power shall be 120 volts, 60 Hertz, single phase.

D. Enclosures and Miscellaneous Material

1. Enclosures shall be constructed of #16 minimum gauge to assure rigidity and durability and shall be either stainless steel, galvanized steel, fiberglass or fiberglass-reinforced polyester or per equipment specification.

2. All miscellaneous material, such as channel, angle, strut, hanger rods, clamps, angle clips, etc., shall be provided as required.

3. All attachment hardware, such as bolts, nuts, screws, washers, etc., shall be stainless steel. Cadmium plating or elector galvanizing is not acceptable.

4. All hardware shall be heavy duty industrial quality. Items, such as Korn Klamps, speed clips, scissors clips, flange clips, set screw couplings, etc., are not acceptable.

5. All junction boxes, terminal boxes, enclosures for relays and enclosures for controls shall be properly sealed against the entrance of dust and moisture and shall be equipped with breathers and drains. Space heaters shall be installed where required on motor data sheets.

6. Enclosures for electrical equipment shall be suitable for the environment in which they will be located as stated in the Mechanical Equipment Specification environmental condition section and shall be as follows:

Indoor Locations	NEMA Type 1
Indoor Process (SWP) & Outdoor Locations	NEMA Type 4

7. Suitably located, flush-hinged access doors shall be provided with a maximum width not to be more than 30 inches. The doors shall be constructed with stiffening members, if necessary, to ensure rigidity. Door handles shall be corrosion resistant and capable of being pedlocked.

8. Enclosures shall be suitable for cable entry from above and below as specified on the Specification Details Tabulation. The panel drawings shall show the areas for cable entrance including pertinent dimensions.

9. Engraved nameplates shall be provided for each instrument or device where mounted on the face of the panel or within the panel exposure. All devices, such as disconnect switches, relays, fuses, etc., are to be identified.

10. Nameplates shall be legible, substantial and permanent--suitable for the environmental conditions specified.

11. Each free-standing enclosure shall be provided with the following:

    a. Sufficient interior lighting to illuminate adequately the enclosure interior. Lighting shall be controlled from conveniently located switches.

    b. One duplex receptacle, grounded type, 120-V ac, NEMA 5-15R configuration, located inside on a side wall in a readily accessible position and fed from a suitable power source.

E. Control Equipment and Devices

1. Refer to the Electrical Material List in Section 2.01 for acceptable manufacturers and equipment types.

2. Control relays shall be rated 600 volts. Relay coils shall be 120 volt, 60 Hertz or 125V DC (when DC is specified for specific relays). Contacts shall be rated 10 amps minimum continuous at rated contact voltage. When approved by the Construction Manager, 5A rating will be acceptable.

3. In addition to contacts required by the system, relays shall have two spare convertible contacts for use by others.

4. Controls shall be mounted on supports (racks) that will not transmit vibration to the control device. In general, these supports shall not be mounted on the machinery or attached to its base.

F. Motor Control Equipment: Where motor controls and wiring are specifically specified to be provided as part of a mechanical equipment package, they shall be as specified below.

1. Starters and Contactors: Shall be of proper NEMA size for voltage, load and environmental conditions per mechanical specification.

   a. Combination Magnetic Starters and Switches: Shall be enclosed type, with circuit breaker, or motor circuit protector.

      1) Switches shall have external operating handles with lock-open padlocking provisions and shall indicate the ON and OFF positions.

      2) Enclosures shall be NEMA 1 or 4 as shown on Drawings.

      3) Where types of motor controller enclosures are not indicated, they shall be NEMA types which are most suitable for the environmental conditions where motor controllers are being installed.

      4) Doors shall mechanically interlock to prevent opening unless the switch is open.

2. Push Buttons, Selector Switches, Pilot Lights: Furnish in starter cover, control panel door or as specified.

a. Provide engraved plastic legend plates to identify the function of each item.

3. Auxiliary Contacts: Provide one extra convertible, normally open or normally closed, auxiliary contact for each magnetic motor starter in addition to the holding contact and any required interlocking contacts.

4. Overload Assembly Heater Elements: Size based on the actual motor nameplate full load current rating and the assembly manufacturer's recommended heater based on starter and motor ambient temperatures and motor service factor.

   a. Quantity: One for each pole

   b. Type: Thermal or induction type

5. Switch and Fuse Units: Not acceptable for motor overload protection unless specifically indicated.

6. Raceway, Wire and Cable: Raceway, wire, cable and accessories shall conform to the requirements of Division 16, Electrical, and NEC.

G. Heating Elements

   1. Heating elements shall be metal-clad and shall be provided with thermal enclosures to prevent exposure of live parts.

   2. Heating elements to 1800 watt rating shall be rated for 120 volt, single phase operation. Higher wattage heaters shall be suitable for 480 volt 3 phase operation.

   3. Heaters where specified shall be readily accessible for replacement and shall be provided with protective screens if located where they may be directly contacted by personnel. Each space heater shall be protected with a properly rated fuse of the nonrenewable type.

H. Wiring

   1. Wire and Cable Types

a. All wire and cable shall be stranded tinned copper.

b. Cable for power service 0-600 volts shall be black, type XHHW, #12 AWG minimum, rated for 600 volts, 3 wire plus equipment grounding conductor.

c. Conductors for 120 volt motor control circuits, interlocks, etc., shall be 600 volt, type XHHW, No. 14 AWG minimum.

d. Conductors for lighting service 0-600 volts shall be type XHHW, No. 12 AWG minimum.

e. Electronic instrument wire shall be a twisted pair, or triad, No. 16 AWG 7-strand copper conductor with No. 18 AWG 7/S tinned copper drain wire, 90°C PVC primary insulation, aluminum 100 percent shield, 80°C jacket, Dekoron Type 1852, 1862 or equal.

f. Individual pair thermocouple extension wire shall be a twisted pair No. 16 solid alloy conductor, 105°C primary insulation, aluminum 100 percent overall shield, 80°C jacket, Dekoron Type 1802 or equal. The extension wire shall be of material compatible with the thermocouple and color coded per ANSI standards.

g. Control panel wiring (internal) shall be single conductor, stranded copper conductor with 600 volt class, 90°C rated, switchboard wire, type SIS insulation. Minimum wire size shall be No. 14 AWG.

h. Cables installed in radioactive environments shall be rated for the maximum anticipated exposure. Specially fabricated flexible heat and radiation resistant cables rated up to 1500°F at 600 volts are produced by Boston Insulated Wire and Cable Co. under the "Bostrad" trade name.

i. Multiconductor cables rated 2 x 10^8 RADS and 90°C operating temperature may be obtained from Okonite Co. FMR-OKOLON or equal. Careful consideration shall be given to methods of termination for all conductors located in gloveboxes. Termination methods and materials must be compatible with radioactive conditions per equipment specification.

j. Wiring shall be so arranged that instruments of devices may be removed and or serviced without unduly disturbing the wiring. No wire shall be routed across the face or rear of an instrument, junction box or device in a manner which will prevent the opening of covers, removal of equipment or access to leads, terminals or instruments.

k. Low-level instrumentation wiring shall be 2/c, 3/c or 4/c twisted, and/or twisted shielded cable not less than No. 16 AWG stranded tin-coated copper conductor. Type PLTC Low-level signal cables must be separately bundled from all control cables and must be maintained at 6 inch minimum spacing from control bundles. Where such spacing cannot be maintained, low-level bundles shall be at right angles to others or enclosed in ferrous conduit.

2. Circuit/Wire Identification

a. Each circuit and/or wire shall be identified at each end and in all junction, terminal and pull boxes with the proper identifying number. Identifying labels shall be firmly attached to the cable, wire, or wires, and shall be of a permanent nonweathering type.

b. An individual wire shall have the same assigned number at each end and at each location where it is terminated.

3. Wire Color Coding

a. Single Phase, AC

- Line - Black
- Neutral - White

b. DC Circuits (Power and Control)

- Positive Leads and Busses - Red
- Negative Leads and Busses - Black

c. Thermocouple Wiring--Per ANSI Standards

d. Insulated Grounding
- Conductors - Green

e. Combination Starter Terminal No.

- Hot--1 - Black
- Ground--X2 - White
- Coil-Hot--3 - Red
- Coil--Neutral (6) - Orange

f. Annunciation (AC or DC)

- Signal - Black
- Common - Red

4. Where it is necessary to terminate 120 volt (nominal) or higher voltage circuits in control panels, terminal boxes or other enclosures containing lower voltage conductors, the higher voltage conductors shall be isolated with an insulating cover or barrier and identified with a label showing the voltage and the service.

5. Terminal Box and Control Panel Wiring Details

   a. All control wiring external to enclosures shall be terminated within the enclosures using T&B Sta-Kon or approved equal insulated spade lugs on devices with screw-type terminals. Terminals shall be sized to the current carrying requirements of the conductor. Splicing of any circuits is not permitted.

   b. Wire and cable shall be neatly dressed with nylon ties and shall be free from nicks or cuts in the copper conductor. Plastic wire duct, Panduit or equal may also be used as an alternate to nylon ties. Self-adhesive "stick-on wire" tie bases are not acceptable.

   c. All wiring shall be suitably sized for the service intended and each end of each conductor shall be permanently tagged in accordance with the schematic and wiring diagrams with plastic, printed wire markers.

d. A maximum of two conductors per terminal shall be permitted. This includes all internal panel wiring plus terminal allowance for all external wiring normally required.

e. A minimum of 25 percent spare terminals shall be provided in all terminal boxes and control panels.

f. Terminal and junction boxes shall be sized per Article 370 of the NEC for the maximum number of terminations in the box (including the 25 percent spares mentioned above) and based on two No. 14 AWG wires per terminal.

g. Control panel wiring shall be done in a neat and professional manner and shall be laced and/or secured in wireways. Wiring shall be collected and gathered wherever possible; however, control and power wiring shall not be intermixed.

h. All thermocouple extension wiring connections to terminal blocks shall be made without lugs. Thermocouple terminal blocks shall be specifically designed for the thermocouple-type wire. Twist both wires together on one terminal.

6. Miscellaneous Wiring Details

a. Wire nuts shall not be used. Splices in junction boxes or at lighting fixtures shall be made with self-insulated crimp type connectors. These connections shall be waterproofed with rubber tape and vinyl plastic electrical tape to prevent the entrance of moisture into the connector.

b. Components requiring soldered connections for installation and/or replacement shall not be used except in nonprocess areas. Soldered connections may be used in equipment, such as transducers and transmitters, located in process (SWP) areas provided the equipment is installed so that it can be readily disconnected and moved to a nonprocess area for making the soldered connections.

c. Splices or taps shall be avoided in power or control wiring. In general, wire or cable shall be installed in a single continuous length from termination point to termination point. Wire shall not be spliced in conduit under any condition.

d. All splices and terminations of thermocouple wiring shall be made with terminal blocks specifically designed for the particular type of thermocouple wire. Individual pair shields shall be kept isolated and continuous at all points except the shield of each pair shall be bonded to the thermocouple well.

e. When dressing individual shielded multi-pair or triad cable at termination points, tape shall be installed on stripped pairs or triads to prevent unraveling of wrapped coverings.

f. Shielded wires shall contain no splices between terminating points.

g. Special care shall be exercised to isolate all shields from ground except at the common grounding point and to keep positive and negative signal leads close together and twisted. Shields shall be wired to separate terminal points.

h. Wiring for AC and DC power or control circuits shall be kept segregated and shall not be mixed in the same conduit or in the conductors of multi-conductor cables.

i. Instrument wiring shall be in separate conduits from power wiring.

j. No open wiring or exposed live parts shall be allowed. All live parts or equipment subject to arcing shall be guarded isolated or insulated by a grounded metal enclosure.

k. All devices requiring periodic operator adjustment; i.e., timers, overloads, resets, etc., shall be accessible without having to open/enter areas containing exposed live parts.

l. Relays, fuses or other devices shall not be installed in wire raceways, junction boxes, pull boxes or other enclosures intended for routing and/or connecting wires.

m. All wiring connections to screw type terminal blocks will be made using insulated ring lugs, T&B STA-KON or equal.

n. Control circuits for motors shall contain only those components necessary for control of the individual motor. A motor driven service and its spare shall not have contacts of one relay in both circuits. A single contact of a relay or sequence timer shall not be used to control more than one motor.

I. Conduit Systems

1. Packaged mechanical equipment shall have a complete conduit system. The conduit system shall include, but not be limited to: conduit, conduit fittings, condulets, pull boxes, junction and terminal boxes, braces, hangers, brackets, supports, cover plates, drains, bonding jumpers, etc.

2. All electrical circuits shall be run in IMC (preferred) or rigid conduit, threaded and bearing the label of a manufacturer listed by Underwriters' Laboratories. All conduit shall be level, plumb and installed in a neat and workmanlike manner. Conduit shall be installed either parallel with or perpendicular to structural members and grouped wherever possible. Conduit shall be supported at spacings not to exceed the following:

Conduit Size	Maximum Support Spacing
3/4" - 1"	10'-0"
1-1/2"	14'-0"
2"	16'-0"
3" and above	20'-0"

3. Conduits of multiple duct systems shall have a minimum separation of 2 inches for conduit to 2 inch nominal size, and a minimum separation of 3 inches for 3 inch and larger size conduit.

4. Conduit and pull fittings shall not be located in inaccessible places where difficulty would be experienced in wire pulling. Conduit and/or conduit fittings shall not be welded to any pipe or structure. Conduit shall not be installed within 6 inches of

insulated above ground hot lines. A line shall be considered as a "hot" line when operating at a temperature of 225°F or more.

5. Conduit sizes shall be 3/4 inch, 1 inch, 1-1/2 inch, 2 inches, 3 inches or 4 inches. Conduit fittings, unless otherwise noted, shall be compatible with conduit with covers and solid neoprene gaskets. Sizing of condulet bodies and boxes to accommodate splices shall be per the NEC. The 480 volt conduit system shall be sized for 75°C rated wire and cable. 1/2 inch or 1-1/4 inch conduit sizes shall not be used.
   Note: Conduit used for instrumentation wiring between instrumentation and junction box shall be 3/4 inch minimum size except where 1/2 inch NPT instrument conduit connection is required, 1/2 inch NPT is acceptable.

6. All conduit shall be terminated in threaded hubs or insulated bushings designed to prevent damage to wire during pulling operation.

7. Conduit entrance into boxes shall be made with threaded terminal adapters with "O" ring seal and nonmetallic bushing.

8. All conduit bends shall be made with an approved conduit bending machine. The use of a pipe tool, vise or heat for bending shall not be permitted.

9. Radius of conduit bends shall be not less than specified in the NEC or the minimum conductor bending radius whichever is greater.

10. Flexible nonmetallic conduit shall be employed at all apparatus or devices subject to vibration, movement for belt adjustments, operational inspection and maintenance facility. Flexible connections shall be Carlon Carflex liquid tight flexible conduit or equal.

11. Flexible conduit connections to motors with belt drives shall be long enough and installed in such a manner as to facilitate belt tightening or replacement without distorting the flexible conduit.

12. Liquid-tight flexible nonmetallic conduit shall be terminated at both ends using insulated, threaded, watertight connectors, Carlon type LT or equal.

13. Conduit shall be installed in such a manner as to prevent the collection of trapped condensation and all runs of conduit shall be arranged so as to be free of traps whenever possible.

14. Power wiring shall not be mixed with control, instrument or alarm wiring. Power circuits shall be run in separate conduits and terminations shall be made in separate junction and terminal boxes.

15. Small single conductor wires or small O.D. single or multiple pair shielded wire shall not be run in the same conduit with larger O.D. multi-conductor cable.

16. The maximum number of single conductor wires in service per conduit shall be limited to 15 in 1 inch and limited to 25 in 1-1/2 inch.

17. Conduits or wireways containing thermocouple lead wires shall not contain any other wiring.

J. Grounding and Bonding

1. Where residual voltage may exist following equipment disconnection from the power source, a warning sign shall be provided.

2. Electrical circuits, exposed noncurrent carrying metal parts of electrical equipment and metal structures shall be grounded in accordance with provisions of the National Electric Code.

3. All grounding cables and wires shall be insulated to prevent corrosion.

4. Green insulated wire shall be used only for the grounding conductor and for no other purpose.

5. A ground wire sized in accordance with the provisions of the National Electric Code shall be installed in the conduit to all motors.

6. The skid-mounted packaged systems shall include threaded stud connectors at each end of the skid, diagonally opposite each other, sized appropriately to accept and connect No. 2/0 AWG stranded copper ground taps.

7. Electrical equipment rated 600 volts or less which is solidly mounted on a metallic switchrack will be considered adequately grounded providing the switchrack is solidly grounded.

8. A copper ground bus with the necessary mechanical lugs must be provided in all control and panel enclosures. This bus shall be grounded to the skid steel.

9. The cases of all instruments, relays and meters in a control panel shall be grounded effectively to the panel frame.

K. Indicating Lights

1. Indicating lights, unless otherwise noted, shall be suitable for operation on either 125-V dc or 120-V ac and supplied with resistor or transformer to allow use of low-voltage bulb. Lamps and color caps shall be replaceable from the front.

2. Color caps shall be as follows unless otherwise specified:

<u>Motors, Circuit Breakers, and Electrical Devices</u>

a. Red - General meaning is "Not Operating"

"On" when: Motor is not running
Device deenergized
Valve is closed

b. Green - General meaning is "Operating"

"On" when: Motor is running
Device is energized
Valve is open

c. Amber - General meaning is "Warning"

"Take Note" or to indicate abnormal equipment or system status.

"On" to show: System or subsystem is in a mode which is other than a normal operating or steady state mode.

d. White - Used for advisory information function for example:

- DC voltage available
- Heater circuit power available
- Bus energized

<u>Valves</u>

a. Red - "Closed" (Off only when valve is fully open)

b. Green - "Open" (Off only when valve is fully closed)

L. Nameplates--Equipment and Device Identification

1. Contractor shall provide a firmly attached nameplate for each item of electrical equipment and each control station consisting of a three ply laminated phenolic plate engraved to show the equipment device number, function and service. Nameplates for equipment shall be (white-black-white) and engraved through the black lamination. Lettering shall be 3/16 inch minimum size. Edges of all nameplates shall be beveled at 45 degrees. Nameplates for emergency equipment or for warning shall be red-white-red, engraved through the red lamination.

2. Nameplates shall be attached with stainless steel screws.

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WRAP MODULE 2A
CDR LAYOUT - AFFINITY ANALYSIS

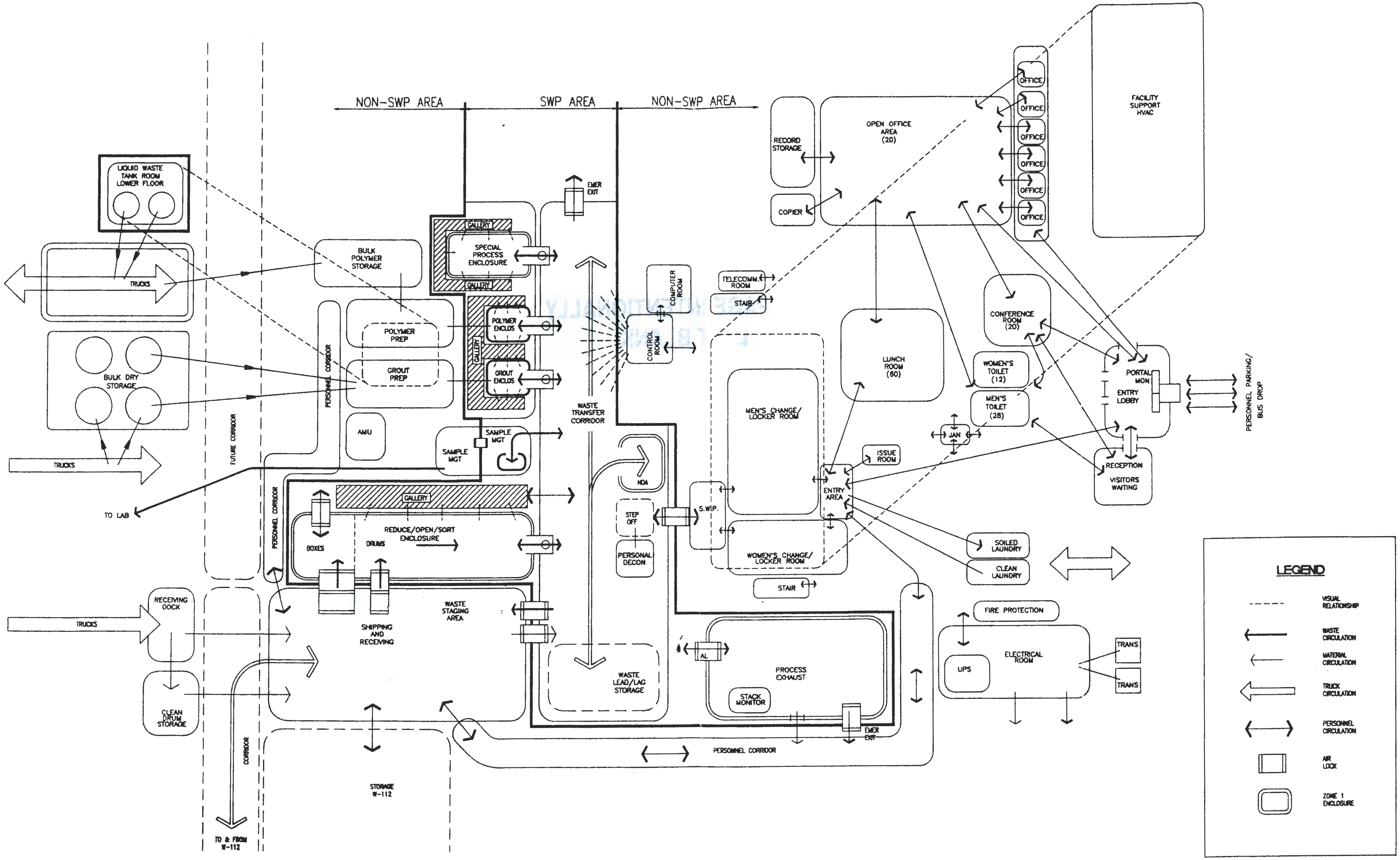

EXHIBIT A

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EXHIBIT B
FACILITY SCHEMATIC PLAN

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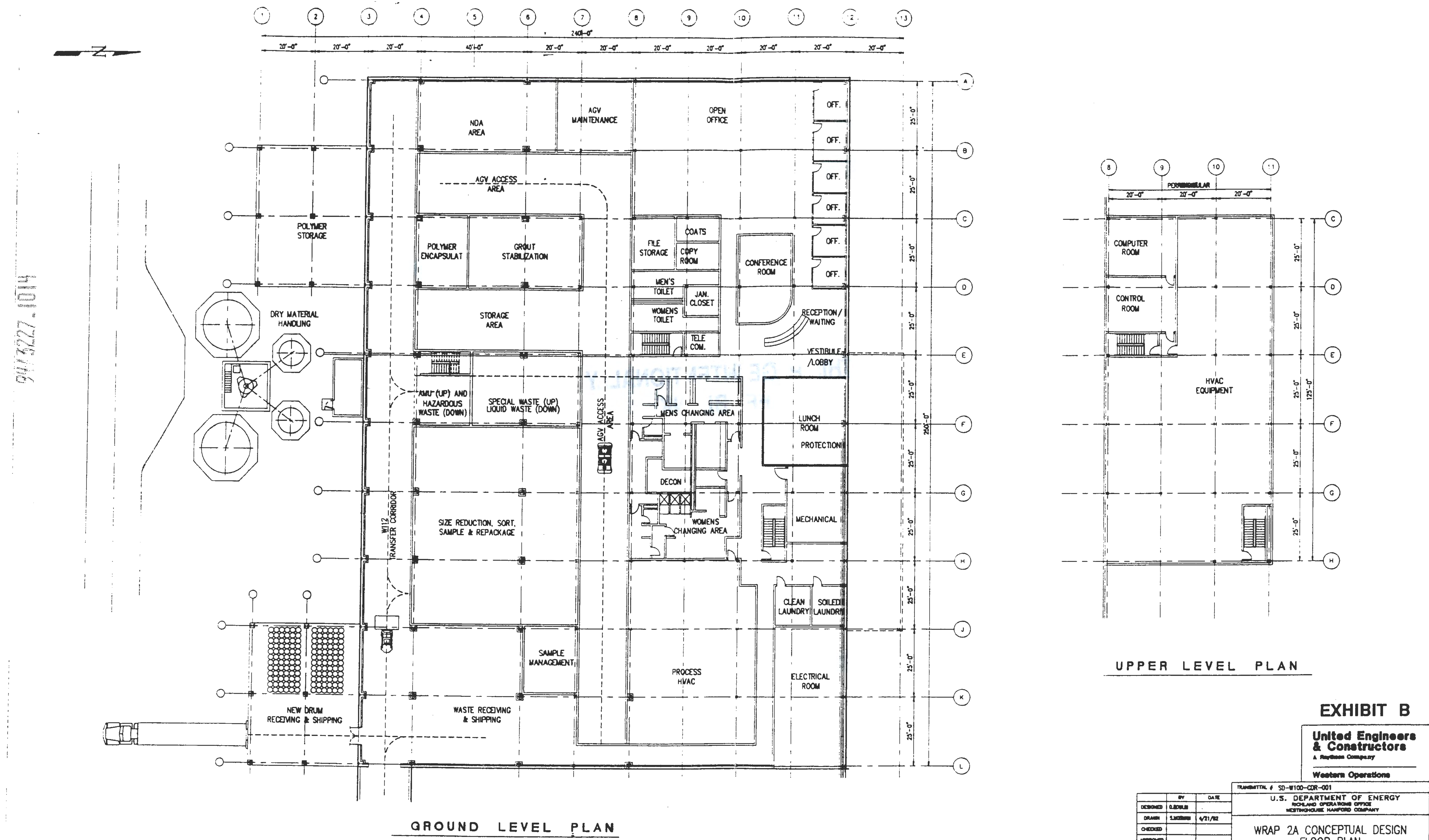

EXHIBIT B

United Engineers & Constructors
A Raytheon Company
Western Operations

TRANSMITTAL # SD-W100-CDR-001

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
WESTINGHOUSE HANFORD COMPANY

WRAP 2A CONCEPTUAL DESIGN
FLOOR PLAN
ARCHITECTURAL

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SCALE: 1/16" = 1'-0" DISCIPLINE NO. A101 SHEET 1 OF 1

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APPENDIX I

PLANT THROUGHPUT FUNCTIONAL ANALYSIS

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I.1 OBJECTIVE

I.1.1 Background and Scope

1. As part of the Conceptual Design Report (CDR), a Plant Throughput Functional Analysis was completed. This analysis would ascertain whether the throughput requirements as stated in the Functional Design Criteria (FDC) could be achieved with the equipment and facility as designed during the CDR effort.

2. The scope of the Plant Throughput Functional Analysis comprises:

a. Develop the sequence of operations for each area and the duration times for these operations, based on the block flow diagrams and process flow diagrams.

b. Develop a simulation model of the WRAP 2A facility using the AT&T ISTEL WITNESS Simulation Program. The model will incorporate all major operations in the facility, the material transfer system (i.e., Automatic Guided Vehicle (AGV), conveyors, forklifts, etc.) and the storage retrieval system. The model will be based on the block flow diagrams, the process flow diagrams, and the equipment general arrangement drawings.

c. Simulate the facility using the model for one year and provide reports which illustrate the throughput of material in the facility.

d. Identify any operations or storage areas which are not in compliance with the requirements of the facility.

e. Determine whether the material transfer system, as shown on the Material Handling Block Flow Diagram, H-2-140665, will adequately meet the design requirements of the facility.

I.1.2 Purpose and Need

1. The purpose of this analysis is to confirm that, based on the conceptual design for WRAP Module 2A Facility:

a. The required material throughput as stated in the FDC can be achieved.

b. The amount of equipment in the facility has the capacity to meet the required throughput.

c. The size of the lead/lag storage in the process area is adequate.

d. The interactions between the main operating areas and the material handling system do not create constraints in the facility which result in a decrease in throughput.

I.2.0 SUMMARY

1. The plant throughput functional analysis evaluates the ability of the WRAP Module 2A Facility to achieve the required material throughput by developing a Time and Motion simulation model of the facility using the WITNESS simulation program. Analysis of the simulation model indicates that at the actual maximum input of 4,174 drums per year, the facility can achieve the required throughput when the grout and polymer areas operate simultaneously 92 percent of the time. To achieve this high level of simultaneous operation, the order and size of "lots" of the incoming waste streams need to be optimized. Additionally, to reduce the simultaneous operation level below 92 percent, the process area can operate on multiple shifts or the capacity of the grout and polymer areas can be increased.

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SECTION 16252

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16252 MANUAL TRANSFER SWITCHES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16252

MANUAL TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of manual transfer switches for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. The manual transfer switch will provide a means to connect a portable generator into the standby power panel.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Manual Transfer Switches: Quick-make, double throw 3 pole, quick-break type, horsepower rated, voltage and amperage as shown heavy-duty, nonfused.

Enclosures: NEMA 3R raintight when installed outside of building and when exposed to moisture, and NEMA 1 in all other locations.

END OF SECTION

SECTION 16310

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16310 AERIAL POWER DISTRIBUTION

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16310

AERIAL POWER DISTRIBUTION

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of the aerial power distribution from existing overhead power lines at Hanford for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute
ANSI Standard C2.2

B. Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines (NBS Handbook H81).

C. National Electrical Safety Code (ENSC) shall be the basic code for design and construction of serial lines at Hanford.

1.04 SYSTEM DESCRIPTION

A. Overhead lines shall be designed to meet the requirements for NESC Grade B unless a lower grade is specified in the supplemental Design Criteria.

The assumed conductor loading shall be as specified by NESC for Medium Loading District.

PART 2 PRODUCTS

2.02 MATERIALS

A. Conductors (Open Wire)

1. Open wire on crossarms shall, in general, be used.

2. Where possible, the phase sequence (A-B-C) of open wire conductors and cables shall be from top to bottom and left to right when facing the source of power.

3. Wire extension shall match existing 556 kcmil ACSR construction.

4. All conductor clearances shall be per ANSI-C-2, Section 234.

5. Open wire line conductor splices shall be of the twisted sleeve or compression type. Self-gripping (automatic) tension splicing sleeves shall not be used.

6. Line conductors shall be secured to pin insulators with soft annealed hand-wrapped wire ties.

   a. Each tie should securely bind the conductor to the insulator to resist chafing.

   b. The tie shall snugly engage the conductor on each side of the insulator.

   c. Composition of ties must be similar to the composition of the conductors.

   d. Preformed aluminum armor rods with center marking shall be used for conductor protection at tie points with certain ACSR and stranded aluminum conductors.

   e. Applications include:

      - Single-insulator side-groove tie and double-insulator side-groove tie for use on pin insulators at angles in the line

      - Single-insulator top-groove tie and double-insulator top-groove tie for use on pin insulators tangent in the line

      - Double-side-groove ties and double-top-groove ties where necessary to provide additional strength and security.

f. The method of typing each conductor shall be illustrated or defined on the Drawings and shall include specifications covering composition, grade, size and length of tie wire.

B. Supports: Wood poles and wood crossarms are standard and shall be used.

Wood Poles

1. Poles shall be Western Red Cedar cut from live stock and shall conform to ANSI Standard 5.1, Specifications and Dimensions for Wood Poles.

   a. All poles shall be air seasoned and butt treated in accordance with the American Wood Preservers' Association (AWPA) Standard C7.

   b. Each pole shall be branded or marked as described in ANSI 05.1 as follows:

   The brand or mark shall be placed squarely on the face of the pole and at 10 feet from the butt of poles 50 feet or less in length and at 14 feet from the butt of poles 55 feet or more in length. The face brand shall designate the supplier's code or trade-mark; plant location and year of treatment; species and preservation code; and class and length of pole.

   c. The pole roof and gain shall be brush coated with pentachlorophenol-petroleum solution conforming to AWPA Standards P8 and P9.

   d. The top of each pole shall have a one-way roof cut sloping 30° (120 degrees with pole axis) and the cut surface shall face at right angles to the pole face.

2. The size of poles will be governed by specific use but the following is required:

   a. Poles smaller than Class 4 shall not be used.

   b. Transformer poles, poles at line angles exceeding 30° and dead-end structure poles shall not be smaller than Class 2.

3. The minimum setting depth for poles shall be according to the following:

Pole Length Feet	Straight Line Setting Depth	Curves, Corners, and Points of Extra Strain
30	5'-6"	5'-6"
35	6'-0"	6'-0"
40	6'-0"	6'-6"
45	6'-6"	7'-0"
50	7'-0"	7'-6"
55	7'-6"	8'-0"
60	8'-0"	8'-6"
65	8'-6"	9'-0"
70	9'-0"	10'-0"
80	10'-0"	10'-6"
85	10'-6"	11'-0"
90	11'-0"	11'-6"
95	11'-0"	12'-0"

4. Holes for wood poles shall have reasonably straight sides.

   Holes shall not be grossly oversize, but shall be sufficiently large to permit use of a tamping bar all around the pole.

5. Backfill around poles in sand and gravel areas shall preferably be compacted by flooding the backfill material as it is placed with copious quantities of water.

   a. Where the use of water is impracticable, the backfill shall be placed in 6 inch lifts and thoroughly compacted by hand tamping.

   b. Surplus excavated material shall be placed around the pole in a cone approximately 1 foot in height.

<u>Crossarms</u>

1. Shall be 9 feet 2 inches in length.

   a. Shall be machined, chamfered, trimmed and bored for stud and bolt holes before pressure treatment.

b. Factory drilling shall be provided for pole and brace mounting, for 4 pin or 4 vertical line-post insulators, and for 4 suspension insulators, except where otherwise indicated or required.

c. Drilling shall provide required climbing space and wire clearances.

d. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length.

e. Bend or twist shall be in one direction only.

2. Crossarms shall face each other on alternate spans on level construction.

3. Line deviations for 20° or less may be on a double arm mounted to bisect the angle.

4. One piece steel angle crossarm braces shall be used where the conductors are No. 0 Awg or larger.

<u>Insulators</u>: For supporting power conductors hall be wet process brown porcelain and shall conform to EEI-NEMA standards for the class.

C. Guy and Anchors

1. Shall be designed and installed according to Hanford Plant Standard Instructions DI-E-4-1 and DI-E-4-5 to 9 and E-4-1, E-4-5 to 9, inclusive.

2. In order to avoid confusion, guy strand shall e limited to two grades; Siemens-Martin grade for distribution lines, and High Strength grade for communications messenger.

D. Switches and Cutouts

1. Disconnecting switches for the purpose of sectionalizing lines shall be group operated.

a. Where mounted on poles, sectionalizing switches must be equipped with a lockable lever for operation from the ground.

b. Ice break criteria shall be utilized.

E. Lightning Arresters: Shall be distribution class, valve type, rated 15 kV and 95 percent BL (ANSI C62.1 and C62.2).

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SECTION 16315

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16315 POWER TRANSFORMER

TABLE OF CONTENTS

POWER TRANSFORMER

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of a power transformer complete from the incoming line terminals to the outgoing feeder terminals for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute (ANSI)

ANSI/IEEE C57.114	Seismic Guide for Power Transformers and Reactors

B. American Society for Testing and Materials (ASTM)

C. American Welding Society (AWS)

D. Insulated Cable Engineers Association (ICEA)

E. Institute of Electrical and Electronic Engineers (IEEE)

F. National Electrical Code, 1990 (NEC)

G. National Electrical Manufacturers Association (NEMA)

H. Occupational Safety and Health Act (OSHA)

OSHA Standards	General Industry Standards CFR 29 Parts 1900 through 1910

I. Underwriters Laboratories (UL)

J. Steel Structure Painting Council (SSPC)

SSPC-SP-10	Surface Preparation Near White Blast Cleaning
SSPC-SP-2	Surface Preparation Hand Tool Cleaning
SSPC-SP-3	Surface Preparation Power Tool Cleaning

K. In addition to the above referenced standards, the design, fabrication, testing, installation and operation shall be in accordance with all applicable laws, regulations or rules of any government authority having jurisdiction over such installations. In case of conflict, the stricter standard shall apply.

L. Manufacturers' names, trade names and model numbers specified herein are used for facilitating description and establishing a standard of quality and required design characteristics.

M. Where a specific revision, issue or date is not referenced, the publication in effect at time of purchase order award shall apply.

N. In cases of conflicting requirements, the most stringent standard shall apply unless approved otherwise by the Contractor.

O. Contractor shall be apprised of all apparent discrepancies.

1.04 SYSTEM DESCRIPTION

A. The transformers will step down the 13.8KV primary service to a utilization voltage of 480/277V, 3 phase.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Power transformer and its accessories shall be in accordance with this Specification and with the requirements specified herein.

B. Equipment shall consist of essentially standard design and first line quality which meet or exceed the requirements of this Specification and shall be UL listed and labeled where possible.

C. Ratings and design parameters of power transformer shall be based on self-cooled conditions.

D. General Design Requirements

1. Connections between transformer and low voltage switchgear shall be low voltage feeder busway. The

Contractor shall coordinate the physical interface between the transformer and busway to insure a matching assembly in the field.

2. Dimensions of the equipment shall not exceed the maximums shown on the Drawings.

3. Transformer shall be outdoor, pad mounted type, compartmental style, self-cooled, liquid filled consisting of:

   - Primary incoming line compartment consisting of 150E amp fuses with disconnect load break connectors and parking bushings.
   - Transformer section
   - Secondary low-voltage compartment consisting of bolted connections and fittings interfaced with low voltage bushings.

4. Transformer shall have weather protected and tamper resistant construction.

E. Transformer Design Requirements

1. Rating of transformer shall be as follows:

   - KVA Rating: Per Drawings
   - Impedance: Not less than 5.75 percent
   - High Voltage: 13,800V Delta
   - H.V. BIL: 95 KV
   - H.V. Tape: Plus and minus two 2.5 percent full capacity
   - Low Voltage: 480/277V Wye

2. Unit shall be mineral oil filled or approved equal, and shall be in accordance with the latest edition of the NEC.

   a. Insulating liquid shall be shipped in the tank of the transformer.

3. Transformer shall carry its continuous rating with average winding temperature rise by resistance that shall not exceed 55°C.

4. Transformer shall include all control wiring, devices, contactors and auxiliary equipment (except fans) for future forced air cooling.

   a. Provisions for fan control from temperature sensing equipment shall also be included.

   b. Control power for fans shall be 120V AC, single phase.

   c. A thermostatically controlled enclosure space heater with ON-OFF switch shall be provided for fan contractor enclosure.

5. Transformer shall be designed to carry short time emergency overloads in accordance with ANSI C57.92 and NEMA TR 98 as applicable.

   a. Duration and magnitude of designed withstand capability shall be as outlined in ANSI C57.12.00.

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SECTION 16316

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16316 LOW VOLTAGE FEEDER BUSWAY

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16316

LOW VOLTAGE FEEDER BUSWAY

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of low voltage feeder busway for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. American Welding Society (AWS)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Code (NEC)

F. National Electrical Manufacturers Association (NEMA)

G. Occupational Safety and Health Act (OSHA)

OSHA Standards	General Industry Standards CFR 29 Parts 1900 through 1910

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SSPC-SP-3	Surface Preparation Power Tool Cleaning

L. In addition to the above referenced standards, the design, fabrication, testing, installation and operation shall be in accordance with all applicable laws, regulations or rules of any government authority having jurisdiction over such installations. In case of conflict, the stricter standard shall apply.

M. Manufacturers' names, trade names and model numbers specified herein are used for facilitating description and establishing a standard of quality and required design characteristics.

N. Where a specific revision, issue or date is not referenced, the publication in effect at time of purchase order award shall apply.

O. In cases of conflicting requirements, the most stringent standard shall apply unless approved otherwise by the Contractor.

P. Contractor shall be apprised of all apparent discrepancies.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Low voltage feeder busway and its accessories shall be in accordance with this Specification and with the requirements specified herein.

B. Equipment shall consist of essentially standard design and first line quality which meet or exceed the requirements of this Specification and shall be UL listed and labeled where possible.

C. Design and Construction

1. Low Voltage Feeder Busway

a. Switchgear shall be connected to the transformers by a system of low voltage busway as shown on the Drawings. The contractor shall coordinate the physical interface between the switchgear, busways and transformers to insure a matching assembly in the field.

b. Busway shall be a unified and continuous system constructed and tested in accordance with NEMA BU.1, and ANSI/UL 857.

c. Busway shall be indoor/outdoor with drain holes, metal-enclosed, nonventilated, nonsegregated phase type.

   Flange assemblies shall be provided to allow water tight penetrations of a 2 inch prefabricated metal panel wall. Contractor shall coordinate this work with the structural and architectural work.

d. Bus bars shall be 98 percent conductive copper.

e. Bus bars shall be insulated.

   Bus supports shall be glass polyester (fiberglass) or porcelain.

f. Busway voltage drop shall not exceed 3 volts line to line per 100 feet at rated capacity.

g. Maximum temperature rise shall not exceed 65°C at rated capacity and 40°C ambient.

h. Busway ratings shall be as follows:

   - Voltage: 480 Volts, 60 Hertz
   - Current: Per Drawings
   - Short Circuit Current Rating: Per Drawings
   - Phases/Wire: 3/3 Wire System with Internal ground

i. Thermal expansion sections and supports shall be provided as recommended by the manufacturer.

j. Busway shall be labeled per NEC Article 364-15.

k. Manufacturer shall submit busway layout and dimensions to Construction Manager for review prior to fabrication.

l. Busway design shall incorporate large air spacings or insulation between phases and ground including the splice locations.

m. Flanged end section of the busway shall provide watertight connection to the top of secondary compartment of the power transformer (two each).

n. Flanged end section of the busway shall provide connection to the top of the low voltage switchgear (two places).

o. <u>Special tools and Devices</u>: One complete set of all special tools or devices required for operation and/or maintenance of the unit furnished shall be provided and delivered with the equipment in a separate container clearly marked with the name of the equipment.

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SECTION 16317

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16317 LOW VOLTAGE SWITCHGEAR

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16317

LOW VOLTAGE SWITCHGEAR

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PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of the low voltage switchgear for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. American Welding Society (AWS)

D. Insulated Cable Engineers Association (ICEA)

E. Institute of Electrical and Electronic Engineers (IEEE)

F. National Electrical Code (NEC)

G. National Electrical Manufacturers Association (NEMA)

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SSPC-SP-10	Surface Preparation Near White Blast Cleaning
SSPC-SP-2	Surface Preparation Hand Tool Cleaning
SSPC-SP-3	Surface Preparation Power Tool Cleaning

K. In addition to the above referenced standards, the design, fabrication, testing, installation and operation shall be in accordance with all applicable laws, regulations or rules of any government authority having jurisdiction over such installations. In case of conflict, the stricter standard shall apply.

L. Manufacturers' names, trade names and model numbers specified herein are used for facilitating description and establishing a standard of quality and required design characteristics.

M. Where a specific revision, issue or date is not referenced, the publication in effect at time of purchase order award shall apply.

N. In cases of conflicting requirements, the most stringent standard shall apply unless approved otherwise by the Contractor.

O. Contractor shall be apprised of all apparent discrepancies.

1.04 SYSTEM DESCRIPTION

A. The low voltage switchgear shall consist of the following coordinated components:

1. Three incoming line sections with instrumentation, metering, key interlocks and bus duct to bus transition.

2. A three section (split) low voltage bus with nonautomatic tie breakers.

3. Power distribution sections with low voltage feeder breakers as shown on the drawings.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Low voltage switchgear and its accessories shall be in accordance with this Specification and with the requirements specified herein.

B. Equipment shall consist of essentially standard design and first line quality which meet or exceed the requirements of this Specification and shall be UL listed and labeled where possible.

C. General Design Requirements

1. Connections between transformer and low voltage switchgear shall be low voltage feeder busway. The contractor shall coordinate the physical interface between the switchgear and busway to insure a matching assembly in the field.

2. Dimensions of the equipment shall not exceed the maximums shown on the Drawings.

3. All openings in equipment shall be guarded to prevent entrance of rodents.

4. Incoming line sections shall consist of full height terminal enclosures.

5. <u>Testing</u>: All buses shall undergo a one minute, 60 Hertz dielectric withstand test in accordance with ANSI standards.

   Reports of all tests shall be prepared and certified to be true, accurate and in accordance with the requirements of the applicable standards and this Specification.

   Contractor shall furnish test reports for review of the Construction Manager before shipment of equipment.

D. Switchgear Design Requirements

1. <u>Ratings and Design Parameters</u>: Low voltage switchgear shall have the following ratings:

   a. Frequency: 60 Hertz
   b. Phases: Three
   c. Incoming, 3 Wire Circuit: 480V, 3 phase, wye and ground
   d. Outgoing, 3 Wire Circuit: 480V, 3 phase
   e. Main Bus Ampacity: Per Drawing
   f. Available Fault At 480V: 65,000 amperes, R.M.S. symmetrical

2. Each low voltage section shall be a dead front type, metal enclosed, self supporting structure, flange connected to it's main section.

a. It shall consist of the required number of vertical sections bolted together to form one assembly approximately 90 inches high.

b. Switchgear shall be designed, built and tested in accordance with applicable portions of C37.20.1, C37.51; UL-1558 and the NEC.

   1) The feeder circuit breakers and devices shall be individually mounted with front and rear access.

      a) The operating handle, lever and similar items of each feeder device shall be externally accessible without opening or removal of covers.

      b) Circuit breakers shall be individually mounted in isolated compartments.

      c) Load connections shall be accessible. Sufficient space shall be provided to accommodate conduit entry, top or bottom, for the feeders shown.

      d) Main and vertical bussing shall be insulated.

c. All bus bars shall be copper.

   1) All bus work shall be rated to withstand maximum short-circuit stresses when connected to a supply system having fault capacity as shown on the Drawings.

   2) A ground bus shall be furnished, firmly secured to each vertical section structure and shall extend the entire length of the switchgear.

      a) A crimp type lug for No. 4/0 copper shall be furnished at each end of the ground bus.

   3) All hardware used on conductors shall be high-tensile strength and zinc plated.

4) All terminals shall be of the crimp type suitable for copper cable of sizes indicated.

d. Phase arrangement shall be A-B-C, left to right, top to bottom, front to back and clockwise when facing front of equipment.

   1) Where special circuitry precludes this arrangement, and with specific Purchaser approval, an alternate bus arrangement may be considered.

   2) All buses shall be labeled.

   3) Buses shall be silver plated at all connections and splices.

e. Current rating of a bus connecting a main or tie breaker shall be equivalent to the frame size rating of the breaker.

f. Main bus shall have provisions for the addition of future feeder breakers at both ends.

g. Small wiring, necessary fuse blocks and terminal blocks within the switchgear shall be furnished as required.

   1) All groups of control wires leaving the switchgear shall be provided with terminal blocks with suitable numbering strips.

   2) 20 percent spare terminals shall be provided.

   3) All wiring shall be tagged with numbers shown on vendor drawings using clip-on or preprinted heat shrinkable wire markers.

h. Wiring shall be stranded tinned copper Type SIS, extra flexible; No. 12 AWG minimum sizes for power and No. 14 AWG minimum size for control.

   1) Current transformer secondary circuits shall be No. 10 AWG minimum.

   2) Conductors shall be terminated with insulated ring tongue terminals.

i. Switchgear shall be provided with adequate lifting means and shall be capable of being rolled or moved into installation position and bolted directly to the floor without the use of floor sills.

j. Metering and Current Transformers and Devices.

1) Provide the following metering on the secondary of each transformer:

a) Six current transformers, 0.3 metering accuracy class at B-2.0 burden, ratio per Drawing.

b) Two voltage transformers, 480/120 Volt, single phase connected on the line side of each secondary breaker.

c) Two indicating ammeters, 1 percent accuracy, 250 degree scale, range 0-3200 Amperes.

d) Two ammeter switches.

e) Two indicating voltmeters; 1 percent accuracy, 250 degree scale, 0-600 volts.

f) Two voltmeter switches.

g) One spare set of control fuses.

h) Two watt hour meters with demand register (demand interval shall be standard 15 minute with 4-20 MADC output signal).

i) Watt hour meters shall have at least a 30-day reading capacity and shall include a primary reading, 5-dial, cyclometer register. Watt hour meter shall be of the semiflush switchboard type with rectangular dust proof enclosing case and antiglare glass.

j) Two control transformers 480/120V, 1 phase connected on the line side of each secondary breaker for circuit breaker operation.

k. Switchgear shall include protective devices as shown on the Drawings and as specified herein with necessary interconnection, instrumentation and control wiring. Breakers shall be designed to ANSI Standards C37.13, C37.16, C37.17.

1) Main and tie shall be draw-out power circuit breakers.

2) Main breakers shall be electrically operated, tie breaker shall be manual, nonautomatic.

3) Power circuit breaker shall be equipped with a solid-state tripping system consisting of three current sensors, solid-state trip device and flux-transfer shunt trip.

a) Current sensors shall provide operation and signal function.

b) All elements of solid-state trip device shall provide continuous current pick up and time delay adjustments.

4) The following solid-state elements shall be provided as an integral part of the solid-state trip device:

a) Main, MCC feeder breakers shall have long delay current pick-up (0.5 to 1.25 times sensor rating) and long delay time (4 to 36 seconds at 6 times sensor rating).

b) Main and MCC feeder breakers shall have short delay pick-up (4 to 12 times sensor rating) and short delay time (0.18 to 0.5 at 2.5 times short delay pick-up).

c) All breakers, except tie shall have ground fault current pick-up approximately 20 percent to 80 percent of sensor rating, but not exceeding 1200 amperes and ground fault time (0.22 to 0.5 seconds).

d) Provide resetable operation indicators for ground, overload and short circuit functions.

5) Power circuit breakers shall have a minimum 65,000 amperes R.M.S. symmetrical interrupting capacity at 480 volts.

6) Breakers shall be lockable in the off (OPEN) position.

7) Breakers shall be suitable for use at 100 percent of their rating.

8) The following accessories shall be provided:

a) A portable wheeled lift unit shall be provided for circuit breaker removal and installation.

b) All special tools, fittings, devices necessary for the maintenance and servicing of the breakers.

9) Breakers shall have red and green operating lights showing breaker position.

a) Red light indicates closed, and green light indicates open or tripped.

1. <u>Low Voltage Section</u>: A low voltage compartment shall be provided to house interface terminal blocks for connection of monitoring circuits to a load monitoring system (by others).

1) Voltage transformer circuits shall be connected to screw type terminal blocks.

2) Current transformer secondary circuits shall be connected to screw type shorting style terminal blocks.

3) Terminal block arrangement and segregation shall be as shown on the Drawings.

m. Testing: Switchgear shall be completely assembled, wired, adjusted and tested at the factory.

1) After assembly, the complete switchgear will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment.

2) Main circuits shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities.

3) Wiring and control circuits shall be given a dielectric test of 1500 volts for one minute between live parts and ground. A certified test report shall be available to the Contractor for approval.

E. Nameplates

1. Equipment shall be supplied with tag of stainless steel material with all pertinent information inscribed.

a. Tag shall be permanently affixed to the unit in a conspicuous and accessible location.

b. Tag shall include such information as model number, serial number, purchase order number, equipment tag number, equipment listing reference designator, ratings, voltage, phase, frequency, and other technical information necessary for complete identification with manufacturer's engineering, design and fabrication records.

2. Engraved nameplates shall be furnished for all equipment items as shown on the Drawings on both front and rear sides for all equipment items.

a. In addition, engraved nameplates shall be furnished for all devices, such as voltage and current transformers, control fuses (including current and voltage), switches, instruments and terminal blocks.

b. Nameplates shall be attached with stainless steel screws and shall consist of a three-ply laminated phenolic plate (white-black-white) and black letters.

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SECTION 16450

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16450 GROUNDING

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16450

GROUNDING

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for the types of grounding systems and their installation for the WRAP Module 2A Facility.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. ANSI/NFPA 70-1990 National Electrical Code

C. Institute of Electrical and Electronics Engineers (IEEE)

IEEE STD 80-1976	Guide for Safety in AC Substation Grounding
ANSI/IEEE STD 142-1982	Grounding of Industrial and Commercial Power Systems

D. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. Exposed noncurrent carrying metallic parts of electrical equipment, metal raceways, building structural steel and neutral of low voltage and UPS power systems shall be grounded.

PART 2 PRODUCTS

2.02 MATERIALS

A. Conductors: Shall be bare copper, insulated copper or THHN insulated (green) copper of size indicated on the Drawing or as required by NEC.

B. Ground Rod: Shall be copper clad steel, 5/8 inch diameter, 8 foot long and shall conform to UL 467 or exothermic connections per the Drawings.

C. Ground Connectors: Shall be bolted pressure type, UL 467 for use with copper conductors.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: All grounding shall be in full accordance with NEC Article 250 and UL 467, as shown on the Drawings.

B. Raceways Of Rigid Metal Conduit: Bond to enclosures.

Feeders and Branch Circuits: Include a separate equipment grounding conductor installed with the circuit grounded and ungrounded conductors in the raceways.

C. Raceways Of EMT: Include a separate grounding conductor installed with the circuit for grounded and ungrounded conductors in the raceways.

Flexible Metal Conduit: Will be permitted as a grounding means provided all requirements of the National Electrical Code are met.

D. Raceways of PVC Conduit: Include a separate equipment grounding conductor installed with the circuit for grounded and ungrounded conductors, except that PVC conduit for the building service conductors between the transformer and the main switchboard will not require inclusion of a grounding conductor.

E. Equipment Grounding Conductors: Size per Table 250-95 of the NEC, unless otherwise indicated on the Drawings.

F. Ground Connections: Shall have clean contact surfaces.

1. Connections For Equipment Grounds, System Grounds and Grounding Electrodes: Make with solderless connectors which are accessible and removable to facilitate inspection and testing.

2. Inaccessible Underground Joints Or Branch Connections Of Copper Grounding Electrode Conductors: Make by brazing, thermic welding or equivalent process.

3. Connections shall be 2 feet below finish grade.

G. Underground Grounding Conductors: Lay slack to prevent breakage.

H. Grounding Conductors Extended Above Grade and Exposed To Possible Damage: Adequately protect and route in conduit.

I. Grounding Electrodes: Drive to a full 2.5 foot depth and connect to the main grounding cables where indicated on Drawings.

1. Sufficient Grounding Electrodes: Drive to obtain a resistance to earth of 25 ohms or less with spacing between rods greater than 6 feet.

2. Testing shall occur not less than 48 hours after installation.

J. Technical Ground: Shall be derived as shown on the Drawings and attached Figure 1.

1. Connections to the facility system shall occur only as shown on the Drawings.

2. Ground resistance shall be one ohm or less after interconnecting technical ground to facility at the single earth ground point as shown on the Drawings.

K. For lightning system resistance and bonds of lightning rods, bonds and grounds shall be 10 ohms or less.

L. Bonding resistance of doors, pipes, HVAC ducts, mechanical and electrical equipment shall be 10 milliohms or less.

END OF SECTION

SECTION 16462

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16462 TRANSFORMERS - DRY TYPE

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16462

TRANSFORMERS - DRY TYPE

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of dry type transformers for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy of conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. The dry type transformers will transform 3 phase 480V power to 208Y/120V to serve receptacles, appliances and miscellaneous 120V loads.

PART 2 PRODUCTS

2.02 MATERIALS

A. Transformers: Furnish ventilated, dry type, two-winding transformers of the ratings as indicated on the Drawings and as specified herein.

1. Design: Shall be in full accordance with the latest revisions of ANSI C89.2 and NEMA ST-20, and suitable for continuous operation of rated KVA, 24 hours a day, 365 days a year, with normal life expectancy as defined in ANSI C57.96.

2. <u>Average Temperature Rise</u>: With 40°C maximum ambient and 30°C average ambient for 15 KVA rating temperature shall not exceed 115°C with a 185°C insulation system.

   For 75 KVA rating temperature shall not exceed 150°C with a 220°C insulation system; and for a 50 KVA rating either temperature rise with its associated insulation system may be provided.

3. <u>Electrical Characteristics</u>: Shal lbe fro operation on a 3 phse, 60 Hertz source with 480 volt delta connected primary winding and 208 wye/120 volt connected secondary winding with a grounded neutral.

   <u>15 KVA Ratings</u>: Shall have two 2.5 percent FCAN and FCBN taps.

   <u>30 KVA, 45 KVA and 75 KVA Ratings</u>: Shall have two 2.5 percent FCAN and four 2.5 percent FCBN taps.

4. <u>Sound Levels</u>: Shall not exceed standard levels, according to KVA ratings, which have been established by NEMA and ANSI.

5. <u>Average Temperature Rise</u>: With 40°C maximum ambient and 30°C average ambient for 15 KVA rating temperature shall not exceed 115°C with a 185°C insultation system.

   For 75 KVA rating and higher temperature shall not exceed 150°C with a 220°C insultation system; and for a 50 KVA rating either temperature rise with its associated insulation system may be provided.

6. <u>Electrical Characteristics</u>: Shall be for operation on a 3 phase, 60 Hertz source with 480 volt delta connected primary winding and 208 wye/120 volt connected secondary winding with a grounded neutral.

   <u>15 KVA Ratings</u>: Shall have two 2.5 percent FCAN and FCBN taps.

   <u>30 KVA, 45 KVA and 75 KVA and Higher Ratings</u>: Shall have two 2.5 percent FCAN and four 2.5 percent FCBN taps.

7. Sound Levels: Shall not exceed standard levels, according to KVA ratings, which have been established by NEMA and ANSI C89.2.

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SECTION 16470

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16470 PANELBOARDS

TABLE OF CONTENTS

PANELBOARDS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of panelboards for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

2.02 EQUIPMENT

A. Panelboards: Furnish with bolt in circuit breakers of number, sizes, interrupt ratings and arrangements as shown on the Drawings.

Panelboards shall be dead-front, factory assembled, surface or flush mounting of code gauge steel, hinged door, typewritten directory card, flush type combination lock and catch, keyed alike with black plastic nameplate engraved with 0.25 inch white letters designating the panel as shown on the Drawings.

B. Panel Bussing and Connectors: Arrange to maintain sequence phasing throughout, that is, adjacent poles shall be of unlike polarity and rotated in sequence.

1. Circuit Numbers: Number for each pole space as shown on Panel Schedules on Drawings.

2. Ground Bar: Shall be furnished, secured to the panel enclosure back box. Bar shall have terminals for attaching grounding conductors.

3. Neutral Bar: Shall be furnished when panel is designated for four wire service.

   Bar shall be insulated from enclosure, furnished with connector for bonding and grounding neutral conductor and also the neutral bus test link when panel is to be used for service entrance application.

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SECTION 16480

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16480 MOTOR CONTROL CENTERS

TABLE OF CONTENTS

SECTION 16480

MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of motor control centers for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA-ICS, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. The motor control centers will provide motor control and, distribute power to the 480V process and HVAC, motors and loads in the WRAP 2A Facility.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Motor Control Centers: Build and test in accordance with NEMA Standards, ANSI Standards and UL. Equipment shall bear UL labels.

B. Service

1. Suitable for operation on 480 volts, 3 phase, 3 wire.

2. Suitable for connection to a system with an available fault current of 65000 RMS symmetrical amperes.

C. Incoming Line: Shall enter the first section at the and bottom and be cable connected. Connection lugs and pulling space shall be provided for incoming feeder cables.

Cable Size: As shown on Drawings.

D. Wiring: NEMA Class I, Type B.

E. Structures: Totally enclosed, dead-front construction with horizontal and vertical bus guards, free standing assemblies, 90 inches high and not less than 16 inches deep space for front mounted units. Enclosure shall be NEMA, ICS6, type 1A, gasketed general purpose-indoor.

1. Working Height: 72 inches to accommodate starter units in multiples of 6 inch increments with a minimum of 12 inches.

2. Provide removable lifting angles.

3. Top Horizontal Wireway: Structures shall contain a horizontal wireway at the top, isolated from horizontal bus and readily accessible.

4. Vertical Wireway: Each structure shall contain an isolated vertical wireway with cable supports, accessible through hinged doors and a horizontal wireway at the bottom.

5. Structure Doors: Mount on removable pin hinges and secure with 0.25 turn indicating type fasteners.

6. Channel sill for mounting of motor control center shall be provided.

F. Bus System: Brace bus to withstand a fault of 65,000 RMS symmetrical amperes.

1. Main Horizontal Bus Rating: As shown on one-line diagram. Main horizontal bus shall be effectively isolated from all wireways and working areas.

2. Vertical Bus Rating: 300 amperes for 600 amp main bus, 600 amperes for 800 amp, 1200 amp and 1400 amp buses.

3. Full Height Of Vertical Bus Bars: Protect against accidental contact by a single sheet of glass reinforced polyester with cutouts for stab openings. All spare cutouts shall be protected by snap-in glass reinforced polyester covers.

4. Ground bus 0.25" x 1" shall run full length at the bottom of motor control center.

5. Bus Material: All bus systems shall be constructed of tin plated copper.

G. Unit Compartments: Provide each unit compartment with an individual front door, identified by screen mounted lamicoid nameplate.

1. Starter and Feeder Tap Unit Doors: Interlock mechanically with the unit disconnect device to prevent unintentional opening of the door while energized and unintentional application of power while door is open.

2. Interlock Between Unit Disconnect Device and Structure: Shall prevent removal or reinsertion of a unit when the disconnect is in the On position.

   Provide means for releasing the interlock for intentional access and/or application of power.

3. Padlocking Arrangements: Shall permit locking the disconnect device in OFF position with at least three padlocks with the door closed or open.

   Provide means to padlock the unit in a partially withdrawn position, test, with the stabs free of the vertical bus.

4. Full Voltage Starter Units Through NEMA Size Five: Shall be of the draw out type.

   a. Draw Out Provisions: Shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus.

   b. Power Wiring to Stabs: Contain within the draw out unit.

c. Overload Relays: Shall be reset from outside the enclosure by means of an insulated button.

5. Securing Of Draw Out Units: Secure by a spring loaded quarter-turn indicating type fastening device, locate at top front of unit.

6. Combination Motor Starter Units: Shall employ molded case circuit breakers with magnetic trip element (MCP) for branch circuit protection.

7. Minimum interrupting capacity of motor control unit shall be 65,000 Amperes RMS Symmetrical.

8. Feeder Tap Units: Shall employ molded case circuit breakers equipped with thermal-magnetic trip elements for branch circuit protection.

9. Control Power: Provide with individual control power transformers with two primary fuses and one secondary control fuse. Control voltage shall be 120VAC.

    a. Unfused Secondary Lead: Shall be grounded.

10. Starter Units: Shall contain the following:

    - Number of Auxiliary Contacts: Two normally open, one normally closed.
    - Unit-mounted pilot devices and indicating lights as shown on Drawings and shall be equipped with legend plates.
    - Indicating pilot lights shall be transformer type.

11. Ten percent of spare compartments for future use shall be provided.

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SECTION 16501

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16501 LAMPS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16501

LAMPS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of lamps utilized in lighting fixtures for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

PART 2 PRODUCTS

2.02 MATERIALS

A. Furnish all lamps for all the lighting fixtures to be furnished and installed.

Lamps are to be the type specified for each Fixture type in the Lighting Fixture Schedule on the Drawings.

END OF SECTION

SECTION 16510

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16510 LIGHTING FIXTURES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16510

LIGHTING FIXTURES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for providing and installing lighting fixtures of size, types and ratings as shown on the drawings; comprised of, but not necessarily limited to, lamps, lampholders, reflectors, switches, ballasts, starters and wiring.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. The lighting fixtures utilized in the WRAP 2A Facility are to be used for interior, exterior, exit and emergency illumination.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. <u>Lighting Fixtures and Equipment:</u> Furnish as specified on the Fixture Schedule.

1. Construct lighting fixtures so that all metallic parts will be continuously grounded.

2. Refer to Section 16501, Lamps, for additional lighting fixture requirements.

B. All ballasts shall be of the high power factor, high efficiency Class P type, suitable to light in cold weather, and their design and construction shall conform to Certified Ballast Manufacturers Standards. Ballasts shall be nonasphaltic thermosetting compound compatible with any contained fluid. Ballasts shall not contain polychlorinated biphenyls (PCBs) and shall be maximum sound level A.

C. Thermal Protection: Shall e provided for incandescent and high-intensity discharge fixtures per NEC Sections 410-65(c) and 410-73(f) when fixtures are mounted recessed in a ceiling, nonlay-in ceiling, which is part of the building structural elements.

1. Recessed incandescent fixtures installed in poured concrete or fixtures labeled Type I.C., suitable for installation in insulated ceilings, where thermal insulation may be in direct contact with the fixture, do not require thermal protection.

2. Suspended ceilings comprised of T-bar grids with lay-in panels are not part of the building structural elements, and fixtures installed in suspended ceilings are neither surface nor recessed mounted per UL Bulletin establishing the Suspended Ceiling Fixture listing. Fixture Schedule designates mounting as lay-in for fixtures to be installed in a suspended ceiling.

D. Provide and install all fixtures, lamps and tubes of the types and wattages indicated on the drawings.

E. All fixtures shall be wired from outlet boxes with No. 14 AWG, Type CF fixture or type THHN wire for through wiring of fluorescent fixtures.

F. Provide and install the necessary equipment for supporting or coordinating the hanging of all light fixtures with the prefabricated building manufacturer.

G. Indoor Lighting: Fluorescent fixtures in general shall be rapid start, bi-pin type, with individually fused high power factor Class P ballasts.

1. Fluorescent tubes (lamps) shall be a standard cool white (CW).

2. Diffusers and lenses shall be manufactured of 100 percent virgin acrylic and shall be noncombustible.

H. Emergency lighting shall consist of battery operated, automatic recharging, push-to-test lighting units, located where shown on the Drawings.

Minimum batter operation time shall be 90 minutes.

I. Indoor high bay lighting shall be high pressure sodium fixtures. Selective high bay lighting fixtures as shown on the drawings shall include integral quartz back up lighting to provide lighting during restrike time.

J. <u>Outdoor Lighting</u>: Outdoor lighting fixtures shall be photocell controlled low pressure sodium (LPS) wall mounted on the building exterior, as shown on the drawings.

K. Exit lighting fixtures shall have plainly legible letters not less than .75 inches wide and 6 inches high. Fixtures shall have red translucent letters in an opaque field.

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SECTION 16610

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16610 UNINTERRUPTIBLE POWER SUPPLY SYSTEM

TABLE OF CONTENTS

SECTION 16610

UNINTERRUPTIBLE POWER SUPPLY SYSTEM

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification defines the electrical and mechanical characteristics and requirements or a continuous-duty 3 phase, solid-state, uninterruptible power supply (UPS) system. The UPS shall provide high-quality, no break, AC power for sensitive electronic equipment loads.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute (ANSI)
ANSI C.62.41 Standards for Surge Withstandability (IEEE 587, Category B)
ANSI/IEEE 446 Emergency and Standby Power Systems for Industrial and Commercial Application

B. FCC Rules and Regulations Part 15, Subpart J. Class A

C. Institute of Electrical and Electronic Engineers (IEEE)

D. National Electrical Manufacturers Association (NEMA)
NEMA PE-1

E. National Electrical Code (NFPA)
NFPA 70

F. Occupational Safety and health Association (OSHA)

G. Underwriter's Laboratories (UL)
Standard 1778

1.04 SYSTEM DESCRIPTION

A. The UPS module shall consist of a rectifier/charger, inverter, static bypass switch, maintenance bypass switch, battery circuit breaker and battery. The AC output of the UPS module shall be connected to a separately mounted UPS power panel. The battery shall be internally mounted and connected to the DC input through the battery circuit breaker. Utility AC power shall be connected to the normal source AC input of the UPS module.

B. Definitions

1. Rectifier/Charger: The portion of the UPS module which converts the normal source AC input power to DC power for the inverter input and for charging the battery.

2. Inverter: The portion of the UPS module which converts DC power, from either the rectifier/charger or the battery, to regulated and filtered AC power which is supplied to the critical load.

3. Static Bypass Switch: The portion of the UPS module which automatically transfers the critical loads, without interruption, from the inverter output to the bypass (normal) AC power source in the event of an overload or degradation of the inverter's performance.

4. Maintenance Bypass Switch: The portion of the UPS module which is used to connect the bypass (normal) AC power source to the critical loads while electrically isolating the static bypass switch, rectifier/charger and inverter for maintenance purposes.

5. Battery: The portion of the UPS module which provides DC power to the inverter input when the normal AC input power to the UPS module fails or in the event that the rectifier/charger should fail.

6. Battery Circuit Breaker: The portion of the UPS module which electrically isolates the battery from the rectifier/charger and inverter for maintenance and provides overcurrent protection at the battery output.

7. Critical Loads: Those loads which require regulated continuous AC power and which are connected to the output of the UPS module.

C. The UPS configuration shall be a single nonredundant, UPS module rated to supply the full load at the battery backup time as specified herein.

D. Normal: The inverter shall supply AC power continuously to the critical loads. The inverter output shall be synchronized with the bypass AC power source provided that the bypass AC power source is within the specified frequency range. The rectifier/charger shall convert the normal AC input power to DC power for the inverter and for float charging the battery.

E. Loss of Normal AC Input Power: The battery shall supply DC power to the Inverter so that there is no interruption of AC power to the critical loads whenever the normal AC input power source of the UPS module deviates from the specified tolerances or fails completely. The battery shall continue to supply power to the inverter for the specified protection time.

F. Return of Normal AC Input Power Source: The rectrifer/charger shall start and assume the DC load from the battery when the normal AC input power source returns. The rectifier/charger shall then simultaneously supply the inverter with DC power and recharge the battery. This shall be an automatic function and shall cause no disturbance to the critical load.

G. Transfer to Bypass AC Power Source: If the static bypass switch senses an overload, an inverter shutdown signal, or degradation of the inverter output, then it shall automatically transfer the critical loads from the inverter output to the bypass AC power source without an interruption of power. If the bypass AC power source is above or below normal voltage limits or out of synchronization with the inverter, then the transfer shall be inhibited.

H. Retransfer to Inverter: The static bypass switch shall be capable of automatically retransferring the load back to the inverter after the inverter has returned to normal conditions and stabilized for a period of time. Retransfer shall not occur if the two sources are not synchronized.

I. Downgrade: If the battery is taken out of service for maintenance, it shall be disconnected from the rectifier/charger and inverter by the battery circuit breaker. The UPS shall continue to function and meet the performance criteria specified herein except for the battery reserve time.

J. The UPS shall be forced air cooled. Air inlets shall be equipped with standard type filters and changeable without opening cabinet doors. Ambient temperature shall be monitored and displayed.

K. The UPS shall be designed and constructed such that the audible noise level is reduced to 65 decibel or less, measured on the A scale at 5 feet from the front of the cabinet.

L. Enclosure: The UPS electronics and batteries shall be housed in a steel, NEMA 1 type enclosure requiring access from the front for all servicing adjustments. Access shall be through hinged doors requiring a special tool to open. The enclosure shall be rimmed and painted inside and outside with manufacturer's standard paint. The enclosure shall be a freestanding floor mount design.

PART 2 PRODUCTS

2.03 EQUIPMENT

A. UPS Module Input

1. Voltage: 480 VAC, 3 phase, 3 wire plus ground

2. Voltage Range: +10 to -15 percent without discharging the battery

3. Frequency: 60 Hertz ±5 percent

4. Current Walk-In: 15 to 30 seconds to full load rating

5. Input Current Limit: 125 percent of nominal full load current

6. Power Factor: 0.80 lagging minimum at nominal input voltage and full rated UPS output load

7. Current Harmonics: 10 percent (5 percent preferred) THD maximum at nominal conditions and at full UPS load

8. Input Translent Protection: ANSI C.62.41 (IEEE 587, Category B)

B. UPS Module Output

1. Voltage: 208 VAC, 3 phase, 4 wire plus ground

WRAP MODULE 2A

2. <u>Frequency</u>: 60 Hertz $\pm$0.1HZ

3. <u>Power Rating</u>: 50 KVA from 0.5 lagging to 0.9 leading power factor

4. <u>Voltage Regulation</u>: $\pm$1 percent of nominal for any of the combined effects:

   - No load to full load
   - 1.0 to 0.5 lagging power factor
   - Minimum to maximum AC input voltage
   - Minimum to maximum DC input voltage
   - 0 to 40°C ambient temperature

5. <u>Dynamic Regulation</u>

   - $\pm$5 percent from nominal for 100 percent step load
   - $\pm$8 percent from nominal for 50 percent step load
   - $\pm$1 percent from nominal for retransfer to inverter from bypass
   - Recovering to within 1 percent in less than 50 milliseconds

6. <u>Voltage Adjustability</u>: $\pm$5 percent

7. <u>Voltage Unbalance</u>

   - $\pm$1 percent of nominal for balanced loads
   - $\pm$2 percent of nominal for 50 percent unbalanced loads
   - $\pm$5 percent of nominal for 100 percent unbalanced loads

8. <u>Phase Separation</u>

   - 120°$\pm$1° with balanced loads
   - 120°$\pm$3° with 20 percent unbalanced loads
   - 120°$\pm$6° with 100 percent load unbalanced

9. <u>Harmonic Distortion</u>: 4 percent THD maximum with 3.0 percent maximum single harmonic for linear loads

10. <u>Frequency Slew Rate</u>: 0.5 Hz to 1 Hz/second, selectable in 0.1 Hz increments

11. Overload (Inverter)

    - 125 percent for 10 minutes (without bypass source)
    - 150 percent for 10 seconds (without bypass source)

12. Fault Clearing (Static Bypass): 300 percent for 1 cycle.

C. Reliability

1. The UPS shall have a minimum of 200,000 hours Mean-Time-Between-Failure (MTBF), including bypass, calculated using MIL-STD-217E "Reliability of Electronic Equipment" techniques.

2. The UPS shall have a maximum of 1 hour mean time to repair (MTBR) when parts are onsite.

D. Battery

1. Voltage: As required by the inverter.

2. Protection Time: 55 minutes

E. Efficiency: 77 percent to 90 percent

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SECTION 16640

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16640 CATHODIC PROTECTION

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16640

CATHODIC PROTECTION

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of cathodic protection for the WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA, UL, OSHA, NEC and all applicable state and local codes.

B. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. Provide and install a cathodic protection system of the sizes, ratings, materials and types as shown on the drawings.

B. The installation of the system shall be under the suspension of a National Association of Corrosion Engineers (NACE) accredited corrosion specialist who has a minimum of 10 years experience installing similar systems.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

B. Cathodic protection systems are to be impressed current type systems.

Isolated or small sections of coated buried piping requiring temporary protection may be cathodically protected using galvanic anodes.

C. Where buried pipelines are to be provided with cathodic protection systems, all pipe joints are to provide electrical continuity.

Where joints do not provide positive continuity, or where the continuity is questionable, such as cast iron pipe with gasket sealed joints, the joints are to be electrically bonded with jumpers across each joint.

D. Buried metallic structures and piping are to be electrically connected to the negative side of the rectifier.

1. Negative riser cables constructed of No. 2 wire are to be connected to existing pipelines through test bond stations.

2. New buried metallic structures and piping are to be bonded to other metallic structures which are connected to the negative riser.

3. In some cases, a new negative riser cable directly connecting the rectifier to the new structures may be required.

E. Metallic pipelines are to be electrically interconnected to the cathodic protection system.

1. To ensure against possible insulators in pumps, flanges, diversion boxes and other internal junctions, underground metallic structures are to be electrically bonded directly at all intersections and between long sections of parallel pipelines.

2. When test stations exist, the bond can be made directly between two structures using suitable size installed burial cable connected to the structures by thermite welds or welded straps.

3. Bonds and test leads with piping identifications are to be provided for each buried structure.

F. Permanent reference electrodes are to be installed to monitor structures and/or piping that are buried under buildings or roadways and are inaccessible for testing with surface reference electrodes.

The permanent electrode lead is to be terminated in the same terminal box as the test leads of the lines or structures to be tested.

G. Materials

1. Rectifier: 100 VDC maximum output complete with circuit interrupter.

   Enclosure to be suitable for outside installation.

2. Junction Boxes: Are to be fiberglass as manufactured by Stahlin Division of Robroy Industries, or approved equal.

3. Anodes: Impressed current system

   a. Anode material is to be high silicon cast iron (Duriron Company, Inc. No. 51 Type "D" Durichlor or approved equal).

   b. Anodes are to be 2 inches in diameter, 60 inches long.

4. Anodes: Galvanic

   a. Anode material is to be magnesium (Dow Galvanomag or approved equal).

   b. prepackaged galvanic anodes consisting of a backfill of 50 percent gypsum and 50 percent Bentonite are to be used.

5. Permanent Reference Electrodes: Are to be as fabricated by Far West Corrosion Control Company or approved equal.

6. <u>Shunts</u>: A 0.001 ohm 50 A type SO shunt is to be installed in all impressed current anode junction boxes and in the negative return lead of all test/bond stations to allow monitoring of current flow as manufactured by Holoway Company or approved equal.

END OF SECTION

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SECTION 16670

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16670 LIGHTNING PROTECTION SYSTEM

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16670

LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of providing a lightning ground perimeter loop around and on the roof of the facility.

The system shall be complete with all necessary hardware and fittings as shown on the Drawings and installed properly so that a Master Label can be obtained after the facility is completed.

B. Any such work included in any other section of these specifications that is not specifically described therein shall comply with the requirements of this section.

C. The following items of work are specifically included in, but not necessarily limited to, the work of this section without limiting the generality implied by these Specifications.

- Lightning Protection Air Terminal
- Equipment
- Down Conductors
- Ground Rods
- Surge Protectors

1.02 RELATED SECTIONS

1.03 REFERENCES

A. Department of Energy (DOE)

DOE Order 6430.1A	General Design Criteria, 04/06/89

B. Institute of Electrical and Electronics Engineers (IEEE)

IEEE Std 142-1982	Grounding of Industrial and Commercial Power Systems

C. Underwriters Laboratories (UL)

UL-96A	Installation Requirements for Lightning Protection Systems

D. All materials, equipment, fabrication and testing shall be in accordance with, but not limited to, the applicable requirements of ANSI, IEEE, NEMA-ICS, UL, OSHA, NEC and all applicable state and local codes.

E. In case of a discrepancy or conflict between various applicable standards, the standards with the highest and more stringent requirements shall govern.

1.04 SYSTEM DESCRIPTION

A. The Contractor shall provide a complete system to capture, control and earth a direct lightning strike.

B. The system, including the air terminal, conductors and complementary parts, shall be installed so that completed work is unobtrusive and does not detract from the building appearance.

C. The lightning systems shall be connected to the building grounding system per UL 96A. Down conductors will be installed on the exterior of building encased in PVC conduit painted to match building panels.

PART 3 EXECUTION

3.01 PREPARATION

A. Install lightning protection system as indicated, in accordance with equipment manufacturer's written instructions, and in compliance with applicable requirements of NEC and NFPA pamphlet 78 to ensure that lightning protection system comply with requirements.

B. Coordinate with other work, including electrical wiring as necessary to interface installation of lightning protection system.

C. The lightning perimeter loop shall be grounded to the building ground grid as shown on the Drawings.

D. The lightning wire cables shall not be subject to a radius smaller than 8 inches.

Large sweep radii shall be employed.

E. Lightning protection material and installation shall be in accordance with the NFPA Pamphlet No. 78 and UL 96A.

END OF SECTION

SECTION 16700

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16700 EMERGENCY AUDIBLE ALARM SIGNALS

TABLE OF CONTENTS

SECTION 16700

EMERGENCY AUDIBLE ALARM SIGNALS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for defining the sounds of emergency audible signals for fire alarm, the critical radiation alarm, evacuation alarm and telephone crash alarms at Hanford for WRAP Module 2A.

B. To insure uniformity at Hanford, the sounds defined herein for the above alarms shall not be used for any alarming or signaling purposes, nor shall any other sounds be used for these alarms except as stated in this Specification.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. Underwriters' Laboratories (UL)

B. Factory Mutual Laboratories (FML)

PART 2 PRODUCTS

2.03 EQUIPMENT

A. Fire Alarm--Single-Stroke Gong

1. A fire alarm is a manually or automatically actuated signal which indicates an actual or potential fire within the facility.

2. The local fire alarm shall be the sound of a metallic bell being struck at a frequency of two strokes per second.

B. Critical Radiation Alarm--Motor-Driven Howler

1. A critical radiation alarm is an automatically actuated signal which indicates a critical mass excursion or other very high radiation condition. The alarm level of radiation shall be determined by the Contractor having local authority.

2. The critical radiation alarm shall be what may be described as an "AH-00-GAH" sound. One sound generator of this type is a horn having a diaphragm vibrated by a motor driven notched wheel when motor is energized at 1 second intervals (0.5 second on - 0.5 second off). A second sound generator of this type is an electronic horn controlled by a characterized signal generator, the resulting sound being similar to that of the motor driven horn.

3.. The alarm shall be audible within a maximum of 0.5 seconds after activation by the radiation detector. A remote alarm and manually reset annunciator shall be incorporated to monitor areas having critical radiation alarms installed.

C. Evacuation Alarm--Sirens, Powerhouse Whistles: A steady "on" siren shall be known as an "evacuation" signal. This signal shall be generated by a motor driven siren or a powerhouse whistle. It may be used for any evacuation need including plant incidents, natural disaster, enemy attack, etc.

D. Telephone Crash Alarm

1. A telephone alarm system shall be used to provide necessary communications for the emergency warning system and shall be so arranged that information can be conveyed simultaneously to a group.

2. The alarm shall be a continuously ringing telephone bell.

E. Sound Level: Audible alarms shall have a sound level of at least 10 decibels above the maximum background noise at any joint in the area covered. Audible alarms shall not subject personnel to sound intensities greater than 125 decibels.

F. Timing Devices: The use of solid state electronic timing devices should be considered in lieu of motor-driven timers to reduce the possibility of timer failure and consequent loss of alarm signals.

G. Emergency Power Supply: All alarm equipment operating from the building power supply should be connected to an emergency power system. For WRAP Module 2A, the UPS system will be considered the Emergency Power Supply. Switching of power sources shall not trip the alarm circuits.

END OF SECTION

SECTION 16720

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16720 FIRE ALARM AND SMOKE DETECTION SYSTEMS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16720

FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of the fire alarm and smoke detection systems for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. National Fire Protection Association (NFPA)

NFPA 72 - 1990	Installation, Maintenance, and Use of Protective Signaling Systems
NFPA 72E - 1990	Automatic Fire Detectors
NFPA 72H - 1988	Guide for Test Procedures for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems
NFPA 101 - 1991	Life Safety Code
NFPA 90A - 1989	Installation of Ventilating and Air Conditioning Systems
NFPA 92A - 1988	Smoke Control Systems

B. Department of Energy (DOE)

DOE 5480.7	Fire Protection
RLIP 5480.7	Fire Protection
DOE 6430.1A	General Design Criteria
DOE/EP-0108	Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems

C. Underwriters Laboratory (UL)
UL Fire Protection Equipment Directory

D. Factory Mutual Approval Guide

E. Drawings
Fire Protection Zone Plan - Ground and Lower Level, Rev. A
Fire Protection Utility Flow Diagram, Rev. A
Fire Protection Zone Plan - Upper Level, Rev. A

WRAP MODULE 2A

SECTION 16720

FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of the fire alarm and smoke detection systems for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. National Fire Protection Association

NFPA 72 - 1990	Installation, Maintenance, and Use of Protective Signaling Systems
NFPA 72E - 1990	Automatic Fire Detectors
NFPA 72H - 1988	Guide for Test Procedures for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems
NFPA 101 - 1991	Life Safety Code
NFPA 90A - 1989	Installation of Ventilating and Air Conditioning Systems
NFPA 92A - 1988	Smoke Control Systems

B. Department of Energy

DOE 5480.7	Fire Protection
RLIP 5480.7	Fire Protection
DOE 6430.1A	General Design Criteria
DOE/EP-0108	Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems

C. UL Fire Protection Equipment Directory

D. Factory Mutual Approval Guide

E. Drawings
Fire Protection Zone Plan - Ground and Lower Level, Rev. A
Fire Protection Utility Flow Diagram, Rev. A

Fire Protection Zone Plan - Upper Level, Rev. A

1.04 SYSTEM DESCRIPTION

A. Fire Alarm System: A proprietary protective signalling system shall be provided. The system shall be designed to NFPA 72, complete with manual pull stations and radio fire alarm reporter (RFAR) to relay alarm and trouble signals to the Hanford Fire Department Central Station. The RFAR is government furnished equipment (GFE).

B. Automatic Detection System: Automatic smoke detection shall be provided throughout the facility in accordance with NFPA 72E. Thermal detection shall be provided in glovebox enclosures and shall comply with NFPA 72E. Ventilation duct smoke detection shall be provided per NFPA 90A.

C. System Supervision: Provide electrically-supervised system, with supervised alarm initiating and alarm signaling circuits.

D. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device shall cause the system to enter ALARM, which includes the following operations:

1. Sound and display local fire alarm signaling devices.

2. Transmit signal to remote station equipment, located at the Hanford Fire Department Central Station. NOTE: The radio fire alarm reported used to transmit signals to the remote location is government-furnished equipment.

3. Indicate location of alarm zone on fire alarm control panel.

4. Transmit signal to building mechanical systems to initiate shutdown of fans and damper operation.

E. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits, or power or system failure shall cause system to enter the TROUBLE mode, including the following operations:

1. Visual and audible trouble alarm by zone at control panel.

2. Transmit trouble signal to remote station.

F. Zoning

1. Refer to Drawings UT-5 and UT-15 and paragraph 1.04.A of Specification Section 15330 for information concerning the fire protection zones.

2. Each fire zone will be identified separately at the Fire Alarm Control Panel (FACP).

END OF SECTION

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16740 VOICE AND DATA SYSTEMS

TABLE OF CONTENTS

SECTION 16740

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16740 VOICE AND DATA SYSTEMS

TABLE OF CONTENTS

SECTION 16740

VOICE AND DATA SYSTEMS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up and acceptance testing of voice and data systems for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. National Electrical Manufacturer's Association (NEMA)

B. Institute of Electrical and Electronic Engineers (IEEE)

C. American National Standards Institute (ANSI)

D. National Electrical Code (NEC)

E. Occupational Safety and Health Act (OSHA)

F. Underwriters Laboratory (UL)

G. Insulated Cable Engineers Association (ICEA)

H. Building Industry Consulting Service International (BICSI)

I. If there is an apparent discrepancy between any of the requirements of this Specification and the standards and requirements stipulated in Paragraph A above, or of any applicable statue, ordinance or code, then the most stringent requirements shall apply.

1.04 SYSTEM DESCRIPTION

A. See Section 01010, Paragraph 1.6.13 (available in Title 2) for general system descriptions.

Equipment and installation shall comply with DOE Order 5300.1B, Telecommunications, including related sections of NEC and NFPA.

B. General Plant Telephone (GPT), Private Automatic Exchange (PAX)

Work in these subsystems shall be performed in accordance with one or more of the following commercial telephone standards:

- Practices employed by Bell systems, General Telephone System, United Telephone, REA Telephone and the Building Industry Consulting Service International (BICSI), Telecommunications Distribution Methods Manual.

C. Local Area Network (LAN)

Work in this subsystem shall be performed in accordance with the following standards and guidelines:

- IEEE 802.3, 10 base T (office area) and THICKNET for main plant area

- IBM Cabling System Planning and Installation Guide (Pub. #GA27-33361-7)

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

2.03 EQUIPMENT

2.04 COMPONENTS

A. <u>Electrical</u>: The room shall have electrical power fed by a computer graded isolation transformer and should have its own dedicated power panel with isolated ground.

1. There shall be a minimum of ten 20-ampere dedicated circuits with isolated grounded outlets.

2. These circuits shall be supported by the building UPS.

3. Additional convenience outlets shall be provided with a maximum of six electrical outlets for each circuit.

4. Outlet locations to be specified after submittal of floor plans.

5. There shall be ready access to a building ground within the room.

6. There shall be a power shutoff switch at each exit in order to comply with the NEC.

B. Connecting Conduit: Telecommunication rooms in multi-floor buildings shall be connected via two 3 inch conduits between floors.

1. Two 4-inch conduits shall be installed between the main telecommunications room and the control room.

2. Two 4-inch conduits shall be installed between the main telecommunications room and the subterminal room in the process area.

C. Cable Trays: Ladder type cable raceways shall be used.

1. Telecommunications room shall have ladder type raceways, a minimum of 2 feet wide with 4 inch sidebars, running the length of the room with multiple extensions reaching to each wall. Ladder type raceways are to be mounted to the building structure and hung at the 8 foot level.

2. Raceways shall be grounded to building ground.

3. The raceways shall be able to support the weight of all cables expected to be run to the telecommunications room plus 100 percent to allow for growth.

D. Fire Suppression: Fire protection systems for Telecommunications, Computer/Data Process systems shall be designed and installed in accordance with DOE/EP-0108 Standard.

1. Primary protection will be automatic wet-pipe sprinkler systems with on/off sprinkler heads.

2. Location of sprinklers shall be determined in relation to equipment layout.

a. The telecommunications room shall be in a different fire zone from the rest of the building.

b. The design shall assure that electrical power to the telecommunications room is only shut off in the event of sprinkler head activation in the telecommunications room.

c. Some type of bypass shall be utilized so that electrical power is not interrupted during periodic sprinkler system testing.

E. <u>Locks</u>: Telecommunications room shall be secured with cipher locks.

F. <u>Backboard</u>: Mount 4′ x 8′ sheet of fire retardant .75 inch plywood horizontally, 36 inches off the floor on all walls, and paint to match the walls.

1. Backboards shall also be provided in the subterminal room.

G. <u>Common Raceways and Conduit--Clean Areas</u>: Metallic, ladder type raceways shall be installed in the above ceiling space above all hallways.

1. These raceways shall be a minimum of 12 inches wide with 2 inch side bars.

2. The sizing of the raceways shall be sufficient to hold all communications cabling plus 100 percent for growth.

3. The raceways shall be secured to the building structure and be able to support the weight of all telephone and network cabling plus 10 percent for growth.

4. Raceways shall maintain adequate distance from fire suppression systems.

5. Raceways shall be grounded to building ground.

6. <u>Process Areas</u>: All conduit entrances into the process area shall utilize penetration duct banks for maintaining adequate isolation between the process area and the clean area.

7. Enclosures within the process area shall be watertight to the degree provided by NEMA 4 enclosures.

8. PVC coated rigid steel conduit shall be used for all communications cabling in process areas.

H. Outlets

1. Clean Areas: Certain office, work station, reception area and conference room shall be provided with GPT, PAX and LAN outlets.

   a. Actual outlet locations to be specified after delivery of floor plans.

   b. Outlets in each room, shall be unambiguously marked indicating cable type (i.e., network or telephone or PAX) and cable number.

   c. Outlet markings shall be of a temporary removable nature.

2. For office space and computer workrooms, the approximate number of GPT, PAX, and LAN outlets shall be determined by multiplying office occupancy by 1.5.

   a. Odd numbers should be rounded up to the nearest whole number.

   b. Each outlet shall be installed using a double gang AMP Universal Wiring System outlet.

   c. The outlet may be recessed or surface mounted, depending upon location.

   d. Outlets should be evenly distributed along the inside walls of each office, 4.5 inches between floor and bottom of outlet plate.

   e. Where wall pones are desired the outlet plate shall be a standard flush mount with mounting lugs.

3. Each outlet location shall be furnished with two duplex receptacles located in close proximity.

   a. Both receptacles at each location shall be on a dedicated 120 volt, 20A circuit.

b. The receptacles shall be located with bottom of receptacle cover at 4.5 inches above the floor for access under back panels.

4. Process Areas: It is anticipated that PAX and PA will be the only communications requirements in the process areas.

   a. Unless a method of using weathertight outlets, which is suitable for the expected environment, is found, no outlets are expected to be utilized.

   b. PAX instruments shall be located in all shops and dressing rooms.

   c. In open areas PAX instruments shall be located approximately every 20 feet.

   d. Access to outside lines will be provided by the PAX switch as a feature.

I. Racks/Cabinets

1. LAN: Two cabinets Electrorack part #115-069 Rev. B, Model #URV-1-BC-19-C-71-PT-24-N-LK, or approved equal, shall be provided for housing LAN electronic equipment.

   a. The dimensions shall be width 19 inch, height 71 inch, depth 24 inch.

   b. Each cabinet shall have a multiple outlet power strip with a 30 amperes power feed plug for attachment to dedicated circuits.

2. One cabinet, Electrorack part #115-575 Rev. A, Model #RV-1-BC-24-C-78-PT-30-N-LK, or approved equal, shall be provided for housing LAN fileserver equipment.

   a. The dimensions shall be width 24 inches, height 78 inches, depth 30 inches.

   b. Newton shelves Model #4077, sized for use in this cabinet, shall be used.

   c. Each cabinet shall have a multiple outlet power strip with a 20 amperes power feed plug for attachment to dedicated circuits.

J. General Plant Telephone

1. Equipment: The GPT service shall be terminated on a standard 2500/500 DTMF instrument.

   a. Electronic ringers shall be used in lieu of bell ringers.

   b. A multiline telephone shall be provided in the control room with the capability of displaying both GPT and PAX numbers.

   c. Instruments shall be provided and installed by others.

2. Cabling: Station wire shall consist of 24 gauge, solid copper, industry standard color coded, twisted, CM rated jacketing, UL listed (plenum if required), telephone wire.

   a. The minimum number of conductors to the telephone stations from the terminal room shall be 8 conductors.

   b. Secretarial locations shall require a 25 pair cable (same specifications as above).

   c. Tie cables to multiple telecommunications rooms (if required) shall have a minimum of 100 pairs.

3. Terminations: In the telecommunications room, the cabling shall terminate on Krone distribution blocks.

   a. At the outlet location the cabling will terminate on one of the outlet jacks of the AMP Universal Wiring System outlet.

   b. The modular jack used in the front of the outlet shall be RJ11.

   c. For wall phones use flush mount face plates with mounting lugs.

K. Private Automatic Exchange

1. Equipment

Switch: The PAX system shall be sized to accommodate a minimum of 200 stations.

a. The switch shall be equipped for a minimum of 120 stations and 4 incoming trunks.

b. The PAX switch shall have a minimum of 31 talk paths for each 200 lines.

c. The PAX switch shall be equipped with two zones for paging and one all-call zone.

d. The switch must come with a minimum of 3 hours of battery back-up built in.

e. The standard system used on the Hanford Site is the latest Generic Mital SX Series system.

Instrument - Clean Areas: The PAX service shall be accessed on standard 2500/500 type DTMF instruments.

a. Electronic ringers shall be used in lieu of bell ringers.

b. In areas where monitoring of equipment is required along with communications, instruments shall be provided with long (approximately 20 feet) cords between the instrument and the handset.

c. Instruments shall be a different color as the color used for FPT instruments.

d. A multiline telephone shall be provided in the control room with the capability of displaying both GPT and PAX numbers.

e. A feature access list shall be visible on the faceplate of each instrument.

Instrument - Process Areas (or Out of Doors): The PAX service shall be accessed on FTMF wall mount phones having weathertight enclosures.

a. Standalone ringing devices shall be used to allow for enough decibels gain to be heard when installed in noisy areas.

b. Instruments allowing personnel in protective clothing with breathing apparatus to use the PAX system shall be utilized.

c. A feature access list shall be visible on the faceplate of each instrument.

d. Where moisture protection is not required use standard AMP outlets or flush mounting wall mount jacks and standard 2500/500 type instruments.

2. Cabling: Station wire shall consist of 24 gauge, solid copper, industry standard color coded, twisted, plastic jacketed, UL listed (plenum if required), telephone wire.

The minimum number of conductors to the telephone stations from the terminal room shall be 8 conductors.

3. Terminations

Clean Areas: In the telecommunications room, the cabling shall be terminated on Krone distribution blocks.

a. At the outlet location the cabling will terminate on one of the outlet jacks of the AMP Universal Wiring System outlet.

b. The modular jack used in the front of the outlet shall be RJ11.

c. For wall phones use flush mount face plates with mounting lugs.

Process Areas: The conduit containing the cabling for the PAX system will terminate in the bottom of the weathertight enclosure.

L. Local Area Network

1. Equipment

Twisted Pair Ethernet Concentrator (10 Base T)

a. The Contractor shall provide recommendations concerning the make and model of this equipment.

Ethernet or FDDI Bridge or Router

a. The Contractor shall provide recommendations concerning the make and model of this equipment.

b. The equipment shall be compatible to existing network as of the time recommendations are made.

c. The Hanford Site currently uses Ungermann Bass, Net One, Ethernet version 2.

2. Cabling: Cabling shall meet IBM Type 2, (Plenum if required) cable specifications, including individually shielded data pairs.

3. Terminations: In the telecommunications room, the cabling shall be terminated on Krone distribution blocks specially made for IBM Type 2 cabling.

a. At the outlet location two modular connectors shall be used with the AMP Universal Wiring System Outlet.

b. One modular connector shall be wired for 10 Base T, the other connector shall be wired for standard Premise Distribution System (PDS, AT&T 258A Standard).

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SECTION 16750

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16750 PUBLIC ADDRESS SYSTEM

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16750

PUBLIC ADDRESS SYSTEM

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of the public address system for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. <u>FCC Compliance</u>: Comply with Part 68, Federal Communications Commission Rules, pertaining to telephone and public address equipment.

Provide public address equipment with FCC labels indicating applicable FCC registration and numbering.

B. <u>NEC Compliance</u>: Comply with NEC, Article 800, "Communication Circuits", as applicable to communication system materials and installations.

C. <u>IEEE Compliance</u>: Comply with Chapter 13, Standard 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to communication systems.

D. <u>NEMA Compliance</u>: Comply with NEMA's Publication No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

1.04 SYSTEM DESCRIPTION

A. Extent of public address system work is indicated on the Drawings and in schedules, and is defined to include, but not limited to, paging access module, amplifiers, microphone, loudspeakers, equipment racks and other related materials and equipment.

B. Notify local telephone operating company in writing of telephone interface connection requirements to ensure proper interfacing of system.

PART 2 PRODUCTS

2.04 COMPONENTS

A. Paging Access Module

1. Units shall be a solid-state paging access module.

2. Operating voltage range, frequency response, idle current and operating current, as well as the other operating parameters, shall be as follows:

- <u>FCC Registration Number Under Part 68 Rules</u>: CD28FH-64733-KX-N, Ringer Equivalence: 0.0B
- <u>Operating Voltage Range</u>: 18 to 28 VDC, nominal, 24VDC positive ground system; resistors and mounting bracket provided for 48 VDC positive ground system
- <u>Frequency Response</u>: Plus or minus one db, 200 Hertz to 8k Hertz
- <u>Idle Current</u>: 40 mA
- <u>Operating Current</u>: 110 mA
- <u>Input/Output Impedance</u>: 600 ohms
- <u>Attention Tone Frequency</u>: 400 Hertz plus or minus 10 percent, duration one second, nominal
- <u>Operating Temperature</u>: 0°C to 50°C (32°F to 122°F)
- <u>Enclosure</u>: Rack mounted

B. Amplifiers

1. <u>Public Address System Amplifiers</u>: Shall have full power ratings of 100 and 200 watts as shown on Drawings.

a. Units: Shall deliver rated power from 100 to 5,000 Hertz at less than 5 percent total harmonic distortion.

b. Frequency response shall be plus or minus 2 dB from 70 to 12,000 Hertz.

c. Outputs: Provide 70 V lines and 16 ohms, balanced or unbalanced.

2. Amplifiers: Shall be completely solid-state and shall be designed for mounting in a 19 inch sound equipment rack.

a. Screw Terminal Strips: Shall accommodate all input and output connections and shall be protected by a removable cover.

b. Controls: Shall consist of three input volume level controls, master volume control, and bass and treble controls, all screwdriver-adjustable.

c. Peak-Reading LED Indicator: Shall be included.

3. Provide three input channels.

a. Channel 1: Shall accept a balance low impedance microphone or a 600 ohm balanced telephone line.

b. Channels 2 and 3: A 600 ohm balanced telephone line (transformer isolated) or high impedance auxiliary input.

c. Precedence Capability: Shall be standard on Channel 3, and shall require a contact enclosure.

d. Provide an illuminated power switch and a front-panel circuit breaker.

a. A thermal circuit breaker shall protect the output stages.

4. Amplifiers shall be capable of operation from a 120 V, 60 Hertz AC power source.

C. Microphone

1. Type: Dynamic Paging Microphone

2. Frequency Response: 300 to 4,000 Hertz

3. Directional Characteristics: Unidirectional

4. Impedance: Dual

   - Low: 200 ohms
   - High: 50,000 ohms

5. Sensitivity

   a. Low Impedance: Minus 82 dB plus or minus 3 dB (at 1,000 Hertz, 0 dB equals one v/u bar).

   b. High Impedance: Minus 59 dB plus or minus 3 dB (at 1,000 Hertz, 0 dB equals one v/u bar).

D. Bi-Directional Horn Loudspeakers

1. Loudspeaker: Shall be a reentrant type horn loudspeaker.

   a. Frequency Response: Shall be from 80 Hertz to 12 kHertz.

   b. Total Rated Power: Shall be 40 watts RMS, continuous.

   c. Dispersion shall be 85 degrees, each horn.

   d. Sound pressure level, measured four feet on axis with 40 watt input at 1,000 Hertz, shall be at least 121 dB for each horn.

2. Unit: Shall incorporate a five-position weather sealed switch, to allow matching the loudspeaker to a 25 volts or 70 volts constant-voltage line.

   a. Power handling capacity shall be adjustable at 70 volts to 40, 20, 10, 15, or 2.5 watts.

   b. Impedance: Shall be adjustable to 2,000, 1,000, 500, 250, 125, or 16 ohms.

3. Loudspeaker: Shall be of weatherproof all metal construction, with driver enclosed within a waterproof housing.

a. Loudspeaker shall include a self-aligning, field replaceable diaphragm.

4. Provide screw terminals for connection to the audio line.

a. Provide a plastic cover to protect the connectors and impedance selector switch, and provide strain relief for the audio line.

5. An all-purpose mounting bracket shall provide precise positioning in the vertical and horizontal planes with a single adjustment.

a. Bracket shall include banding slots to permit mounting the loudspeaker on beams or pillars.

E. Trumpet Horn Loudspeakers

1. <u>Loudspeaker</u>: Shall be a exponentially flared reflex type horn loudspeaker.

a. Frequency response shall be from 115 Hertz to 14 kHertz.

b. <u>Total Rated Power Output</u>: Shall be 30 watts RMS, continuous.

c. Dispersion shall be 120 degrees by 60 degrees.

d. Sound pressure level, measured 4 feet on axis with 30 watt input at 1,000 Hertz, shall be at least 126 dB for each horn.

2. <u>Unit</u>: Shall incorporate a seven-position weather-sealed switch, to allow matching the loudspeaker to 25 volts or 70 volts constant-voltage line.

a. <u>Power Handling Capacity</u>: Shall be adjustable at 70 volts to 30, 15, 7.5, 3.7, or 1.8 watts, and at 25 volts to 15, 7, 3.7, or 1.8 watts.

b. <u>Impedance</u>: Shall be adjustable to 2,500, 1,300, 666, 333, 167, 89, or 45 ohms.

3. Loudspeaker: Shall be of weatherproof all metal construction, with driver enclosed within a waterproof housing.

    a. Loudspeaker shall include a self-aligning, field replaceable diaphragm.

4. Provide screw terminals for connection to the audio line.

    a. Provide a plastic cover to protect the connectors and impedance selector switch, and provide strain relief for the audio line.

5. An all-purpose mounting bracket shall provide precise positioning in the vertical and horizontal planes with a single adjustment.

    a. Bracket shall include banding slots to permit mounting the loudspeaker on beams or pillars.

F. Equipment Racks

1. Racks: Shall accommodate-standard 19 inch panels having 1.25" x 0.5" mounting spacings.

    a. Racks shall be approximately 22-3/8" wide by 18.5 inches deep with louvers on the sides and rear sized to accommodate the above amplifiers and access modules.

    b. Provide a rear door having slip-joint hinges for easy removal without the use of tools.

    c. Rack shall be constructed of 16 gauge steel with stainless steel screw cover trim.

6. Related Items

1. Furnish and install wire, cabling, jacks, terminal boards, power supplies, conduit, and all necessary equipment to provide a complete system.

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SECTION 16780

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
16780 CLOSED CIRCUIT TELEVISION SYSTEM

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 16780

CLOSED CIRCUIT TELEVISION SYSTEM

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, selection and installation of a Closed Circuit Television (CCTV) System for WRAP Module 2A.

B. Closed Circuit Television Systems are comprised but not limited to cameras, camera monitors, video switchers, record/playback equipment, signal transmission lines, controls and accessories.

C. Work of this section includes raceways, electrical boxes and fittings, wiring/cabling and control/signal transmission media, as specified in applicable Division 16 sections, which shall be used in conjunction with installation of CCTV systems.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute (ANSI), Standards C2, C33.116, C37.90A, C62.41, C63.12 and X3.4.

B. Underwriters' Laboratory (UL), Standards 486A and B, 813, 983, 1409, 1410, 1412, 1414, 1416, 1417 and 1418 pertaining to television system products. And, UL Standard 1449 for surge protection.

C. Electronic Industries Association (EIA), Standards RS-170, 222, 232, 312, 330, 403, 412, 420, 4398 and 455 pertaining to television equipment and accessories.

D. National Fire Protection Association (NFPA), Standard.

E. National Electrical Code.

F. National Electrical Manufacturers Association (NEMA), Standard Publication no. WC 41, Coaxial Communication Cable.

G. Federal Communications Commission (FCC), Rules pertaining to computing devices including Class A, Class B, personal and peripheral types.

The edition for all codes and standards referred to in this Specification shall be that edition in force at the time of Specification approval by all parties.

In case of conflict, the more stringent standard shall apply.

PART 2 PRODUCTS

2.02 MATERIALS

A. Provide CCTV systems of types, sizes, capacities and electrical characteristics indicated, consisting of cameras, monitors, video switchers, time/date generators, signal transmission lines, recording/playback units and other components as required for complete installation.

B. Except otherwise indicated, proved manufacturer's standard CCTV system components as indicated by published product information, designed and constructed as recommended by manufacturer.

2.03 EQUIPMENT

Provide CCTV systems with following functional and construction features as indicated:

A. Silicon Charge-Coupled Device (CCD) CCTV Cameras: Provide for low light level solid state circuitry which permits fully automatic camera operation, from bright daylight to dim indoor lighting. CCTV cameras shall have motorized lenses capable of remote zoom and focus control. CCTV camera lenses shall be capable of 6:1 zoom.

B. Monochrome CCTV Monitors: Provide 14 inch monochrome (black and white) monitors with 15MHz bandwidth; and 800 lines resolution; with solid state circuitry; videotape recording compatible. CCTV monitors shall be provided with front panel control of power on/off, horizontal hold, vertical hold, brightness and contrast.

C. Video Matrix Switcher: Provide rack mounted microprocessor based video matrix switcher with 40 video input capacity, capable of switching into 20 video outputs. The video matrix switcher shall be capable of switching control signals to pan, tilt, zoom and focus cameras. the video matrix switcher shall be able to lock out user selected devices from control by nonauthorized keyboards.

D. Video Matrix Switcher Keyboard: Provide video matrix switcher matrix keyboard capable of selecting any input device to any output device. Also, the keyboard shall be able to activate the pan/tilt/zoom/focus control of any camera. the keyboard shall be capable of locking out user selected devices from access by other keyboards.

E. Video Cassette Recorders (VCR): Provide video cassette recorders capable of recording and playback events on real time and time-lapsed basis with a minimum 330 lines of horizontal resolution. On time lapsed basis, the VCR shall be able to record up to 240 hours on a standard 120 minutes (T120) 0.5 inch VHS cassette. The VCR shall be capable of recording or playback one "frame" at a time. Capability shall be provided to insert date/time and process area.

2.05 COMPONENTS

The following suggests a configuration for the WRAP 2A project:

Quantity	Description
27 ea	CCD Monochrome Video Camera with • 6:1 motorized zoom • motorized focus • auto iris control • contained in pressurized sealed enclosure for indoor use
23 ea	Camera mounts and stands with motorized pan and tilt control.
4 ea	Camera mounts and stands without pan and tilt control.
10 ea	14 inch monochrome monitors with from panel control and 800 line horizontal resolution.
10 ea	Matrix switcher keyboard with zoom, pan, tilt and focus control.

WRAP MODULE 2A

1 ea	Microprocessor based matrix switcher capable of accepting 40 video inputs and switching into 20 video outputs.
2 ea	VHS video cassette recorders with real time and time lapsed record and playback capability. VCR shall be capable of time lapsed record and playback 120 hours of video into a 120 minutes (T120) 0.5 inch VHS video cassette.

END OF SECTION

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM DECONTAMINATION SYSTEM RESP. ENG. PROCESS: V.A. White MECHANICAL: G.B. Davies WBS: 1104	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
P-04-201	1104		1	2,500	DECON WATER BOOSTER PUMP	S.S. HORIZONTAL CENTRIFUGAL PUMP	140602
P-04-210A,B	1104		2	1,500	SIZE REDUCE AND REPACKAGE AREA SUMP PUMPS	S.S. VERTICAL CENTRIFUGAL PUMPS	140602
P-04-230	1104		1	1,500	SPECIAL WASTE PROCESS SUMP PUMP	S.S. VERTICAL CENTRIFUGAL PUMP	140602
P-04-240	1104		1	1,500	POLYMER ENCAPSULATION ENCLOSURE SUMP PUMP	S.S. VERTICAL CENTRIFUGAL PUMP	140602
P-04-250	1104		1	2,500	HIGH PRESSURE RECIRCULATION PUMP	POSITIVE DISPLACEMENT PUMP	140602
P-04-251	1104		1	1,500	GROUT AREA SUMP PUMP	S.S. VERTICAL CENTRIFUGAL PUMP	140602
X-04-210 A,B,C,D,E,F	1104		6	250	SIZE REDUCE AND REPACKAGE AREA HYDROLASERS	S.S. HYDROLASERS	140602
X-04-230	1104		1	250	SPECIAL WASTE PROCESS ENCLOSURE SPRAY RING	S.S. SPRAY RING	140602
X-04-231 A,B,C	1104		3	250	SPECIAL WASTE PROCESS ENCLOSURE HYDROLASERS	S.S. HYDROLASERS	140602
X-04-240	1104		1	100	POLYMER ENCAPSULATION ENCLOSURE SPRAY RING	S.S. SPRAY RING	140602
X-04-250A&B	1104		2	250	GROUT AREA SPRAY RINGS	S.S. SPRAY RINGS	140602
X-04-251	1104		1	250	GROUT AREA HYDROLASER	S.S. HYDROLASER	140602
X-04-252	1104		1	750	GROUT AREA DRUM SPRAY	S.S. DRUM SPRAY	140602

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM OFF-GAS TREATMENT SYSTEM RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: B. Davies WBS: 1104	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-04-101A,B	1104		2	4,500	ACTIVE WASTE TANKS OFF-GAS FILTER	HEPA FILTER TRAIN, 200 ACFM SIZE: COMPONENTS: PREFILTER, HEPA FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
F-04-102A,B	1104		2	27,000	SIZE REDUCTION OFF-GAS FILTER	HEPA FILTER TRAIN, 6,000 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
F-04-103A,B	1104		2	2,500	POLYMER ENCAPSULATION OFF-GAS PREFILTER	PREFILTER TRAIN, 200 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
F-04-104A,B	1104		2	2,000	POLYMER ENCAPSULATION OFF-GAS FINAL FILTER	HEPA FILTER TRAIN, 200 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
OFF-GAS TREATMENT SYSTEM

RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: B. Davies WBS: 1104

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-04-105A,B	1104		2	4,500	GROUT POWDER TANKS OFF-GAS FILTER	DRY FILTER TRAIN, 200 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: STEEL	SHEET 2 - 140600
F-04-106	1104		1	13,500	GROUT ENCLOSURE OFF-GAS FILTER	HEPA FILTER TRAIN, 2,500 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
F-04-107A,B	1104		2	18,000	SPECIAL WASTE ENCLOSURES OFF-GAS FILTER	HEPA FILTER TRAIN, 1,220 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER, CARBON FILTER, CARBON FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
F-04-108	1104		1	27,000	SAMPLE MANAGEMENT HOODS OFF-GAS FILTER	HEPA FILTER TRAIN, 2,505 ACFM SIZE: COMPONENTS: FIRESCREEN, PREFILTER, HEPA FILTER, CARBON FILTER, CARBON FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM OFF-GAS TREATMENT SYSTEM RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: B. Davies WBS: 1104	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-04-109A,B	1104		2	4,500	NON-ACTIVE TANKS OFF-GAS FILTER	HEPA FILTER TRAIN, 20 ACFM SIZE: COMPONENTS: PREFILTER, HEPA FILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS HOUSING: BAG-IN, BAG-OUT	SHEET 2 - 140600
H-04-101	1104		1	850	NON-ACTIVE TANKS OFF-GAS REHEATER	ELECTRIC IN-LINE HEATER DUTY: 1,000 BTU/HR	SHEET 2 - 140600
H-04-102	1104		1	850	ACTIVE WASTE TANKS OFF-GAS REHEATER	ELECTRIC IN-LINE HEATER DUTY: 8,000 BTU/HR	SHEET 2 - 140600
S-04-101A,B	1104		2	14,000	SIZE REDUCTION OFFGAS DUST COLLECTOR	BAG FILTER, 1,500 ACFM, -15" W.G.; DUST BIN WITH DRUM OUT DISCHARGE 277 FT² FILTER AREA, 304-SS	SHEET 2 - 140600
E-04-101	1104		1	9,400	POLYMER ENCAPSULATION VAPOR CONDENSER	7,000 BTU/HR, 160 FT² SURFACE AREA (FINTUBE) DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONSTRUCTION: 304-SS	SHEET 2 - 140600
V-04-101A,B	1104		2	9,500	POLYMER ENCAPSULATION OFF-GAS CARBON ADSORBER	PACKED TOWER 3'0" ID X 5'0" LENGTH (S/S) INTERNALS: PELLETIZED ACTIVATED CARBON DESIGN TEMP: 150°F DESIGN PRESS: -15" W.G. MATERIAL OF CONSTRUCTION: 304-SS	SHEET 2 - 140600

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM OFF-GAS TREATMENT SYSTEM RESP. ENG. PROCESS: K. VanZanten MECHANICAL: B. Davies WBS: 1104	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-04-121	1104		1	750	ACID FEED TANK INLET AIR FILTER	HEPA FILTER TRAIN, 1 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: POLYETHYLENE	SHEET 1 - 140600
F-04-122	1104		1	750	CAUSTIC FEED TANK INLET AIR FILTER	HEPA FILTER TRAIN, 1 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: CARBON STEEL	SHEET 1 - 140600
F-04-123	1104		1	750	DECON SOLUTION FEED TANK INLET AIR FILTER	HEPA FILTER TRAIN, 3 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: 304-SS	SHEET 1 - 140600
F-04-124A,B	1104		2	750	NON-ACTIVE WASTE COLLECTION TANKS INLET AIR FILTERS	HEPA FILTER TRAIN, 5 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: 304-SS	SHEET 1 - 140600
F-04-125	1104		1	750	ACTIVE WASTE COLLECTION TANK INLET AIR FILTER	HEPA FILTER TRAIN, 140 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: 304-SS	SHEET 1 - 140600

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM: OFF-GAS TREATMENT SYSTEM
RESP. ENG. PROCESS: K. VanZanten MECHANICAL: B. Davies WBS: 1104

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-04-126	1104		1	750	TREATED ACTIVE WASTE TANK INLET AIR FILTER	HEPA FILTER TRAIN, 30 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: 304-SS	SHEET 1 - 140600
F-04-127	1104		1	19,800	SIZE REDUCTION AND GROUT ENCLOSURES INLET AIR FILTER	HEPA FILTER TRAIN, 8,500 ACFM SIZE: COMPONENTS: PREFILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: CARBON STEEL	SHEET 1 - 140600
F-04-128	1104		1	1,600	POLYMER ENCLOSURE INLET AIR FILTER	HEPA FILTER TRAIN, 200 ACFM SIZE: COMPONENTS: HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: CARBON STEEL	SHEET 1 - 140600
F-04-129	1104		1	4,400	SPECIAL WASTE SHREDDER ENCLOSURE INLET AIR FILTER	HEPA FILTER TRAIN, 1,200 ACFM SIZE: COMPONENTS: PREFILTER, HEPA FILTER DESIGN TEMP: 150°F DESIGN PRESS: -15" W.C. MATERIAL OF CONST: CARBON STEEL	SHEET 1 - 140600

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WRAP FACILITY, DOE-RL
DE-AC06-91RL11946

UNITED ENGINEERS & CONSTRUCTORS
Project No. 6237.006

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM POLYMER STORAGE MIXING/ENCAPSULATION RESP. ENG. PROCESS: R. Henkel MECHANICAL: A. Zindel WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
GB-05-401	1105		1	73,048	POLYMER ENCAPSULATION		140621
M-05-401	1105		1	950	POLYMER MIXING AGITATOR	PROP AGITATOR 2 HP MOTOR DRIVEN (DISPOSABLE PROP)	140621
M-05-402	1105		1	550	IN-DRUM MIXER	PROP AGITATOR 1/2 HP MOTOR DRIVEN	140621
M-05-403	1105		1	14,000	VIBRATORY MIXER	VIBRATORY ON-DRUM MOUNT 1.6 HP MOTOR DRIVEN	140621
M-05-411	1105		1	14,000	VIBRATORY MIXER	VIBRATORY ON-DRUM MOUNT 1.6 HP MOTOR DRIVEN	140621
M-05-412	1105		1	14,000	VIBRATORY MIXER	VIBRATORY ON-DRUM MOUNT 1.6 HP MOTOR DRIVEN	140621
M-05-413	1105		1	14,000	VIBRATORY MIXER	VIBRATORY ON-DRUM MOUNT 1.6 HP MOTOR DRIVEN	140621
M-05-404	1105		1*	487	IN-LINE MIXER 1	IN-LINE STATIC MIXER 5 GPM	140621
M-05-405	1105		1*	487	IN-LINE MIXER 2	IN-LINE STATIC MIXER 5 GPM	140621
M-05-406	1105		1	487	IN-LINE MIXER 3	IN-LINE STATIC MIXER 5 GPM	140621
M-05-407	1105		1*	487	IN-LINE MIXER 4	IN-LINE STATIC MIXER 5 GPM	140621
M-05-408	1105		1	550	IN-DRUM MIXER	PROP AGITATOR 1/2 HP MOTOR DRIVEN	140621
M-05-409	1105		1	550	IN-DRUM MIXER	PROP AGITATOR 1/2 HP MOTOR DRIVEN	140621
M-05-410	1105		1	550	IN-DRUM MIXER	PROP AGITATOR 1/2 HP MOTOR DRIVEN	140621
P-05-301A,B	1105		2	500	SOLVENT TRANSFER PUMP	CENTRIFUGAL, 10 GPM @ 20 PSI ΔP	140620
P-05-302	1105		1	3,450	EXTENDER METERING PUMP	METERING, 3 GPM @ 20 PSI ΔP	140620
P-05-303A,B	1105		2	2,064	CATALYST METERING PUMP	METERING, 0.1 GPM @ 50 PSI ΔP	140620

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM POLYMER STORAGE MIXING/ENCAPSULATION RESP. ENG. PROCESS: R. Henkel MECHANICAL: A. Zindel WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
P-05-304	1105		1	1,240	PROMOTER METERING PUMP	METERING, 0.5 GPM @ 20 PSI ΔP	140620
P-05-305A,B	1105		2	4,500	VES RESIN TRANSFER PUMP	POS DISP GEAR, 30 GPM @ 50 PSI ΔP	140620
P-05-306	1105		1	500	BULK STORAGE SUMP PUMP	CENTRIFUGAL, 20 GPM @ 10 PSI ΔP	140621
P-05-307	1105		1	500	CATALYST SUMP PUMP	CENTRIFUGAL, 10 GPM @ 20 PSI ΔP	140621
P-05-401A,B	1105		2	1,200	MIXED POLYMER PUMP	POS DISP GEAR, 5 GPM @ 100 PSI ΔP	140621
P-05-402	1105		1	600	WASTE WATER TRANSFER PUMP	CENTRIFUGAL, 5 GPM @ 20 PSI ΔP	140621
P-05-403	1105		1	1,500	VACUUM DEWATERING PUMP	ROTARY VACUUM, 0.8 ACFM @ 5 PSI ΔP	140621
P-05-404	1105		1	1,000	HYDROCARBON WASTE TRANSFER PUMP	POS DISP GEAR, 40 GPM @ 50 PSI ΔP	140621
P-05-405	1105		1	500	DAY TANK SUMP PUMP	CENTRIFUGAL, 20 GPM @ 20 PSI ΔP	140620
T-05-301A,B	1105		2	7,650	SOLVENT STORAGE TANK	S/S, 750 GAL CAPACITY, VERTICAL	140620
T-05-302	1105		1	7,650	EXTENDER STORAGE TANK	S/S, 750 GAL CAPACITY, VERTICAL	140620
P-05-308	1105		1	1,000	CATALYST DRUM PUMP	MOTORIZED DRUM PUMP	140620
P-05-309	1105		1	1,000	PROMOTER DRUM PUMP	MOTORIZED DRUM PUMP	140620
P-05-310	1105		1	1,000	SOLVENT DRUM PUMP	MOTORIZED DRUM PUMP	140620
P-05-311	1105		1	1,000	EXTENDER DRUM PUMP	MOTORIZED DRUM PUMP	140620
T-05-303	1105		1	3,550	CATALYST STORAGE TANK	S/S, 140 GAL CAPACITY, VERTICAL	140620
T-05-304	1105		1	3,550	PROMOTER STORAGE TANK	S/S, 140 GAL CAPACITY, VERTICAL	140620

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM POLYMER STORAGE MIXING/ENCAPSULATION RESP. ENG. PROCESS: R. Henkel MECHANICAL: A. Zindel WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-05-305A,B	1105		2	24,900	VES RESIN STORAGE TANK	S/S, 5,900 GAL CAPACITY, VERTICAL	140621
T-05-401	1105		1	10,830	POLYMER MIXING TANK	S/S, 1100 GAL CAPACITY, VERTICAL	140621
T-05-402	1105		1	10,830	HYDROCARBON WASTE TANK	S/S, 1100 GAL CAPACITY, VERTICAL	140621
V-05-401	1105		1	2,032	LIQUID CATCH DRUM	S/S, 80 GAL CAPACITY VERTICAL	140620
E-05-301	1105		1	1,400	EXTENDER COOLER	DUTY: 700 BTU/HR TYPE: DOUBLE PIPE AREA: 2.5 FT^2	140620
E-05-302A,B	1105		2	3,500	VES RESIN COOLER	DUTY: 2,800 BTU/HR TYPE: S&T OR DOUBLE PIPE AREA: 15.2 FT^2	140620
E-05-401	1105		1	4,350	MIXED POLYMER COOLER	DUTY: 1,200 BTU/HR TYPE: S&T OR DOUBLE PIPE AREA: 6.5 FT^2	140621
DO-05-401	1105		1	25,000	SIMPLE DOUBLE LID DOOR	DRUM FILL (55-GAL)	140621
DO-05-402	1105		1	25,000	SIMPLE DOUBLE LID DOOR	DRUM FILL (55-GAL)	140621
DO-05-403	1105		1	25,000	SIMPLE DOUBLE LID DOOR	DRUM FILL (55-GAL)	140621
DO-05-404	1105		1	25,000	SIMPLE DOUBLE LID DOOR	DRUM FILL (55-GAL)	140621
LT-05-401	1105		1	8,400	LIFT TABLE	TO BE FITTED WITH ROLLER CONVEYOR	140621
LT-05-402	1105		1	8,400	LIFT TABLE	TO BE FITTED WITH ROLLER CONVEYOR	140621
LT-05-403	1105		1	8,400	LIFT TABLE	TO BE FITTED WITH ROLLER CONVEYOR	140621
LT-05-404	1105		1	8,400	LIFT TABLE	TO BE FITTED WITH ROLLER CONVEYOR	140621
C-05-301A,B	1105		2	2,500	VAULT EXHAUST BLOWER	EXHAUSTER	140622
V-05-301 A,B,C	1105		3	9,500	VAULT EXHAUST CARBON ADSORBER	VESSEL/CARBON BED	140622
F-05-301A,B	1105		2	1,000	CARBON ADSORBER PREFILTER	700 CFM	140622

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
POLYMER STORAGE
MIXING/ENCAPSULATION

DATE: 07/31/92
REV: 1

RESP. ENG. PROCESS: R. Henkel MECHANICAL: A. Zindel WBS: 1105

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
F-05-302A,B	1105		2	1,000	VAULT EXHAUST FILTER	700 CFM	140622

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM AGITATED GROUT SYSTEM RESP. ENG. PROCESS: S. MacKay MECHANICAL: R. Weber WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-05-205	1105		1	6,475	BFS SILO	CAPACITY: 170 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140609
T-05-206	1105		1	6,475	PFA SILO	CAPACITY: 170 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140609
T-05-207	1105		1	2,845	SURGE HOPPER	CAPACITY: 20 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140609
T-05-208	1105		1	6,454	BLENDED POWDER BATCH WEIGH HOPPER	CAPACITY: 20 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140609
T-05-209	1105		1	3,236	OPC SILO	CAPACITY: 65 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140609
S-05-205	1105		1	2,332	BFS SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 100 ACFM PARTICLE SIZE: < 1/8"	140609
S-05-206	1105		1	2,332	PFA SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 100 ACFM PARTICLE SIZE: < 100 MESH	140609
S-05-209	1105		1	2,332	OPC SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 100 ACFM PARTICLE SIZE: < 100 MESH	140609
Y-05-205	1105		1	2,043	BFS ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR PARTICLE SIZE: 100 MESH → 1/8" SIZE: 6", 3/4 HP	140609
Y-05-206	1105		1	2,043	PFA ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR PARTICLE SIZE: < 100 MESH SIZE: 6", 3/4 HP	140609
Y-05-207	1105		1	2,043	BLENDED POWDER ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR PARTICLE SIZE: < 1/8" SIZE: 6", 3/4 HP	140609

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM AGITATED GROUT SYSTEM RESP. ENG. PROCESS: S. MacKay MECHANICAL: R. Weber WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
Y-05-208	1105		1	2,043	BLENDED POWDER ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR PARTICLE SIZE: < 1/8" SIZE: 6", 3/4 HP	140609
Y-05-209	1105		1	2,043	OPC ROTARY FEEDER	FLOW RATE: 2,000 LBS/HR PARTICLE SIZE: < 100 MESH SIZE: 6", 3/4 HP	140609
M-05-202	1105		1	7,500	POWDER BLENDER	RIBBON BLENDER: MOTOR DRIVEN 1.0 HP	140609
M-05-203	1105		1	3,000	GROUT/WASTE DRUM MIXER	PROP AGITATOR: MOTOR DRIVEN 1 HP	140609
P-05-203	1105		1	500	EXCESS WATER PUMP	CENTRIFUGAL: 5 GPM @ 5 PSI ΔP	140609
CV-05-205	1105		1	1,656	BFS SCREW CONVEYOR	CAPACITY: 3,600 LBS/HR DIAMETER: 9" MATERIAL: MILD STEEL	140609
CV-05-206	1105		1	1,656	PFA SCREW CONVEYOR	CAPACITY: 3,600 LBS/HR DIAMETER: 9" MATERIAL: MILD STEEL	140609
CV-05-208	1105		1	1,656	BLENDED POWDER SCREW CONVEYOR	CAPACITY: 3,600 LBS/HR DIAMETER: 9" MATERIAL: MILD STEEL	140609
CV-05-209	1105		1	1,656	OPC SCREW CONVEYOR	CAPACITY: 2,000 LBS/HR DIAMETER: 6" MATERIAL: MILD STEEL	140609
CV-05-212B	1105		2	4,500	INPUT CONVEYOR FROM AGV	ROLLER CONVEYOR: 4'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-213B	1105		2	4,500	AIRLOCK CONVEYOR	ROLLER CONVEYOR: 5'-1" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-216	1105		1	1,350	AIRLOCK TO LIFT TABLE ROLLER CONVEYOR	ROLLER CONVEYOR: 2'-6" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-217	1105		1	5,000	DRUM TRANSFER ROLLER CONVEYOR	ROLLER CONVEYOR: 8'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
AGITATED GROUT SYSTEM

RESP. ENG. PROCESS: S. MacKay MECHANICAL: R. Weber WBS: 1105

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CV-05-218	1105		1	32,000	AGITATED GROUT CURING ROLLER CONVEYOR (W/TRANSFERS)	ROLLER CONVEYOR: 27'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-220	1105		1	5,000	DRUM TRANSFER ROLLER CONVEYOR	ROLLER CONVEYOR: 3'-2" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-221	1105		1	32,000	VIBRATED GROUT CURING ROLLER CONVEYOR (W/TRANSFERS)	ROLLER CONVEYOR: 23'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-224	1105		1	5,000	TRANSFER ROLLER CONVEYOR TO TURNTABLE	ROLLER CONVEYOR: 6'-4" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-226	1105		1	4,500	AIRLOCK CONVEYOR	ROLLER CONVEYOR: 5'-1" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-227	1105		1	4,500	OUTPUT CONVEYOR TO AGV	ROLLER CONVEYOR: 4'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
CV-05-228	1105		1	1,350	TRANSFER CONVEYOR TO AIRLOCK	ROLLER CONVEYOR: 1'-6" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
AL-05-201	1105		1	35,000	ENTRY AIRLOCK	SIZED FOR: 55-GAL DRUM	140609
AL-05-202	1105		1	35,000	EXIT AIRLOCK	SIZED FOR: 55-GAL DRUM	140609
LT-05-202	1105		1	8,400	LIFT TABLE W/CONVEYOR	ROLLER CONVEYOR: 4'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
LT-05-203	1105		1	8,400	LIFT TABLE W/TURNTABLE CONVEYOR INSTALLED (SEE X-05-235)	ROLLER CONVEYOR: 6'-4" LG UNIT LOAD CAPACITY: 1,000 LBS	140609
XX-05-201	1105		1	2,500	DECANT WAND	FLEXIBLE, MOVABLE PIPE FOR EXCESS WATER REMOVAL	140609
XX-05-225	1105		1	4,500	TURNTABLE		140609
DO-05-202	1105		1	25,000	SIMPLE DOUBLE LID DOOR		140609
DO-05-203	1105		1	25,000	SIMPLE DOUBLE LID DOOR		140609
RT-05-202	1105		1	2,500	CLAMP REMOVAL MECH		140609

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
VIBRO-GROUT SYSTEM
RESP. ENG. PROCESS: S. MacKay MECHANICAL: R. Weber WBS: 1105

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-05-201	1105		1	3,677	OPC DAY SILO	CAPACITY: 65 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140608
T-05-202	1105		1	2,140	OPC WEIGH HOPPER	CAPACITY: 20 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140608
T-05-203	1105		1	5,518	BFS DAY SILO	CAPACITY: 170 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140608
T-05-204	1105		1	1,622	BFS WEIGH HOPPER	CAPACITY: 20 CU FT (W/LOAD CELLS) MATERIAL: MILD STEEL	140608
T-05-212	1105		1	1,622	WET GROUT MIXING TANK	CAPACITY: 8 CU FT (W/LOAD CELLS) MATERIAL: STAINLESS STEEL	140608
T-05-210	1105		1	5,518	PFA DAY SILO	CAPACITY: 170 CU FT (W/LOAD CELL) MATERIAL: MILD STEEL	140608
T-05-211	1105		1	1,622	PFA WEIGH HOPPER	CAPACITY: 20 CU FT (W/LOAD CELL) MATERIAL: MILD STEEL	140608
S-05-201	1105		1	2,322	OPC SILO DUST COLLECTOR	PULSE JET: AIR FLOW: 100 ACFM PARTICLE SIZE: < 100 MESH	140608
S-05-203	1105		1	2,322	BFS SILO DUST COLLECTOR	PULSE JET: AIR FLOW: 100 ACFM PARTICLE SIZE: < 1/8"	140608
S-05-210	1105		1	2,322	PFA SILO DUST COLLECTOR	PULSE JET: AIR FLOW: 100 ACFM PARTICLE SIZE: < 100 MESH	140608
Y-05-201	1105		1	2,043	OPC SILO ROTARY FEEDER	FLOW RATE: 2,000 LBS/HR SIZE: 6"	140608
Y-05-202	1105		1	2,043	OPC HOPPER ROTARY FEEDER	FLOW RATE: 2,000 LBS/HR SIZE: 6"	140608
Y-05-203	1105		1	2,043	BFS SILO ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR SIZE: 8"	140608

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM VIBRO-GROUT SYSTEM RESP. ENG. PROCESS: S. MacKay MECHANICAL: R. Weber WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
Y-05-204	1105		1	2,043	BFS HOPPER ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR SIZE: 6"	140608
Y-05-210	1105		1	2,043	PFA SILO ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR SIZE: 8"	140608
Y-05-211	1105		1	2,043	PFA HOPPER ROTARY FEEDER	FLOW RATE: 3,600 LBS/HR SIZE: 8"	140608
M 05-201	1105		1	14,000	VIBRATING DRUM MIXER	1,000 LB DRUM VIBRATOR 1.6 HP MOTOR MOTOR DRIVEN	140608
GB-05-201	1105		1	391,858	GROUT ENCLOSURE		140608
P-05-201A,B	1105		2	12,000	VIBRO GROUT MIXER/PUMP (ONE SPARE)	LOW SHEAR MIXER/PUMP 0.75 HP	140608
CV-05-202	1105		1	3,500	OPC BATCH SCREW CONVEYOR	CAPACTIY: 2,000 LBS/HR DIAMETER: 6" MATERIAL: MILD STEEL	140608
CV-05-204	1105		1	3,500	BFS BATCH SCREW CONVEYOR	CAPACTIY: 3,600 LBS/HR DIAMETER: 9" MATERIAL: MILD STEEL	140608
CV-05-211	1105		1	3,500	PFA BATCH SCREW CONVEYOR	CAPACTIY: 3,600 LBS/HR DIAMETER: 9" MATERIAL: MILD STEEL	140608
AL-05-203	1105		1	35,000	ENTRY AIRLOCK	55-GAL DRUM	140608
CV-05-212A				4,500	INPUT CONVEYOR FROM AGV	ROLLER CONVEYOR: 4'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140608
CV-05-213A				4,500	AIRLOCK CONVEYOR	ROLLER CONVEYOR: 5'-1" LG UNIT LOAD CAPACITY: 1,000 LBS	
CV-05-215	1105		1	4,500	AIRLOCK TO LIFT TABLE ROLLER CONVEYOR	ROLLER CONVEYOR: 2'-6" LG UNIT LOAD CAPACITY: 1,000 LBS	140608
DO-05-201	1105		1	25,000	SIMPLE DOUBLE LID DOOR	PIVOT TYPE	140608
LT-05-201	1105		1	8,400	LIFT TABLE W/CONVEYOR	ROLLER CONVEYOR: 4'-0" LG UNIT LOAD CAPACITY: 1,000 LBS	140608

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
VIBRO-GROUT SYSTEM
RESP. ENG. PROCESS: S. MacKay   MECHANICAL: R. Weber   WBS: 1105

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
RT-05-201	1105		1	2,500	CLAMP REMOVAL MECH	MECHANICAL	140608

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM BULK POWDER STORAGE RESP. ENG. PROCESS: S.M. Mackay MECHANICAL: R. Weber WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-05-101	1105		1	10,332	BULK ADDITIVE SILO	CAPACITY: 1,140 CU FT MATERIAL: MILD STEEL	140607
T-05-102	1105		1	26,480	BULK PFA SILO	CAPACITY: 5,280 CU FT MATERIAL: MILD STEEL	140607
T-05-103	1105		1	26,480	BULK BFS SILO	CAPACITY: 5,280 CU FT MATERIAL: MILD STEEL	140607
T-05-104	1105		1	12,332	BULK OPC SILO	CAPACITY: 1,140 CU FT MATERIAL: MILD STEEL	140607
S-05-101	1105		1	3,602	ADDITIVE SILO DUCT COLLECTOR	TYPE: PULSE JET AIR FLOW: 30 ACFM PARTICLE SIZE: < 100 MESH	140607
S-05-102	1105		1	3,602	PPA SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 60 ACFM PARTICLE SIZE: < 100 MESH	140607
S-05-103	1105		1	3,602	BFS SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 60 ACFM PARTICLE SIZE: < 100 MESH - 1/8"	140607
S-05-104	1105		1	3,602	OPC SILO DUST COLLECTOR	TYPE: PULSE JET AIR FLOW: 30 ACFM PARTICLE SIZE: < 100 MESH	140607
Y-05-101	1105		1	2,043	BULK ADDITIVE ROTARY FEEDER	FLOW RATE: 100 CU FT/HR	140607
Y-05-102	1105		1	2,043	BULK PFA RATARY FEEDER	FLOW RATE: 150 CU FT/HR	140607
Y-05-103	1105		1	2,043	BULK BFS ROTARY FEEDER	FLOW RATE: 150 CU FT/HR	140607
Y-05-104	1105		1	2,043	BULK OPC ROTARY FEEDER	FLOW RATE: 100 CU FT/HR	140607
C-05-102	1105		1	1,504	ADDITIVE SILO DUST COLLECTOR FAN	AIR FLOW: 60 ACFM	140607
C-05-103	1105		1	1,504	PFA SILO DUST COLLECTOR FAN	AIR FLOW: 60 ACFM	140607
C-05-104	1105		1	1,504	BFS SILO DUST COLLECTOR FAN	AIR FLOW: 60 ACFM	140607
C-05-105	1105		1	1,504	OPC SILO DUST COLLECTOR FAN	AIR FLOW: 60 ACFM	140607

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM BULK POWDER STORAGE RESP. ENG. PROCESS: S.M. Mackay MECHANICAL: R. Weber WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
C-05-101	1105		1	50,300	AIR COMPRESSOR PACKAGE	PACKAGE TO INCLUDE DRYER, RECEIVER AND FILTERS DUTY: 1,000 CU FT/MIN POWER: 200 HP	140607
P-05-102	1105		1	39,400	DENSE PHASE PUMP & PNEUMATIC CONVEYING SYSTEM	PACKAGE TO INCLUDE DENSE PHASE PUMP, 12 FT^3 POT, CONVEYING LINES, DIVERTER VALVES	140607
P-05-101	1105		1	600	POLYMER PUMP	METERING, 5 GPM @ 10 PSI Δp	140607
CV-05-101	1105		1	7,600	ADDITIVE AIR SLIDE	CAPACITY: 100 CU FT/HOUR SIZE: 4"	140607
CV-05-102	1105		1	7,600	PFA AIR SLIDE	CAPACITY: 150 CU FT/HOUR SIZE: 6"	140607
CV-05-103	1105		1	7,600	BFS AIR SLIDE	CAPACITY: 150 CU FT/HOUR SIZE: 6"	140607
CV-05-104	1105		1	7,600	OPC AIR SLIDE	CAPACITY: 100 CU FT/HOUR SIZE: 4"	140607

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SIZE REDUCTION AND REPACK RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CR-05-501	1105		1	80,000	OVERHEAD CRANE	CAPACITY: 15 TONS LENGTH OF TRAVEL: 75 FT	Sheet 1 - 140628
CV-05-501	1105		1	4,735	INLET CONVEYOR FROM RECEIPT	ROLLER CONVEYOR - CAPACITY 3,000 LBS, TO TRANSPORT 55 - 85-GALLON DRUMS	Sheet 1 - 140628
CV-05-502	1105		1	5,302	CONVEYOR FEEDING TRANSFER CAR	ROLLER CONVEYOR - CAPACITY 3,000 LBS, TO TRANSPORT 55 - 85-GALLON DRUMS	Sheet 1 - 140628
TC-05-501	1105		1	10,400	TRANSFER CAR	CAPACITY: 3,000 LB, TO BE CAPABLE OF HANDLING 55- TO 85-GAL DRUMS TO BE FITTED WITH CONVEYOR, LENGTH OF TRAVEL 40 FT	Sheet 1 - 140628
AL-05-501	1105		1	35,000	DRUM AIRLOCK FROM RECEIPT	CAPACITY: 3,000 LBS TO BE SIZED FOR 55- TO 85-GAL DRUMS.	Sheet 1 - 140628
FT-05-501	1105		1	2,700	DRUM PALLET TRUCK	CAPACITY; MAXIMUM LOAD 3,000 LB, TO BE CAPABLE OF HANDLING 55- TO 85-GAL DRUMS. MOTORISED HAND PALLET TRUCK, ELECTRICALLY POWERED WITH BATTERY BACK UP.	Sheet 1 - 140628
LT-05-521	1105		1	8,400	LIFT TABLE (DRUM ENTRY)	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
DO-05-521	1105		1	25,000	SIMPLE DOUBLE LID (DRUM ENTRY)	TO ALLOW TRANSFER OF 55- TO 85-GAL DRUMS INTO CONTAINMENT	Sheet 1 - 140628
CR-05-521	1105		1	5,300	DRUM HOIST	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS AND DRUM LIFTER	Sheet 1 - 140628
DH-05-521	1105		1	1,000	DRUM LIFTER	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS	Sheet 1 - 140628
TC-05-521	1105		1	35,100	TRANSFER CAR - USED DRUMS	CAPACITY: 1,000 LBS--55- AND 85-GAL DRUMS	Sheet 1 - 140628

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SIZE REDUCTION AND REPACK RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
DO-05-522	1105		1	12,000	SLIDING HATCH	TO COVER OPENING THAT IS SIZED FOR 85-GAL DRUM	Sheet 1 - 140628
CY-05-521	1105		1	3,000	DRUM PUSHER	CAPACITY: VERTICAL LOAD 3,000 LBS TO HANDLE 55- TO 85-GAL DRUMS	Sheet 1 - 140628
RT-05-521	1105		1	2,500	BAND SAW	TO CUT THE CLAMP BAND OFF 55- TO 85-GAL DRUMS	Sheet 1 - 140628
RT-05-522	1105		1	9,500	LID REMOVER	TO LIFT THE LID OFF 55- TO 85-GAL DRUMS	Sheet 1 - 140628
DH-05-522	1105		1	30,000	DRUM HANDLER/TIPPER	CAPACITY: 3,000 LBS TO HANDLE 55- TO 85-GAL DRUMS AND ROTATE THROUGH 180°	Sheet 1 - 140628
CR-05-522	1105		1	3,500	HOIST (NON SHREDDABLE ITEMS)	CAPACITY: 1 TON, MONORAIL MOUNTED	Sheet 1 - 140628
ST-05-521A,B	1105		2	15,000	SORTING/TIPPING TABLE	CAPACITY: 3,000 LBS VOLUME 12 CU FT	Sheet 1 - 140628
T-05-522	1105		1	37,000	ABSORBANT DISCHARGE HOPPER	CAPACITY: 1,300 LBS VOLUME 15 CU FT	Sheet 1 - 140628
EM-05-521A,B	1105		2	106,000	MANIPULATOR ASSEMBLY	MANIPULATOR CARRIAGE AND PAIR OF MANIPULATORS	Sheet 1 - 140628
DO-05-525A,B	1105		2	9,800	PURGED PORT (PROCESS SAMPLES)	TO TRANSFER WASTE FROM ENCLOSURE FOR PROCESS SAMPLING	Sheet 1 - 140628
X-05-521	1105		10	200	TRASFER TRAY (NONSHREDDABLE ITEMS)	CAPACITY 500 LBS	Sheet 1 - 140628
DO-05-523	1105		1	25,000	SIMPLE DOUBLE LID (NONSHREDDABLE ITEMS)	TO ALLOW TRANSFER OF WASTE IN 55-GAL DRUM	Sheet 1 - 140628
LT-05-522	1105		1	8,400	LIFT TABLE (NONSHREDDABLE ITEMS)	CAPACITY: 1,000 LBS TO LIFT 55-GAL DRUM - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
SH-05-521	1105		1	260,000	COARSE SHREDDER	CAPACITY: 3,000 LBS 55- TO 85-GAL DRUM, 25 CU FT/HOUR	Sheet 1 - 140628

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SIZE REDUCTION AND REPACK RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
SH-05-522	1105		1	130,000	FINE SHREDDER	CAPACITY: 3,000 LBS 55- TO 85-GAL DRUM, 25 CU FT/HR	Sheet 1 - 140628
CV-05-521	1105		1	5,800	VIBRATING CONVEYOR	CAPACITY: 3,000 LBS, 25 CU FT/HR, VOLUME 12 CU FT	Sheet 1 - 140628
X-05-522	1105		1	10,000	DIVERTER TRAY	CAPACITY: 1,000 LBS MATERIAL: 304L STAINLESS STEEL	Sheet 1 - 140628
T-05-521A,B	1105		2	37,000	WEIGH HOPPER	CAPACITY: 1,000 LBS, VOLUME 12 CU FT	Sheet 1 - 140628
DO-05-524A,B	1105		2	25,000	SLIDING DOUBLE LID (DRUM EXIT)	TO ALLOW TRANSFER OF WASTE INTO 55-GAL DRUM	Sheet 1 - 140628
LT-05-523A,B	1105		2	8,400	LIFT TABLE (DRUM EXIT)	CAPACITY: 1,000 LBS TO LIFT 55-GAL DRUM - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
GB-05-521	1105		1	557,733	SHREDDER AND REPACK ENCLOSURE		Sheet 1 - 140628
CR-05-523	1105		1	5,300	MAINTENANCE HOIST	CAPACITY: 1 TON, MONORAIL MOUNTED	Sheet 1 - 140628
LT-05-541	1105		1	8,400	LIFT TABLE (DRUM ENTRY)	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
DO-05-541	1105		1	25,000	SIMPLE DOUBLE LID (DRUM ENTRY)	TO ALLOW TRANSFER OF 55- TO 85-GAL DRUMS INTO CONTAINMENT	Sheet 1 - 140628
CR-05-541	1105		1	5,300	DRUM HOIST	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS	Sheet 1 - 140628
DH-05-541	1105		1	1,000	DRUM LIFTER	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS	Sheet 1 - 140628
DO-05-542	1105		1	12,000	SLIDING HATCH	TO COVER OPENING SIZED FOR 85-GAL DRUM MAXIMUM	Sheet 1 - 140628
CY-05-541	1105		1	3,000	DRUM PUSHER	CAPACITY: VERTICAL LOAD 3,000 LBS TO HANDLE 55- TO 85-GAL DRUMS	Sheet 1 - 140628

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SIZE REDUCTION AND REPACK RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
RT-05-541	1105		1	2,500	BAND SAW	TO CUT THE CLAMP BAND OFF 55- TO 85-GAL DRUMS	Sheet 1 - 140628
RT-05-542	1105		1	9,500	LID REMOVER	TO LIFT THE LID OFF 55- TO 85-GAL DRUMS	Sheet 1 - 140628
DH-05-542	1105		1	30,000	DRUM HANDLER/TIPPER	CAPCITY: 3,000 LBS TO HANDLE 55- TO 85-GAL DRUMS AND ROTATE THROUGH 180°	Sheet 1 - 140628
AL-05-541	1105		1	15,000	AIRLOCK - PUG MILL ENCLOSURE TO TRANSFER TUNNEL ENCLOSURE		Sheet 1 - 140628
AL-05-521	1105		1	15,000	AIRLOCK - SHRED AND REPACK ENCLOSURE TO TRANSFER TUNNEL ENCLOSURE		Sheet 1 - 140628
ST-05-541	1105		1	15,000	SORTING/TIPPING TABLE	CAPACITY: 3,000 LBS, VOLUME 12 CU FT	Sheet 1 - 140628
EM-05-541	1105		1	106,000	MANIPULATOR ASSEMBLY	MANIPULATOR CARRIAGE AND PAIR OF MANIPULATORS	Sheet 1 - 140628
DO-05-543	1105		1	25,000	SIMPLE DOUBLE LID (NON-PUG MILL PROCESSABLE ITEMS)	TO ALLOW TRANSFER OF WASTE INTO 55-GAL DRUMS	Sheet 1 - 140628
CR-05-542	1105		1	3,500	HOIST (NON-PUG MILL PROCESSABLE ITEMS)	CAPACITY: 1 TON, MONORAIL MOUNTED	Sheet 1 - 140628
CR-05-543	1105		1	5,300	MAINTENANCE HOIST	CAPACITY: 1 TON, MONORAIL MOUNTED	Sheet 1 - 140628
LT-05-542	1105		1	8,400	LIFT TABLE (NON PUG MILL PROCESSABLE ITEMS)	CAPACITY: 1,000 LBS TO LIFT 55-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
SH-05-541	1105		1	54,000	PUG MILL	CAPACITY: 3,000 LBS, 25 CU FT/HR	Sheet 1 - 140628
T-05-541	1105		1	37,000	WEIGH HOPPER	CAPACITY: 3,000 LBS, VOLUME 15 CU FT	Sheet 1 - 140628
DO-05-544	1105		1	25,000	SLIDING DOUBLE LID (DRUM EXIT)	TO ALLOW TRANSFER OF WASTE INTO 55-GAL DRUMS	Sheet 1 - 140628

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SIZE REDUCTION AND REPACK RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
LT-05-543	1105		1	8,400	LIFT TABLE (DRUM EXIT)	CAPACITY: 1,000 LBS TO LIFT 55-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	Sheet 1 - 140628
GB-05-541	1105		1	348,698	PUG MILL ENCLOSURE		Sheet 1 - 140628
GB-05-522	1105		1	148,833	TRANSFER TUNNEL ENCLOSURE		Sheet 1 - 140628
AL-05-561	1105		1	80,000	BOX ENTRY AIRLOCK	TO TRANSFER BOX SIZE 5' X 5' X 9', WEIGHT 12,000 LBS INTO ENCLOSURE	Sheet 1 - 140628
X-04-541	1105		10	200	TRANSFER TRAY (NON-PUG MILL PROCESSABLE ITEMS)	CAPACITY: 500 LBS	Sheet 1 - 140628
DO-05-545	1105		1	9,800	PURGED PORT (PROCESS SAMPLES)	TO TRANSFER WASTE FROM ENCLOSURE FOR PROCESS SAMPLING	Sheet 1 - 140628
CV-05-561 A,B,C	1105		3	3,835	BOX INLET CONVEYOR	CAPACITY: 12,000 LBS TO TRANSPORT BOX SIZE 5' X 5' X 9'	Sheet 1 - 140628
CR-05-561	1105		1	26,000	OVERHEAD CRANE (45' TRAVEL)	CAPACITY: 12,000 LBS ELECTRIC POWER DRIVEN ELECTRIC POWR HOIST	Sheet 1 - 140628
EM-05-561	1105		1	200,000	POWER MANIPULATOR ASSEMBLY	BRIDGE MOUNTED TELESCOPIC MANIPULATOR CAPACITY: 240 LBS TO COVER WORKING ENVELOPES 15' X 30' X 15' HIGH	Sheet 1 - 140628
DO-05-561	1105		1	9,800	PURGED PORT (PROCESS SAMPLING)	TO TRANSFER WASTE FROM ENCLOSURE FOR PROCESS SAMPLING (140 MM DIA)	Sheet 1 - 140628
CM-05-561	1105		1	25,000	FILTER COMPACTOR	TO CRUSH FILTER SIZED 2' X 2' X 1'	Sheet 1 - 140628
DO-05-562	1105		1	25,000	SIMPLE DOUBLE LID (DRUM EXIT)	TO ALLOW TRANSFER OF WASTE INTO 55-GAL DRUMS	Sheet 1 - 140628
LT-05-561	1105		1	8,400	LIFT TABLE (DRUM EXIT)	CAPACITY: 3,000 LBS TO LIFT 55- TO 85-GAL DRUMS - TO BE FITTED WITH ROLLER	Sheet 1 - 140628

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
SIZE REDUCTION AND REPACK

RESP. ENG. PROCESS: S.A. Sharpe MECHANICAL: S.A. Sharpe WBS: 1105

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
RT-05-561	1105		1	40,000	MECHANICAL SAW	TO SIZE REDUCE GROUTED AND POLYMER DRUMS	Sheet 1 - 140628

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
SAMPLING

RESP. ENG. PROCESS: V.A. White MECHANICAL: S.A. Sharpe WBS: 1105

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CR-05-601	1105		1	5,300	DRUM HOIST	CAPACITY: 3,500 LBS TO LIFT 55- TO 83-GAL DRUMS AND LIFTER	140633
DH-05-602	1105		1	1,000	DRUM LIFTER	CAPACITY: 3,000 LBS TO LIFT 55- TO 83-GAL DRUMS	140633
EM-05-603	1105		1	106,000	MANIPULATOR ASSEMBLY	CAPACITY: 60 LBS ±150% ELECTRIC MOTOR MATERIAL: 2" X 2" RHS	140633
RT-05-610	1105		1	9,500	LID REMOVAL FIXTURE	TO LIFT LID OF 55-GAL DRUMS	140633
RT-05-611	1105		1	2,500	DRUM CLAMP BAND SAW	TO CUT CLAMPBANDS OF 55-GAL DRUMS	140633
DO-05-620	1105		1	10,000	SPHINCTER PORT	CAPACITY: TO RECEIVE 1 LITER CAPACITY CONTAINERS	140633
DO-05-621	1105		1	10,000	BAGLESS TRANSFER PORT	CAPACITY: TO RECEIVE 1 LITER SAMPLE CONTAINERS FOR TRANSPORT TO THE LABS	140633
DO-05-622	1105		1	25,000	SIMPLE DOUBLE LID (83-GAL DRUM ENTRY EXIT)	TO ALLOW 83-GAL DRUMS TO INTERFACE WITH CONTAINMENT AND TO ALLOW 55-GAL DRUMS IN AND OUT OF CONTAINMENT	140633
DO-05-623	1105		1	25,000	SIMPLE DOUBLE LID (55-GAL DRUM ENTRY)	TO ALLOW 55-GAL DRUMS TO BE TRANSFERRED INTO CONTAINMENT VIA AN AIRLOCK	140633
CV-05-630	1105		1	5,500	CONVEYOR	3,000 LBS CAPACITY ROLLER CONVEYOR TO TRANSFER 55-GAL DRUMS BETWEEN FORK LIFT TRUCK AND LIFT TABLE (3 FT LONG)	140633
RT-05-612	1105		1	20,000	CORE DRILL		140633

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SAMPLING RESP. ENG. PROCESS: V.A. White MECHANICAL: S.A. Sharpe WBS: 1105	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CV-05-631	1105		1	5,500	CONVEYOR	3,000 LBS CAPACITY ROLLER CONVEYOR TO TRANSFER 83-GAL DRUMS BETWEEN FORK LIFT TRUCK AND LIFT TABLE (3 FT LONG)	140633
LT-05-640	1105		1	8,400	LIFT TABLE	CAPACITY: 3,500 LBS TO LIFT 55-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	140633
LT-05-641	1105		1	8,400	LIFT TABLE	CAPACITY: 3,500 LBS TO LIFT 83-GAL DRUMS - TO BE FITTED WITH ROLLER CONVEYOR	140633
GB-05-600	1105		1	127,736	SAMPLE ENCLOSURE		140633
GB-05-601 A,B,C,D	1105		4	9,800	SAMPLE FUME HOOD		140633
CV-05-632	1105		1	10,430	CONVEYOR	3,000 LBS CAPACITY ROLLER CONVEYOR, 30' LONG	140633

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SPECIAL WASTE - SIZE REDUCTION RESP. ENG. PROCESS: R. Henkel MECHANICAL: B. Davies BS: 1106	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CR-06-101	1106		1	2,900	TRANSFER CRANE	3,000 LB CAPACITY MONORAIL	140649
CV-06-101	1106		1	1,350	REPACKED SHREDDED LEAD CONVEYOR	CAPACITY: 100 LB/DAY OF LEAD (P = 354 LB/FT^3) IN 1 DRUM/HR ROLLER CONVEYOR	140649
CR-06-103	1106		1	3,000	LEAD BRICK BASKET HOIST	CAPACITY: 1,000 LB	140649
GB-06-101	1106		1	766,194	SHREDDER ENCLOSURE (SPECIAL WASTE)		140649
SH-06-101	1106		1	130,000	SHREDDER	CAPACITY: 300 LB/HR (MAX)BULK SOLIDS (P = 22 LB/FT^3)	140649
ST-06-101	1106		1	15,000	SORTING/TIPPING TABLE	CAPACITY: 3,000 LB SIZE: 3' X 6' HYDRAULIC TIPPER	140649
T-06-101A,B	1106		2	3,000	SHREDDER DISCHARGE BIN	CAPACITY: 15 FT^3 SIZE: 2.5' DIA. X 2.5'H W/45° CONE BOTTOM WITH FRAME AND SLIDE VALVE OUTLET	140649
EM-06-101	1106		1	106,000	SORTING MANIPULATOR	CAPACITY: 60 LBS $\pm$150% ELECTRIC MOTOR MATERIAL: 2" X 2" RHS	140649
LT-06-101	1106		1	8,400	LIFT TABLE - DRUM ENTRY	CAPACITY: 3,000 LB	140649
DO-06-101	1106		1	25,000	SIMPLE DOUBLE LID - DRUM ENTRY	PNEUMATIC	140649
DH-06-103	1106		1	19,400	DRUM LIFTER	CAPACITY: 3,000 LB	140649
CR-06-102	1106		1	5,000	BIN HOIST	CAPACITY: 6,500 LB	140649
CY-06-101	1106		1	3,000	DRUM PUSHER	CAPACITY: 3,000 LB	140649
RT-06-102	1106		1	2,500	BAND SAW		140649
RT-06-101	1106		1	9,500	LID REMOVER	SUCTION PADS	140649
DH-06-102	1106		1	37,000	DRUM HANDLER/TIPPER	CAPACITY: 3,000 LB	140649
DH-06-104	1106		1	3,000	SHREDDER BIN LIFTING FRAME	CAPACITY: 6,500 LB	140649
DO-06-102	1106		1	12,000	SLIDING HATCH-LEAD DRUM FILLING	28" DIA	140649

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM

SPECIAL WASTE - SIZE REDUCTION

RESP. ENG. PROCESS: R. Henkel MECHANICAL: B. Davies BS: 1106

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
LT-06-102	1106		1	11,000	LIFT TABLE - DRUM EXIT	SCISSOR LIFT WITH CONVEYOR MOUNTED ON LOAD CELLS CAPACITY: 1,500 LBS	140649
XX-06-101	1106		1	1,500	LEAD BRICK TRANSFER BASKET	18" DIA X 12" HIGH	140649
DO-06-103	1106		1	12,000	SLIDING HATCH	26"	140649
DO-06-104	1106		1	10,000	TRANSFER PORT - FLASK/BOTTLE	1 LITER BOTTLE CAPACITY	140649
XX-06-102	1106		1	1,500	MERCURY FLASK TRANSFER BASKET	18" DIA X 12" HIGH	140649
XX-06-103	1106		1	10,000	TRANSFER RAIL - LEAD BASKET	1,000 LBS - 3' TRAVEL	140649
XX-06-104	1106		1	15,000	TRANSFER RAIL - DISCHARGE HOPPER	6,500 LBS - 5' TRAVEL INCL WEIGH FRAME	140649
AL-06-101	1106		1	10,000	AIRLOCK - TRANSFER TUNNEL	4' WIDE X 5' HIGH	140649

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MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SPECIAL WASTE - MERCURY TREATMENT RESP. ENG. PROCESS: R. Henkel MECHANICAL: B. Davies WBS: 1106	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CV-06-201	1106		1	5,000	EVAPORATOR DISCHARGE CONVEYOR	CAPACITY: 600 LB/DAY OF RETORTED WASTE ($P = 40$ LB/FT^3) IN 3 DRUMS/HR ROLLER CONVEYOR WITH LOAD CELL	140650
E-06-201	1106		1	10,000	EVAPORATOR CONDENSER	DUTY: 1,000 BTU/HR TYPE: DOUBLE PIPE	140650
H-06-201	1106		1	17,300	MERCURY EVAPORATOR	CAPACITY: 600 LB SIZE: 30" DIA. X 36" H DUTY: 50,000 BTU/HR ELECTRIC HEATER	140650
GB-06-201	1106		1	0	AMALGAMATION ENCLOSURE (PRICING INCLUDED WITH GB-06-101)		140650
GB-06-202	1106		1	0	EVAPORATOR ENCLOSURE (PRICING INCLUDED WITH GB-06-101)		140650
X-06-201A,B	1106		2	1,600	JAR MILL	CAPACITY: 30-1 LITER BOTTLES/DAY EACH SPEED: 20-300 RPM MOTOR HP: 1/4 HP	140650
DO-06-202	1106		1	12,000	SLIDING HATCH - BIN FEED	12" DIA OPENING	140650
X-06-202	1106		1	15,000	EVAPORATOR DISCHARGE GUIDE	18" DIA	140650
DO-06-201	1106		1	12,000	SLIDING HATCH - EVAPORATOR DISCHARGE	28" DIA	140650
DO-06-203	1106		1	10,000	TRANSFER PORT - FLASK/BOTTLE	1 LITER	140650
DO-06-204	1106		1	10,000	TRANSFER PORT - FLASK/BOTTLE	1 LITER CAPACITY	140650
LT-06-201	1106		1	11,000	LIFT TABLE DRUM EXIT	SCISSOR LIFT WITH CONVEYOR MOUNTED ON LOAD CELLS	140650

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
SPECIAL WASTE - REACTIVE METALS TREATMENT

RESP. ENG. PROCESS: R. Henkel   MECHANICAL: B. Davies   WBS: 1106

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
C-06-301	1106		1	N/A INCL IN V-06-301	SCRUBBER OFFGAS BLOWER	CENTRIFUGAL, CAPACITY 15 ACFM @ 20" H_2O ΔP	140651
CV-06-301	1106		1	0	HUMIDIFIER DISCHARGE VIBRATORY CONVEYOR	CAPACITY: 1,000 LB/DAY METALS IN SCREENING PANS	140651
E-06-301	1106		1	3,000	SCRUBBER CIRCULATION COOLER	DOUBLE PIPE EXCHANGER DUTY: 7,000 BTU/HR	140651
H-06-301	1106		1	300	SCRUBBER OFFGAS REHEATER	ELECTRIC IN-LINE HEATER DUTY: 1,000 BTU/HR	140651
GB-06-301	1106		1	0	HUMIDIFIER/SCREENING CHAMBER		140651
P-06-301	1106		1	2,500	SCRUBBER CIRCULATION PUMP	CENTRIFUGAL, 2 GPM @ 10 PSI ΔP	140651
S-06-301	1106		1	0	VIBRATING SCREEN	CAPACITY: 1,000 LB/DAY TOTAL, 50 WT% < 48 MESH MOTOR DRIVEN	140651
V-06-301	1106		1	11,000	CHEMICAL SCRUBBER	6" DIA X 30" S/S W/ 15" POLYETHYLENE PACKED BED	140651
T-06-301	1106		1	0	DISCHARGE BIN	38" DIA WITH SLIDE VALVE	140651
X-06-301	1106		1	0	FEED HOPPER	4' SQUARE X 60°-12" DIA OUTLET	140651
DO-06-304	1106		1	0	SLIDING HATCH - SCREEN FEED	15" DIA	140651
DO-06-305	1106		1	0	SLIDING HATCH - CONVEYOR DISCHARGE	15" DIA	140651
P-06-302	1106		1	0	HUMIDIFIER CONDENSATE SUMP PUMP	S.S. HORIZONTAL CONTRIFUGAL PUMP	140651
X-06-302	1106		1	0	TRANSFER RAIL - FEED HOPPER	3,000 LBS - 4' TRAVEL	140651

NOTE: REACTIVE METALS EQUIPMENT INCLUDED AT ZERO COST

9413227.1167

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
LIQUID WASTE COLLECTION

RESP. ENG. PROCESS: T. Sayers MECHANICAL: B. Davies WBS: 1107

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-07-101A,B	1107		2	9,700	NON-ACTIVE WASTE COLLECTION TANKS	SS, VERTICAL, ROUND BOTTOM TANKS 500 GAL EA (4'DIA. X 5'1/2" H)	140659
P-07-101A,B	1107		2	1,500	NON-ACTIVE WASTE PUMPS	SS, HORIZONTAL, CENTRIFUGAL PUMPS 1/2 HP	140659
P-07-102	1107		1	1,500	NON-ACTIVE SUMP PUMP	SS, VERTICAL, CENTRIFUGAL PUMP 1/4 HP	140659
T-07-201	1107		1	57,600	ACTIVE WASTE COLLECTION TANK	SS, VERTICAL, ROUND BOTTOM TANK 10,000 GAL (12' DIA X 12' H)	140659
P-07-201	1107		1	1,500	ACTIVE WASTE PUMP	SS, HORIZONTAL, CENTRIFUGAL PUMP, 3 HP	140659
P-07-202	1107		1	1,500	ACTIVE SUMP PUMP	SS, VERTICAL, CENTRIFUGAL PUMP, 1/2 HP	140659
M-07-201	1107		1	950	TREATED ACTIVE WASTE TANK MIXERS	MIXER WITH SS SHAFT & IMPELLER 1 HP	140659
F-07-201	1107		1	4,000	ACTIVE WASTE FILTER	SS DUPLEX BAG FILTER, ASME CODE STAMPED "100 PSIG", 6" DIA X 30"	140659
F-07-202	1107		1	4,000	ACTIVE CARBON FILTER	SS DUPLEX FILTER, 7 ROUND BY 4 HIGH, ASME CODE 100 PSIG	140659
T-07-202	1107		1	17,900	TREATED ACTIVE WASTE TANK	SS, VERTICAL, ROUND BOTTOM TANK, 3,000 GAL, 8' DIA X 8' HIGH	140659
P-07-203	1107		1	3,000	TREATED ACTIVE WASTE PUMP	SS, HORIZONTAL, CENT. PUMP 3/4 HP	140659
M-07-101A,B	1107		2	550	NONACTIVE WASTE TANK MIXERS	MIXER WITH SS SHAFT & IMPELLER, 1/2 HP	140659

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
MATERIAL HANDLING
RESP. ENG. PROCESS: J. Cavarra   MECHANICAL: WBS: 1108

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CR-08-101	1108	ESKAY	1	340,000	DRUM STORAGE/RETRIEVAL	(2) RACKS (7) H X (13) L STORAGE MATRIX, (1) AISLE, 182 DRUM CAPACITY, UNIT LOAD 3,000 LBS, 26" DIA SIZE, SPEED(FPM): TRAVEL 207, LIFT 33, SHUTTLE 66, SLAVE PALLETS	140666
CV-08-101	1108	ROACH/ #251-CDLR	1	1,350	DRUM NDA TRANSFER CONVEYOR	POWERED CDLR, 3 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-102	1108	ROACH/ #251-CDLR	1	1,350	DRUM NDA TRANSFER CONVEYOR	POWERED CDLR, 3 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-103	1108	ROACH/ #251-CDLR	1	1,350	DRUM NDA TRANSFER CONVEYOR	POWERED CDLR, 3 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-104	1108	ROACH/ #251-CDLR	1	1,350	DRUM NDA TRANSFER CONVEYOR	POWERED CDLR, 3 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-301	1108	ROACH/ #251-CDA	1	7,500	DRUM AS/RS TRANSFER CONVEYOR	POWERED CDLR W/DRUM PUSHER, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-302	1108	ROACH/ #251-CDA	1	7,500	DRUM AS/RS TRANSFER CONVEYOR	POWERED CDLR W/DRUM PUSHER, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-303	1108	ROACH/ #251-CDA	1	12,140	SLAVE PALLET TRANSFER CONVEYOR	POWERED CDLR, 5 FT LENGTH, 39" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, 4" ROLLER CENTERS, (2) 90° CHAIN TRANSFER DEVICE	140666
CV-08-501	1108	ROACH/ #251-CDA	1	4,500	DRUM REC/SHIP TRANSFER CONVEYOR	POWERED CDLR, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666

9413227.1169

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM MATERIAL HANDLING RESP. ENG. PROCESS: J. Cavarra MECHANICAL: WBS: 1108	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CV-08-502	1108	ROACH/ #251-CDA	1	4,500	DRUM REC/SHIP TRANSFER CONVEYOR	POWERED CDLR, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-503	1108	ROACH/ #251-CDA	1	4,500	DRUM REC/SHIP TRANSFER CONVEYOR	POWERED CDLR, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
CV-08-504	1108	ROACH/ #251-CDA	1	4,500	DRUM REC/SHIP TRANSFER CONVEYOR	POWERED CDLR, 5 FT LENGTH, 33" BF, SPEED 35 FPM, (2) 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140666
GV-08-101	1108	CATERPILLAR SGC - ROLLER DECK II	1	280,000	AUTOMATIC GUIDED VEHICLE	ELECTRIC POWERED WITH BATTERY CHARGER, LASER GUIDED, DUAL ROLLER DECKS, 2.5" ON 4.5" CENTERS, CAPACITY (LBS): UNIT LOAD 3,000, DIST. LOAD 6,000	140666
GV-08-102	1108	CATERPILLAR SGC - ROLLER DECK II	1	280,000	AUTOMATIC GUIDED VEHICLE	ELECTRIC POWERED WITH BATTERY CHARGER, LASER QUIDED, DUAL ROLLER DECKS, 2.5" ON 4.5" CENTERS, CAPACITY (LBS): UNIT LOAD 3,000, DIST. LOAD 6,000	140666

9413227.1170

WRAP FACILITY, DOE-RL
DE-AC06-91RL11946

UNITED ENGINEERS & CONSTRUCTORS
Project No. 6237.006

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
RECEIVING & SHIPPING AREA

RESP. ENG. PROCESS: J. Cavarra   MECHANICAL: S.A. Sharpe   WBS: 1109

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CR-09-101	1109	P&H	1	9,924	DRUM JIB CRANE	2 TON CAPACITY WITH A DRUM GRIPPER, FLOOR MOUNTED, PENDANT CONTROL, 10 FT. SPAN, 12 FT. HEIGHT, HOIST WITH 2 TON CAPACITY, TROLLEY WITH 2 TON CAPACITY, MOTORIZED DRIVE ROTATION.	140670
CR-09-102	1109	P&H	1	9,924	DRUM JIB CRANE	2 TON CAPACITY WITH A DRUM GRIPPER, FLOOR MOUNTED, PENDANT CONTROL, 10 FT. SPAN, 12 FT. HEIGHT, HOIST WITH 2 TON CAPACITY, TROLLEY WITH 2 TON CAPACITY, MOTORIZED DRIVE ROTATION.	140670
CV-09-101	1109	KORNYLAK	1	4,365	PALLET ACCUMULATION CONVEYOR	GRAVITY FLOW RACK, SLOPED, HYSTERESIS TYPE, UNIT CAPACITY 12,000 LBS, 30 FT. LENGTH	140670
CV-09-102	1109	ROACH/ #251-CDA	1	4,735	DRUM FEED CONVEYOR	POWERED CDLR, 6 FT LENGTH, 33" BF, SPEED 35 FPM, 2 - 36" ACCUMULATION ZONES, UNIT LOAD CAPACITY 3,000 LBS, 4" ROLLER CENTERS	140670
CV-09-103	1109	ROACH/ #251-CDA	1	19,179	NEW DRUM FEED CONVEYOR	POWERED CDLR, 30 FT LENGTH WITH 90° CHAIN TRANSFER, 33" BF, SPEED 35 FPM, 8 - 30" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140670
CV-09-104	1109	ROACH/ #251-CDA	1	11,130	DRUM DISCHARGE CONVEYOR	POWERED CDLR, 4 FT LENGTH, 33" BF, SPEED 35 FPM, 8 - 36" ACCUMULATION ZONES, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140670
CV-09-105	1109	ROACH/ #251-CDLR	1	8,320	DRUM SCALE/CONVEYOR	POWERED CDLR WITH LOAD CELL, 4 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 3,000 LBS, 4" ROLLER CENTERS	140670
CV-09-106	1109	ROACH/ #251-CDLR	1	8,320	DRUM SCALE/CONVEYOR	POWERED CDLR WITH LOAD CELL, 3 FT LENGTH, 33" BF, SPEED 35 FPM, UNIT LOAD CAPACITY 1,000 LBS, 4" ROLLER CENTERS	140670

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM RECEIVING & SHIPPING AREA RESP. ENG. PROCESS: J. Cavarra MECHANICAL: S.A. Sharpe WBS: 1109	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
FT-09-101	1109	HYSTER/ E120XL	1	45,000	FORK TRUCK	FORK TRUCK TO SERVICE RECEIVING & SHIPPING AREA, 12,000 LBS CAPACITY, ELECTRIC WITH BATTERY CHARGER	140670
X-09-101	1109	VALLEY CRAFT/ #6158	1	2,000	FORK TRUCK DUAL DRUM GRIPPER	FORK TRUCK ATTACHEMENT TO TRANSPORT 2 NEW DRUMS, 2,000 LBS CAPACITY HYDRAULIC POWER FROM FORK TRUCK	140670
AL-09-101	1109		1	35,000	AIRLOCK		140670

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
NON-DESTRUCTIVE AREA (NDA)
RESP. ENG. PROCESS: S.M. MacKay MECHANICAL: A. Watson WBS: 1109

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
ND-09-201	1109		1	920,000	DRUM PASSIVE/ACTIVE NEUTRON (PAN) EQUIPMENT	55 GAL DRUMS WITH REPACKED LLRMW THROUGHPUT = 6 DRUMS/HOUR. UNIT LOAD MAXIMUM = 1,000 LB	140673
ND-09-202	1109		1	920,000	DRUM PASSIVE/ACTIVE NEUTRON (PAN) EQUIPMENT	55 GAL DRUMS WITH REPACKED LLRMW THROUGHOUT = 6 DRUMS/HOUR. UNIT LOAD MAXIMUM = 1,000 LB	140673
ND-09-203	1109		1	325,000	DRUM GAMMA ENERGY ASSAY EQUIPMENT	55 GAL DRUMS WITH REPACKED LLRMW THROUGHOUT = 6 DRUMS/HOUR. UNIT LOAD MAXIMUM = 1,000 LB	140673
ND-09-204	1109		1	325,000	DRUM GAMMA ENERGY ASSAY EQUIPMENT	55 GAL DRUMS WITH REPACKED LLRMW THROUGHOUT = 6 DRUMS/HOUR. UNIT LOAD MAXIMUM = 1,000 LB	140673
ND-09-205	1109		1	170,000	SYSTEM INTEGRATION EQUIPMENT		140673

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM AQUEOUS SOLUTION MAKEUP RESP. ENG. PROCESS: T. Sayers MECHANICAL: A. Zindel WBS: 1112	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
T-12-101	1112		1	1,600	ACID FEED TANK	75 GAL, LINED CS	140687
T-12-104	1112		1	500	ACID FEED POT	5 GAL, LINED CS WITH CALIBRATED LEVEL INDICATOR	140687
M-12-101	1112		1	400	ACID TANK MIXER	1/8 HP WITH RUBBER COATED SHAFT AND IMPELLER	140687
P-12-101	1112		1	300	ACID DRUM PUMP	HAND PUMP	140687
P-12-102	1112		1	4,090	ACID METERING PUMP	DIAPHRAGM METERING PUMP 1/4 HP, ALLOY 20, TEFLON DIAPHRAGM	140687
T-12-102	1112		1	800	CAUSTIC FEED TANK	75 GAL, CS	140687
T-12-105	1112		1	500	CAUSTIC FEED POT	5 GAL, CS WITH CALIBRATED LEVEL INDICATOR	140687
M-12-102	1112		1	400	CAUSTIC TANK MIXER	1/8 HP; SS SHAFT AND IMPELLER	140687
P-12-103	1112		1	300	CAUSTIC DRUM PUMP	HAND PUMP	140687
P-12-104	1112		1	3,800	SECONDARY WASTE TREAT CAUSTIC PUMP	DIAPHRAGM METERING PUMP 1/4 HP, SS, TEFLON DIAPHRAGM	140687
P-12-105	1112		1	3,800	CHEMICAL SCRUBBER FEED PUMP	DIAPHRAGM METERING PUMP 1/4 HP	140687
T-12-103	1112		1	1,800	DECON SOLUTION FEED TANK	150 GAL, SS	140687
T-12-106	1112		1	500	DECON SOLUTION FEED POT	5 GAL, SS W/ CALIBRATED LEVEL INDICATOR	140687
P-12-106	1112		1	300	DECON SOLUTION DRUM PUMP	HAND PUMP	140687
M-12-103	1112		1	400	DECON SOLUTION TANK MIXER	1/2 HP, SS SHAFT AND IMPELLER	140687
P-12-107	1112		1	3,800	DECON SOLUTION METERING PUMP	DIAPHRAGM METERING PUMP SS, TEFLON DIAPHRAGM, 1/4 HP	140687

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
UTILITIES

RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: A. Zindel WBS: 1112

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
C-12-301A,B	1112		2	10,760	INSTRUMENT AIR COMPRESSOR	ROTARY SCREW AIR COMPRESSOR, 200 SCFM @125 PSIG, 50 HP, 150 PSIG DESIGN PRESSURE, AIR-COOLED AFTERCOOLER AND OIL COOLER, MOISTURE SEPARATOR WITH AUTO, CONDENSATE TRAP, DRY TYPE AIR INLET FILTER	140691
DR-12-301	1112		1	4,359	INSTRUMENT AIR DRYER	HEATERLESS REGENERATIVE DUAL TOWER AIR DRYER WITH STANDARD ACCESSORIES AND CONTROL PANEL CAPACITY: 250 SCFM @100 PSIG & 100°F DESIGN: 150 PSIG @150°F	140691
F-12-301A,B	1112		2	475	INSTRUMENT AIR PREFILTER	CARTRIDGE FILTER, COALESCING TYPE WITH AUTO DRAIN VALVE, 250 SCFM @ 100 PSIG, 150 PSIG DESIGN	140691
F-12-302	1112		1	418	INSRUMENT AIR AFTER FILTER	CARTRIDGE FILTER, PARTICULATE TYPE, 415 SCFM @ 100 PSIG, 150 PSIG DESIGN	140691
V-12-301	1112		1	6,070	INSTRUMENT AIR RECEIVER	VERTICAL VESSEL, 1,500 GALLON, 54" ID X 11'-0" LENGTH (S/S) DESIGN: 150 PSIG @150°F, CARBON STEEL	140691
U-12-301	1112		1	19,000	NITROGEN GENERATION PACKAGE	SEMI-PERMEABLE MEMBRANE MULTI-BED UNIT PRODUCT: 4.0 SCFM NITROGEN WITH 2% OR LESS OXYGEN CONTENT FEED: 12.8 SCFM INSTRUMENT AIR @125 PSIG DESIGN: 150 PSIG @150°F	140691

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM UTILITIES RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: A. Zindel WBS: 1112	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
V-12-302	1112		1		NITROGEN RECEIVER	VERTICAL VESSEL, 180 GAL, 24" ID X 7'-0" LENGTH (S/S) DESIGN: 150 PSIG @ 150°F, CARBON STEEL	140691
BA-12-301	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-302	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-303	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-304	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-305	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A

CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM
UTILITIES

RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: A. Zindel WBS: 1112

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
BA-12-306	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-307	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-308	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-309	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
BA-12-310	1112		1	2,700	PORTABLE BREATHING AIR	(2) BREATHING AIR CYLINDERS ON PORTABLE BOTTLE RACK MANIFOLDED TOGETHER WITH VALVES, REGULATORS AND ALARMS, 100 FEET OF HOSE AND FACE MASKS	140691
CH-12-501A,B	1112		2	5,000	PROCESS CHILLER	5 REFRIG TONS, R-22 REFRIGERANT, RECIPROCATING, AIR-COOLED CONDENSER (110°F OSA), (2) CHILLING EXCHANGERS, 4.5 GPM EACH, 45% PROPYLENE GLYCOL, 57°F ENTERING, 42°F LEAVING, SKID MOUNTED WITH PANEL, MOTOR STARTER AND GAGES	140690

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM UTILITIES RESP. ENG. PROCESS: K. Van Zanten MECHANICAL: A. Zindel WBS: 1112	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
P-12-501A,B	1112		2	1,200	ACTIVE PROCESS CHILLED WATER PUMPS	5 GPM, DISCHARGE PRESSURE 35 PSIG, 45% PROPYLENE GLYCOL, 1.5 HP DESIGN TEMP: 42 TO 57°F (G6 ECO)	140690
P-12-502A,B	1112		2	1,200	NON-ACTIVE PROCESS CHILLED WATER PUMPS	5 GPM, DISCHARGE PRESSURE 35 PSIG, 45% PROPYLENE GLYCOL, 1.5 HP DESIGN TEMP: 42 TO 57°F (G6 ECO)	140690

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM UTILITIES PLUMBING RESP. ENG. PROCESS: L. FEIST	MECHANICAL: A.J. Zindel	WBS: 1112	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
H-12-201	1112	A.O. SMITH	1		DOMESTIC WATER HEATER	700 GALLON, 60 KW	
HWC - PUMP	1112	B&G	1		HOT WATER CIRCULATOR PUMP	IN LINE, BRONZE	
RPBP	1112	1" & .75"	2		BACKFLOW PREVENTER	REDUCED PRESSURE TYPE	
PVB	1112	1.5"	1		VACUUM BREAKER	PRESSURE TYPE	
PRV	1112	1"	1		PRESSURE REGULATING VALVE	WITH STRAINER	
PRV	1112	1.5"	3		PRESSURE REGULATING VALVE	WITH STRAINER	
TMV	1112	.75"	4		THERMOSTATIC MIXING VALVE	110°F OUTLET	
SA	1112	SIZE A	2		SHOCK ABSORBER	HYDROPNEUMATIC	
SA	1112	SIZE C	2		SHOCK ABSORBER	HYDROPNEUMATIC	
ES	1112	HAWS	2		EMERGENCY SHOWER	WITH PULL ROD	
EW	1112	HAWS	4		EYE WASH	WITH PUSH FLAG	
D-SHR	1112	HAWS	1		DECONTAMINATION SHOWER	WITH CONTAINED DRAIN	
EWC	1112	HAWS	3		ELECTRIC WATER COOLER	WALL MOUNTED	
WC	1112	KOHLER	10		WATERCLOSET	FLUSH VALVE	
UR	1112	KOHLER	6		URINAL	FLUSH VALVE	
LAV	1112	KOHLER	15		LAVATORY	VITREOUS CHINA	
SHR	1112	BRADLEY	10		SHOWER	3 GPM SHOWER HEAD	
MSB	1112	FIAT	1		MOP SERVICE BASIN	FLOOR MOUNTED	
KS	1112	ELKAY	1		KITCHEN SINK	STAINLESS STEEL	
FD	1112	JOSAM	16		FLOOR DRAIN	WITH TRAP AND VENT	
WCO	1112	JOSAM	8		WALL CLEANOUT	WITH COVER PLATE	
FCO	1112	JOSAM	4		FLOOR CLEANOUT	NICKEL BRONZE TOP	
S.T.	1112	4,000 GAL	1		SEPTIC TANK	WITH MANHOLE COVERS	

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM PROCESS HVAC RESP. ENG. PROCESS: M. Patel MECHANICAL: J.M. Keiser WBS: 1114	DATE 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
AH-14-101 A,B,C,D	14/14	PACE	4		PACKAGE AIR HANDLING UNIT	100% MAKEUP AIR SUPPLY, 23,693 CFM AT 6.5" TSP, 30% PREFILTER, 80% FILTER, 150 TON, 1,337 MBH, 334 GPM, 45% GLYCOL COOLING COIL, 170 KW HUMIDIFIER/310 KW PREHEAT COIL, 200 KW REHEAT COIL, 1,078 MBH, 270 GPM, HEAT RECOVERY COIL WITH 45% GLYCOL, ACCESS DOORS FOR FILTERS & COILS, CONTROL PANEL, SOUND INSULATION & VIBRATION PADS, HORIZONTAL RETURN, TOP DISCHARGE, ACCESS DOORS 120 V, 4-20 MA CONTROL PANEL	140728
*SF-14-101 A,B,C	14/14	PACE	4		SUPPLY AIR FAN	23,693 ACFM AT 6.5" TSP WITH VARIABLE INLET VOLUME DAMPER (VIV)	140728
F-14-101 A,B,C,D	14/14	CUSTOM, CSC	4		PROCESS EXHAUST HEPA AIR FILTER UNIT	19,913 ACFM AT 12.5" TSP, 30% PREFILTER, (2) BAGOUT HEPA SECTIONS & TEST SECTIONS, 1,078 MBH, 270 GPM HEAT RECOVERY COIL WITH 45% GLYCOL, UNITS A/B STACKED W/CONTROL PANEL	140728
EF-14-101 A,B,C,D	14/14	BUFFALO-FORGE	4		PROCESS EXHAUST AIR FAN UNIT	19,913 ACFM AT 12.5" TSP, WITH VIV DAMPER AND CONTROL PANEL, UNITS A/B STACKED, BELT DRIVE	140728
LV-14-101 A,B,C,D	14/14	RUSKIN	4		WALL LOUVER, AIR INTAKE	23,693 ACFM AT 0.05" WC, EXTR. ALUMINUM, BIRDSCREEN, RAINTIGHT	140727
EF-14-104A,B	14/14	BUFFALO-FORGE	2		ZONE I PROCESS EXHAUST FANS	11,540 ACFM AT 14" TSP, VIV, BELT DRIVEN, 50 HP	140728

*SUPPLIED WITH AH-14-101A,B,C

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM PROCESS HVAC RESP. ENG. PROCESS: M. Patel MECHANICAL: J.M. Keiser WBS: 1114	DATE 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
AH-14-201/	14/14	PACE	1		PACKAGE AIR HANDLING UNIT, LOCKER ROOM	100% OSA MAKEUP UNIT W/HEAT RECOVERY, 7,100 ACFM AT 4" SP, 120 V 30%, 4-20 MA CONTROL PANEL PREFILTER, 80% FILTER ACCESS DOORS, HEAT RECOVERY WHEEL, WHEEL CAPACITY 330 MBH, 200 MBH, 50 GPM COOLING COIL, ELECTRIC HEAT COIL 150KW, SAFETY CUTOUTS & DISCHARGE AIR SWITCH	140730
**SF-14-201	14/14	PACE	1		SUPPLY FAN, LOCKER ROOM	7,100 ACFM AT 4" TSP, BELT DRIVEN	140735/140730
**EF-14-201	14/14	PACE	1		EXHAUST FAN, LOCKER ROOM	6,400 ACFM AT 2.5" TSP, BELT DRIVEN	140735/140730

**SUPPLIED WITH AH-14-201

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM SHIPPING AND RECEIVING RESP. ENG. PROCESS: M. Patel MECHANICAL: J.M. Keiser WBS: 1114	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
AH-14-301	14/09	PACE	1		PACKAGE AIR HANDLING UNIT, SHIPPING & TRANSFER AREAS	18,000 ACFM AT 3" TSP, 30% PREFILTER, 80% FINAL FILTER, 400 MBH, 100 GPM, 45% GLYCOL COOLING COIL, ELECTRIC REHEAT COIL 100 KW, HUMIDIFIER 20 KW, ACCESS DOORS AND 120 V, 4-20 MA CONTROL PANEL	140736
*SF-14-301	14/09	PACE	1		SUPPLY FAN	18,000 ACFM AT 3" SP, 20 HP, BELT DRIVEN	140736
RF-14-301	14/09	HARTZELL	1		RETURN AIR FAN, AXIAL, SHIPPING	18,000 ACFM AT 0.5" SP, 3 HP AXIAL	140736
EH-14-301A,B	14/09	TRANE	2		UNIT HEATER, CLEAN DRUM AREA	3,000 ACFM AT 0.5" SP, ELECTRIC, 25 KW & 0.5 HP	140736
EH-14-302A-G	14/09	TRANE	7		UNIT HEATER, TRANSFER CORR AND SHIPPING	1,000 ACFM AT 0.5" SP, ELECTRIC, 8 KW & 1/6 HP	140736

*SUPPLIED WITH AH-14-301

WRAP FACILITY, DOE-RL
DE-AC06-91RL11946

UNITED ENGINEERS & CONSTRUCTORS
Project No. 6237.006

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A
CLIENT: DOE/WHC
PROJECT NO.: 6237.006

AREA DESCRIPTION/SYSTEM: ADMINISTRATION
RESP. ENG. PROCESS: M. Patel MECHANICAL: J.M. Keiser WBS: 1114

DATE: 07/31/92
REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
AH-14-401	14/13	PACE	1		PACKAGE AIR HANDLING UNIT, ADMINISTRATION	25,000 ACFM AT 3.5" TSP, 30% PREFILTER, 80% FINAL FILTER, 460 MBH, 115 GPM, 45% GLYCOL, ELECTRIC HEAT COIL 120 KW, HUMIDIFIER 66 KW, ACCESS DOORS & 120 V, 4-20 MA, CONTROL PANEL	140734
*SF-14-401	14/13	PACE			SUPPLY FAN	25,000 ACFM AT 3.5" SP, 30 HP	140734
RF-14-401	14/13	HARTZELL			RETURN FAN	22,500 ACFM AT 0.5" SP, 5 HP	140734
EF-14-401	14/13	TRANE	1		TOILET EXHAUST FAN	1,000 ACFM AT 0.25" SP, 1/12 HP	140734
CB-14-401A-T	14/13	TEMPMSTR	20		CABINET HEATER	ELECTRIC WITH THERMOSTAT AND FAN 350 ACFM AT 0.25" SP, ELECTRIC	140733
AC-14-501A,B	14/13	LIEBERT	2		COMPUTER ROOM AC UNIT	4,000 ACFM AT 0.5" SP, 30%, 7.5 TON, 30% PREFILTER, 80% FINAL FILTER 15 KW, REHEAT COIL 15 KW HUMIDIFIER, 45% GLYCOL, INFRARED HUMIDIFIER, 5 HP	140734
AH-14-601	14/13	PACE	1		AIR HANDLING UNIT, HVAC EQUIPMENT ROOM	12,000 TO 21,000 ACFM AT 3" SP, 30% PREFILTER, 60% FINAL FILTER, HEAT COIL 160 KW, ACCESS DOORS & 120 V, 4-20 MA, CONTROL PANEL	140734
**SF-14-601	14/13	PACE			SUPPLY FAN	12,000 TO 21,000 ACFM AT 3" SP CENTRIFUGAL FAN, WITH VIV CONTROL, BELT DRIVEN	140734
EF-14-601A,B	14/13	TRANE	2		ROOF EXHAUST FAN	10,500 ACFM AT 0.5" SP, 2 HP	140733
EF-14-602	14/13	TRANE	1		COMPRESSOR ROOM EXHAUST FAN	600 ACFM AT 0.25" SP, 1/12 HP	140734

*SUPPLIED WITH AH-14-401
**SUPPLIED WITH AH-14-601

MECHANICAL EQUIPMENT LIST

PROJECT: WRAP 2A CLIENT: DOE/WHC PROJECT NO.: 6237.006	AREA DESCRIPTION/SYSTEM CHILLED WATER SYSTEM RESP. ENG. PROCESS: M. Patel MECHANICAL: J.M. Keiser WBS: 1114	DATE: 07/31/92 REV: 1

COMPONENT/ TAG NO.	SYSTEM/ AREA	VENDOR/ MODEL/ SIZE	QTY	UNIT PRICE	NAME	MECHANICAL DESCRIPTION	REF. DWG.
CH-14-101A,B	14/12	DUNHAM-BUSH	2		CHILLER	ROTARY SCREW, CFC-123, 200 TON, 600 GPM, 45% GLYCOL, 42°F CH SUPPLY, 52°F CH RETURN, CRANKCASE HEATER	140732
CT-14-101	14/12	MARLEY	1		EVAPORATOR COOLING TOWER	400 TON, 1,200 GPM, 45% GLYCOL, 68°F WB, 80°F CONDENSER GLYCOL, SUMP HEATER, AXIEL FLOW FANS	140732
P-14-101A,B	14/12	BELL & GOS	2		PUMP, SECONDARY CHILLER WATER	CENTRIFUGAL, 1,200 GPM AT 80' WITH SUCTION DIFFUSER & MULTIPURPOSE DISCHARGE VALVE & ELECTRONIC SPEED CONTROL, 45% GLYCOL 50 HP	140732
P-14-102A,B	14/12	BELL & GOS	2		PUMP, PRIMARY CHILLER WATER	CENTRIFUGAL, 600 GPM AT 50' WITH SUCTION DIFFUSER & MULTIPURPOSE DISCHARGE VALVE CONSTANT SPEED, 45 GLYCOL, 15 HP	140732
P-14-103A,B	14/12	BELL & GOS	2		PUMP, CONDENSER WATER	CENTRIFUGAL, 600 GPM AT 50' WITH SUCTION DIFFUSER & MULTIPURPOSE DISCHARGE VALVE, CONSTANT SPEED, 30 HP	140732
P-14-104	14/12	BELL & GOS	1		PUMP, HEAT RECOVERY	CENTRIFUGAL, 350 GPM AT 70' WITH SUCTION DIFFUSER, 15 HP, MULTIPURPOSE DISCHARGE VALVE, CONSTANT SPEED	140734
XS-14-101	14/12	CUSTOM	1		STACK, PROCESS EXHAUST	71,280 ACFM AT 1" SP, 72" DIA X 68' HIGH WITH STEEL LADDER AND CIRCULAR ACCESS PLATFORM, 10" DIA ACCESS FLANGE FOR CAM STACK MONITOR, VORTEX SHREDDER	140733
AS-14-101			1		AIR SEPARATOR CHILLED GLYCOL SYSTEM	16" DIA X 16" HIGH	140732
ET-14-101			1		EXPANSION TANK CHILLED GLYCOL SYSTEM	30" DIA X 72" HIGH	140732

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CONCEPTUAL DESIGN REPORT

WASTE RECEIVING AND PROCESSING FACILITY
MODULE 2A

Project W-100

For the
U.S. Department of Energy
Richland Operations Office
Richland, Washington

Prepared by: United Engineers & Constructors

Contractor Approval

DOE Field Organization Approval

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VOLUME I
CONCEPTUAL DESIGN REPORT

TABLE OF CONTENTS

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TABLE OF CONTENTS

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TABLE OF CONTENTS

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VOLUME I
CONCEPTUAL DESIGN REPORT

TABLES & FIGURES

TABLES

FIGURES

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VOLUME II
PROJECT COST ESTIMATE

TABLE OF CONTENTS

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VOLUME II
PROJECT COST ESTIMATE

TABLES & FIGURES

TABLES

FIGURES

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VOLUME III
OUTLINE SPECIFICATIONS

TABLE OF CONTENTS

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VOLUME IV
CONCEPTUAL DRAWINGS

TABLE OF CONTENTS

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VOLUME V
SYSTEM DESCRIPTIONS

TABLE OF CONTENTS

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TABLE OF CONTENTS

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TABLE OF CONTENTS

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TABLE OF CONTENTS

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VOLUME V
SYSTEM DESCRIPTIONS

TABLES & FIGURES

TABLES

FIGURES

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ABBREVIATIONS & ACRONYMS

ACDR	ADVANCED CONCEPTUAL DESIGN REPORT
AEA	ATOMIC ENERGY AGENCY
AGV	AUTOMATED GUIDED VEHICLE
AI	ANALOG INPUTS
ALARA	AS LOW AS REASONABLY ACHIEVABLE
AMU	AQUEOUS MAKE UP
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AO	ANALOG OUTPUTS
ARM	AREA RADIATION MONITORING
ASILS	AMBIENT SOURCE IMPACT LEVELS
AS/RS	AUTOMATIC STORAGE/RETRIEVAL SYSTEM
BACT	BEST AVAILABLE CONTROL TECHNOLOGY
BARCT	BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY
BDAT	BEST DEMONSTRATED AVAILABLE TECHNOLOGY
BFS	BLAST FURNACE SLAG
BNFL	BRITISH NUCLEAR FUELS LIMITED, INC.
C	AMPLIFICATION FACTOR
CAM	CONTINUOUS AIR MONITOR
CASS	COMPUTER AUTOMATED SURVEILLANCE SYSTEM
CBR	CALIFORNIA BEARING RATIO
CCTV	CLOSED CIRCUIT TELEVISION
CDR	CONCEPTUAL DESIGN REPORT
CFR	CODE OF FEDERAL REGULATIONS
CH	CONTACT HANDLED
CHLLMW	CONTACT HANDLED LOW LEVEL RADIOACTIVE MIXED WASTE
DB	DRY BULB
DBA	DESIGN BASIS ACCIDENT
DCG	DERIVED CONCENTRATION GUIDE
DCS	DISTRIBUTED CONTROL SYSTEM
DI	DIGITAL INPUT
DMS	DATA MANAGEMENT SYSTEM
DO	DIGITAL OUTPUTS
DOE	U.S. DEPARTMENT OF ENERGY
DOE-RL	U.S. DEPARTMENT OF ENERGY FIELD OFFICES, RICHLAND
DOT	DEPARTMENT OF TRANSPORTATION
DSHS	DEPARTMENT OF SOCIAL AND HEALTH SERVICES
ECOLOGY	WASHINGTON STATE DEPARTMENT OF ECOLOGY
EEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
EMP	ENVIRONMENTAL MONITORING PLAN
EPA	ENVIRONMENTAL PROTECTION AGENCY
EPRI	ELECTRICAL POWER RESEARCH INSTITUTE
ES&H	ENVIRONMENT, SAFETY & HEALTH
FACP	FIRE ALARM CONTROL PANEL
FDC	FUNCTIONAL DESIGN CRITERIA
FM	FACTORY MUTUAL
GEA	GAMMA ENERGY ASSAY
HCWC	HANFORD CENTRAL WASTE COMPLEX
HDW-EIS	HANFORD DEFENSE WASTE ENVIRONMENTAL IMPACT

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ABBREVIATIONS & ACRONYMS

HEPA	HIGH EFFICIENCY PARTICULATE AIR
HFD	HANFORD FIRE DEPARTMENT
HLAN	HANFORD LOCAL AREA NETWORK
HP	HORSEPOWER
HSWA	HAZARDOUS SOLID WASTE AMENDMENTS
I	IMPORTANCE FACTOR
IES	ILLUMINATING ENGINEERING SOCIETY
IMC	INTERMEDIATE METAL CONDUIT
IMT	INTEGRATED MANAGEMENT TEAM
IVDTS	INTEGRATED VOICE AND DATA TELECOMMUNICATIONS SYSTEM
KEH	KAISER ENGINEERS HANFORD
LCC	LIFE CYCLE COST
LDR	LAND DISPOSAL RESTRICTIONS
LETF	LIQUID EFFLUENT TREATMENT FACILITY
LI&LO	LOOP INPUT/OUTPUT
LLMW	LOW-LEVEL RADIOACTIVE MIXED WASTE
LLW	LOW-LEVEL WASTE
MCC	MOTOR CONTROL CENTERS
MRP	MANAGEMENT REQUIREMENTS & PROCEDURES
MR/YR	MILLIREM PER YEAR
MS	MILITARY SPECIFICATION
MW	HAZARDOUS AND RADIOACTIVE MIXED WASTE
NACE	NATIONAL ASSOCIATION OF CORROSION ENGINEERS
NBS	NATIONAL BUREAU OF STANDARDS
NCI/G	NANOCURIES/GRAM
NDA	NON-DESTRUCTIVE ASSAY
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NESHAP	NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOCS	NOTICES OF CONSTRUCTION
NSPS	NEW SOURCE PERFORMANCE STANDARDS
OPC	ORDINARY PORTLAND CEMENT
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PA	PERFORMANCE ASSESSMENT OR PUBLIC ADDRESS
PAN	PASSIVE ACTIVE NEUTRON
PC	PERSONAL COMPUTER
PCB	POLYCHLORINATED BIPHENYL
PCS	PLANT CONTROL SYSTEM
PELS	PERMISSIBLE EXPOSURE LIMITS
PFA	PULVERIZED FLY ASH
pH	POTENTIAL OF HYDROGEN
PLC	PROGRAMMABLE LOGIC CONTROLLER
PMS	PLANT MANAGEMENT SYSTEM
PSD	PREVENTION OF SIGNIFICANT DETERIORATION
PSE	PRELIMINARY EVALUATION SAFETY
RAM	RANDOM ACCESS MEMORY
RCRA	RESOURCE CONSERVATION AND RECOVERY ACT
RFAR'S	RADIO FIRE ALARM REPORTERS

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ABBREVIATIONS & ACRONYMS

RH	REMOTE-HANDLED
RO	REVERSE OSMOSIS
ROD	RECORD OF DECISION
RPT	RADIATION PROTECTION TECHNICIAN
R_w	FORCE REDUCTION FACTOR
RWP	RESTRICTED WORK PERMIT
SCFM	STANDARD CUBIC FOOT PER MINUTE
SMA	SAMPLE MANAGEMENT AREA
SSW	SOUTH SOUTH WEST
SWITS	SOLID WASTE INFORMATION TRACKING SYSTEM
SWP	SPECIAL WORK PERMIT
T-BACT	BEST AVAILABLE CONTROL TECHNOLOGY FOR TOXICS
TAPS	TOXIC AIR POLLUTANTS
TCAPCA	TRI-COUNTY AIR POLLUTION CONTROL AUTHORITY
TCLP	TOXICITY CHARACTERISTIC LEACHING PROCEDURE
TEC	TOTAL ESTIMATED COST
TLVS	THRESHOLD LIMIT VALUES
TPC	TOTAL PROJECT COST
TRU	TRANSURANIC
TSDF	TREATMENT, STORAGE AND DISPOSAL FACILITY
UBC	UNIFORM BUILDING CODE
UCRL	UNIVERSITY OF CALIFORNIA RESEARCH LABORATORY
UE&C	UNITED ENGINEERS & CONSTRUCTORS
UK	UNITED KINGDOM
UL	UNDERWRITERS LABORATORIES
UPS	UNINTERRUPTIBLE POWER SUPPLY
VCR	VIDEO CASSETTE RECORDERS
VES	VINYL ESTER STYRENE
VGA	VIDEO GRAPHICS ARRAY
VOCS	VOLATILE ORGANIC COMPOUNDS
WAC	WASHINGTON ADMINISTRATIVE CODE <u>OR</u> WASTE ACCEPTANCE CRITERIA
WB	WET BULB
WDOE	STATE OF WASHINGTON DEPARTMENT OF ECOLOGY
WG	WATER GAUGE
WHC	WESTINGHOUSE HANFORD COMPANY
WINTER	WNW
WIPP	WASTE ISOLATION PILOT PLANT
WIPP-WAC	WIPP WASTE ACCEPTANCE CRITERIA
WSW	WEST SOUTH WEST
WNW	WEST NORTH WEST
WRAP	WASTE RECEIVING AND PROCESSING

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1.0 INTRODUCTION

1.1 General

1. This Conceptual Design Report (CDR) for the Waste Receiving and Processing (WRAP) Module 2A facility is submitted to the Richland Operations office of the U.S. Department of Energy (DOE-RL) in response to contract DE-AC06-91RL11946 Statement of Work, Revision 4A.

2. This CDR was performed by United Engineers & Constructors (UE&C). The work encompassed a period of performance for pre-conceptual studies during the latter half of 1991 and the preparation of the CDR from 10 February 1992 through 18 June 1992. The CDR was performed at UE&C's Denver, Colorado offices.

3. The mission of the WRAP Module 2A facility is to receive, process, package, certify, and ship for permanent burial at the Hanford site disposal facilities those contact handled (CH) low-level radioactive mixed wastes (LLMW) that: (1) are currently in retrievable storage at the Hanford Central Waste Complex (HCWC) awaiting a treatment capability to permit permanent disposal compliant with the Land Disposal Restrictions and; (2) are forecasted to be generated over the next 30 years.

4. The total treatment volume of waste represented by WRAP Module 2A constitutes approximately 72 percent of the low-level mixed waste (stored and future) at Hanford requiring implementation of final disposal action.

5. The primary sources of waste to be treated at WRAP Module 2A include the currently stored waste from the 183-H solar basin evaporators, secondary solids from the future Hanford site liquid effluent treatment facilities, thermal treatment facility ash, other WRAP modules, and other miscellaneous waste from storage and onsite/offsite waste generators consisting of compactible and non-compactible solids, contaminated soils, and metals.

6. The function of WRAP Module 2A is limited to low to moderate temperature (<500°F) treatment processes. It is not designed to provide treatment of non-hazardous low-level waste. The facility, however, will be designed and constructed to support an expansion to add a separate immobilization system to the facility in order to process such waste in the future.

7. The technical basis for the WRAP Module 2A conceptual design is the Functional Design Criteria (FDC) for WRAP Facility Module 2A, Project W-100, WHC-SD-W100-FDC-001, Revision 1 (draft) as transmitted by DOE-RL via 92-WPO-006, dated February 25, 1992.

8. The CDR defines a WRAP Module 2A facility, as illustrated in **Figure 1-1**, that is in accordance with DOE-RL FDC requirements. WRAP Module 2A is summarized by the following parameters:

Building Size	50,000 Square Feet
Building Type	Pre-engineered Metal Building
Waste Volume Throughput	29,000 Cubic Feet per Year
Waste Drum Throughput	5,259 Drums per Year
Facility Safety Classification	Low Hazard
Scheduled Operation Start Date	1999
Total Estimated Cost (TEC)	$81.1M
Total Estimated Project Cost (TPC)	$150.1M

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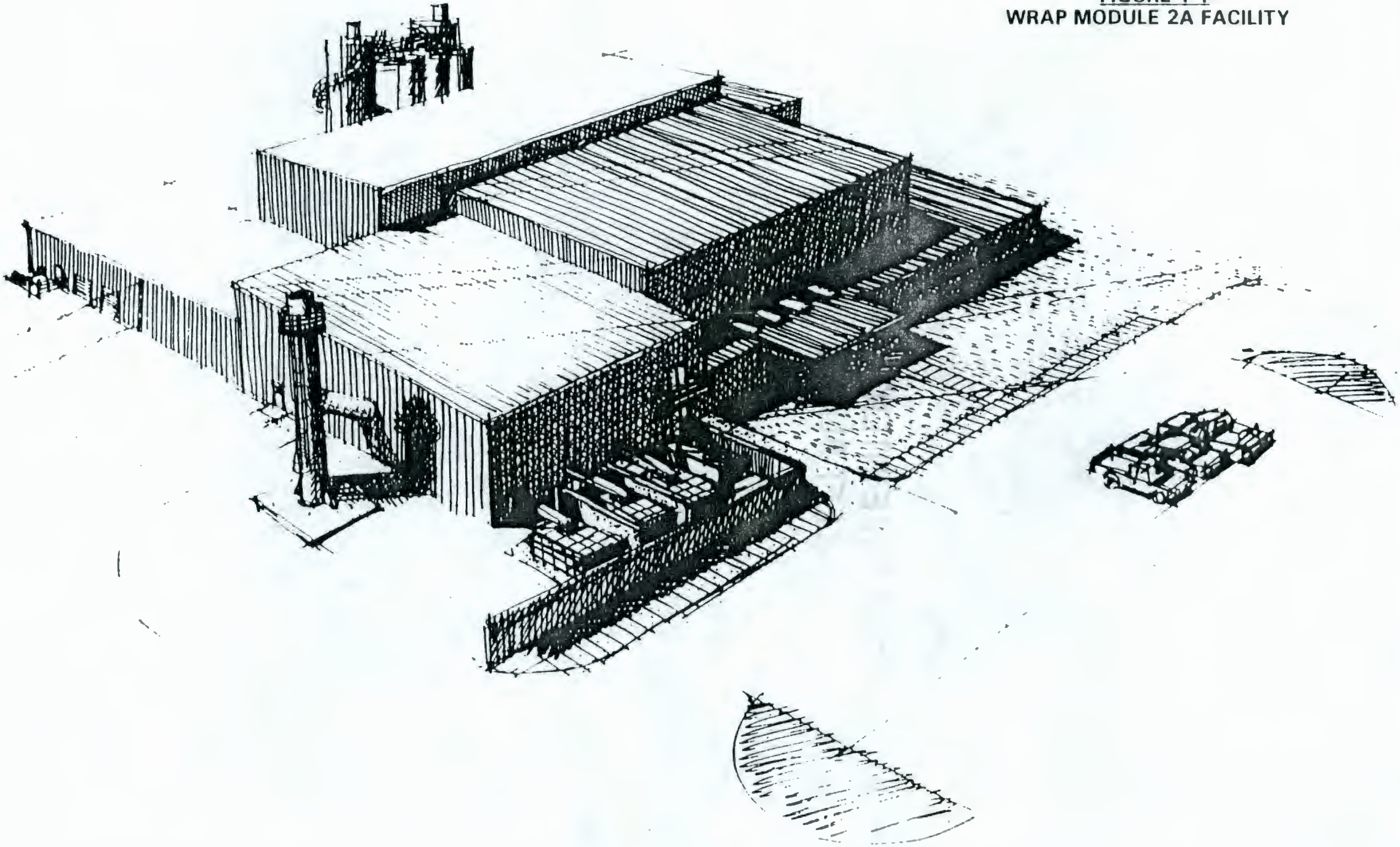

FIGURE 1-1
WRAP MODULE 2A FACILITY

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9. The conceptual design report submitted for the WRAP Module 2A Facility consists of the following volumes

Volume I	WRAP 2A Conceptual Design Report
Volume II	WRAP 2A Project Cost Estimate
Volume III	WRAP 2A Outline Specifications
Volume IV	WRAP 2A Conceptual Drawings
Volume V	WRAP 2A System Descriptions

10. **Volume 1** provides a narrative of the project background, objective and justification. A description of the WRAP 2A mission, operations and project scope is also included. Significant project requirements such as security, health, safety, decontamination and decomissioning, maintenance, data processing, and quality are outlined. Environmental compliance issues and regulatory permits are identified, and a preliminary safety evaluation is provided.

11. **Volume II** provides the detailed cost estimate for the WRAP 2A facility. Included in this volume is the project construction schedule.

12. **Volume III** is a compilation of the outline specifications that will form the basis for development of the Title design construction specifications. This volume contains abbreviated CSI outline specifications for equipment as well as non-equipment related construction and material items. For process and mechanical equipment, data sheets are provided with the specifications which indicate the equipment overall design parameters. This volume also includes a major equipment list.

13. **Volume IV** provides a complete set of the conceptual design drawings. Once reviewed and approved, these drawings will be utilized as a baseline to support the Advanced Conceptual Design effort.

14. **Volume V** provides a comprehensive conceptual design level narrative description of the process, utility, ventilation, and plant control systems. The feeds and throughputs, design requirements, and basis for process selection are provided, as appropriate. Key DOE/WHC criteria and reference drawings are delineated.

1.2 Project Organization

1. The CDR defines a project which will be performed by an Integrated Management Team (IMT) under the direction of DOE-RL. The IMT consists of:

DOE-RL	Project Management
Westinghouse Hanford Company (WHC)	Operations Contractor
UE&C	Architect Engineer
Kaiser Engineers Hanford (KEH)	Construction Manager

2. The IMT is an approach to project management which achieves excellence through coordinated participation of team members in accordance with the following fundamental principles:

- Assembly of a project team reflecting full spectrum of required expertise.
- Assignment of roles and responsibilities based on recognition of expertise.
- Emphasis on individual performance excellence by all team members.
- Elimination of duplication of effort.
- Focused and efficient checks and balances.
- Commitment to cooperative resolution of issues by all team members.
- Acceptance of objective performance measurement including how to show work quality indicators.

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- Application of root cause analysis to support true corrective action and recurrence control.

3. The IMT organization for WRAP is shown in **Figure 1-2**.

4. UE&C has executed the WRAP Module 2A CDR using an integrated design team consisting of UE&C and British Nuclear Fuels Limited, Inc. (BNFL). UE&C, as prime contractor to DOE-RL, provided the overall project management and A-E design services. BNFL provided a cadre of solid waste management personnel from their United Kingdom operations to perform solid waste process design services. A WHC project engineer has been in residence at UE&C's Denver offices during the preparation of the CDR.

1.3 CDR Scope

1. The purpose of this CDR is to identify and sufficiently develop a design concept that satisfies the FDC requirements, provides a solid process configuration and facility layout for future optimization efforts to proceed from, and establish the project cost and schedule baseline.

2. Documents which defined the scope of work for the WRAP Module 2A CDR included Revision 4A to the contract statement of work, the WRAP Module 2A CDR work plan, and functional design criteria WHC-SD-W100-FDC-001, Revision 1.

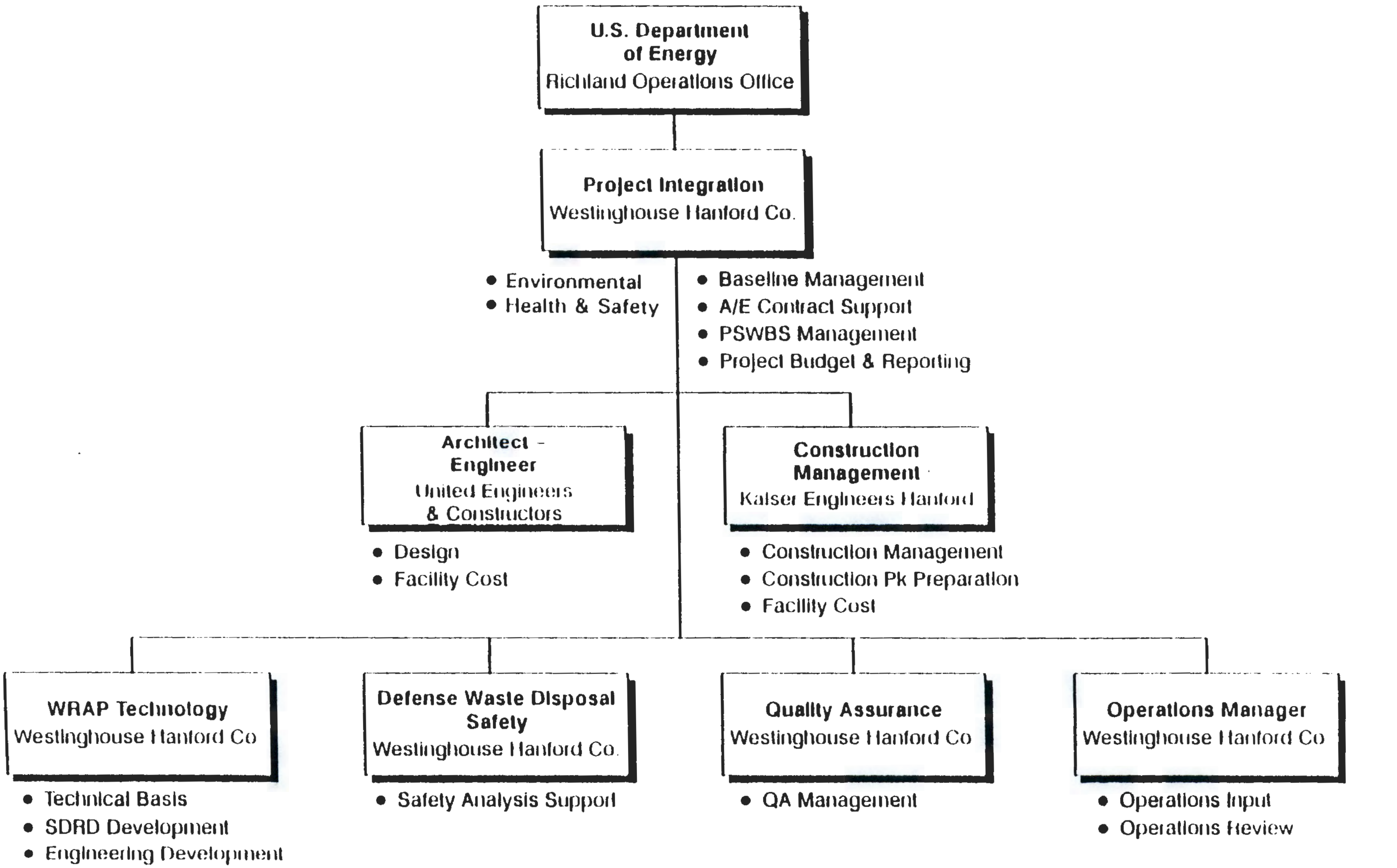
3. The initial phase of the CDR effort consisted of evaluating the LLMW compositions to select suitable process(s) for treatment. Two process were selected. Grout was selected for treatment of heterogeneous dry materials such as construction debris. A Vinyl Ester Styrene polymer encapsulation process was selected for treatment of wastes which contain high percentages of soluble salts such as ammonium sulphate. An example is waste generated from the operation of Liquid Effluent Treatment Facilities at Hanford. Once processes were selected, the facility systems and equipment were identified to perform the processes in compliance with the functional design criteria.

4. The production effort of the CDR consisted of preparing design media (drawings and outline specifications) that would support the design concept and configuration of the facility and provide sufficient information to obtain a reliable cost estimate. The drawings included the following generic types:

- Site Plans
- Process Block Diagrams
- Process and Mechanical Flow Diagrams
- Equipment General Arrangement Drawings
- Electrical One-Line Diagrams
- Control & Monitoring System Block Diagrams
- Building Interior Floor Plans
- Building Exterior Elevations

5. An integral component of the CDR development was the identification of those areas or aspects of the conceptual design that warrant further evaluation and cost/benefit study in order to arrive at an optimized design concept that would form the technical baseline for the title design to proceed from. These considerations are identified and described in Section 10.0.

FIGURE 1-2
WRAP INTEGRATED MANAGEMENT TEAM ORGANIZATION



2.0 SUMMARY

1. WRAP Module 2A, Project W-100, is the second module of the WRAP facility and is intended for construction in the 200-west area of the Hanford site, south and west of the intersection of 23rd Street and Dayton Avenue, directly west of WRAP Module 1.

2. WRAP Module 2A is currently envisioned as a FY 1994 line item, and scheduled for initial operation in 1999.

3. The primary function of WRAP Module 2A is to receive contact handled solid low-level mixed waste; approximately treat and stabilize these wastes to render the hazardous material into a form that will allow certification and permanent disposal in accordance with Regulations, and finally to certify and package the treated wate for shipping to permanent burial at Hanford.

4. Some of the low volume infrequent waste feedstreams will be campaigned through the Mixed Waste Storage Facility, Phase V, Project-112 for processing at WRAP Module 2A.

5. The conceptual facility layout for WRAP Module 2A is illustrated on **Figure 2-1** which demonstrates compliance with the FDC requirements. The significant design aspects and parameters are summarized below:

Operating Life	30 years
Waste Feed In	5,259 Drums per year
Waste Form Out	9,515 Drums per year
HVAC Confinement System	2 Zones
Main Process(es)	Grouting and Polymer Encapsulation
Process Support	Sampling, Decontamination, Secondary Waste Collection and Treatment, Size Reduction, Special Waste Pre-treatment
Plant Management	Micro-processor Based Tracking of Waste through the Plant
In-Process Storage	182 Drums--Fully Automated
Material handling System	AGVs--Semi-automated
Administrative Support	60 Persons

6. WRAP Module 2A will provide the following functional capabilities:

a. Shipping and Receiving for receipt of supplies, and entry and exit of all waste via the transfer corridor connecting to the Radioactive and Mixed Waste Store, Phase V, Project W-112.

b. Contact Handled Mixed Waste Treatment including necessary pre-treatment, size reduction, cement grout immobilization, polymer encapsulation, and special waste treatment for dangerous and reactive metals.

c. Liquid Waste Handling for collection, treatment, recycling, and disposal of radioactively contaminated and non-contaminated hazardous liquid waste generated by the WRAP Module 2A processes.

d. Non-destructive assay of the waste to determine the low-level waste category of exiting waste.

e. Decontamination of equipment and areas for reuse and maintenance.

f. Sample management for process and product verification.

g. Self contained support services such as ventilation systems, administrative areas, change rooms, storage for in-process waste and operating supplies, and all required utilities.

FIGURE 2-1
WRAP 2A CONCEPTUAL FACILITY LAYOUT PLAN
PAGE 1 OF 2

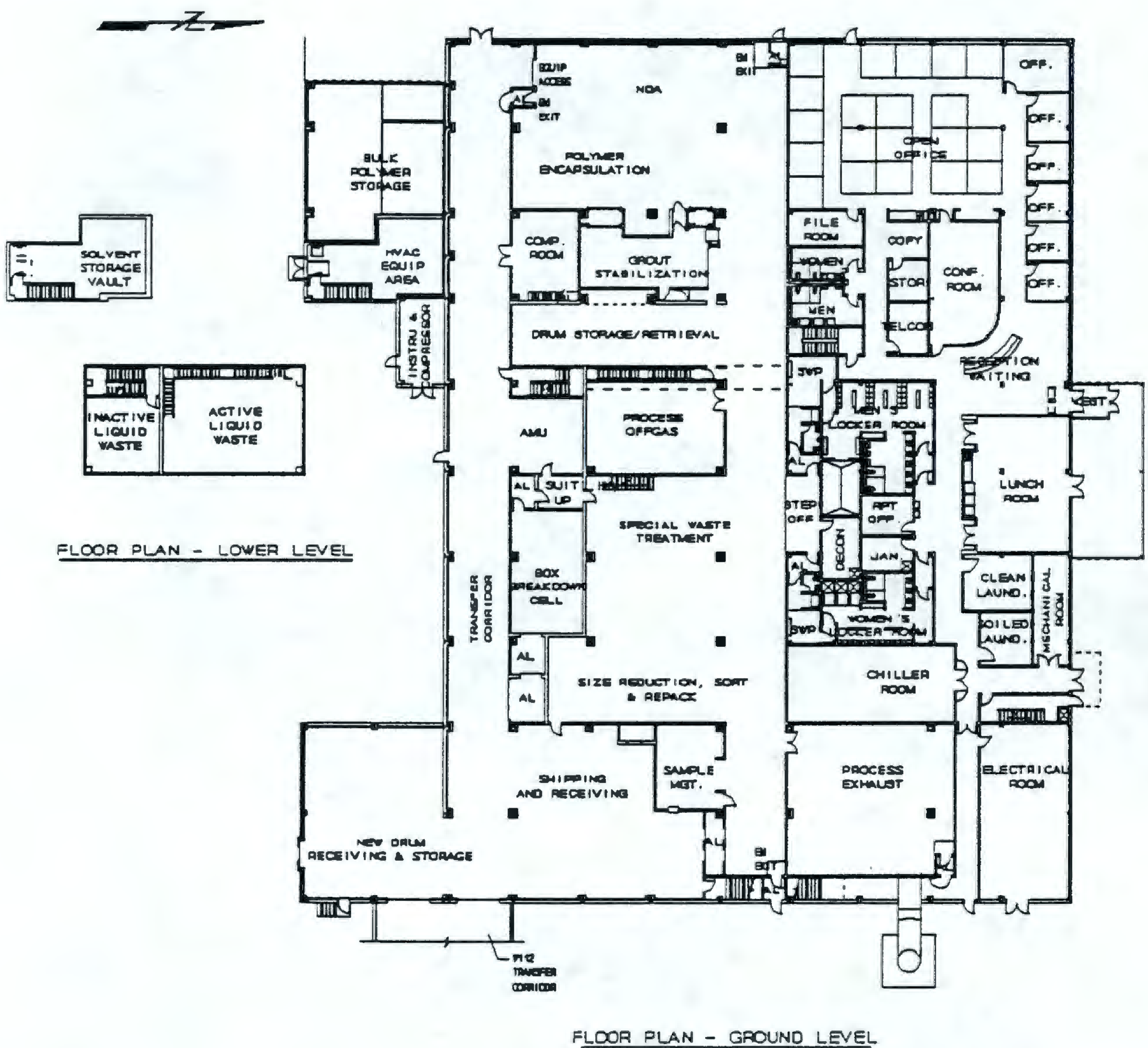
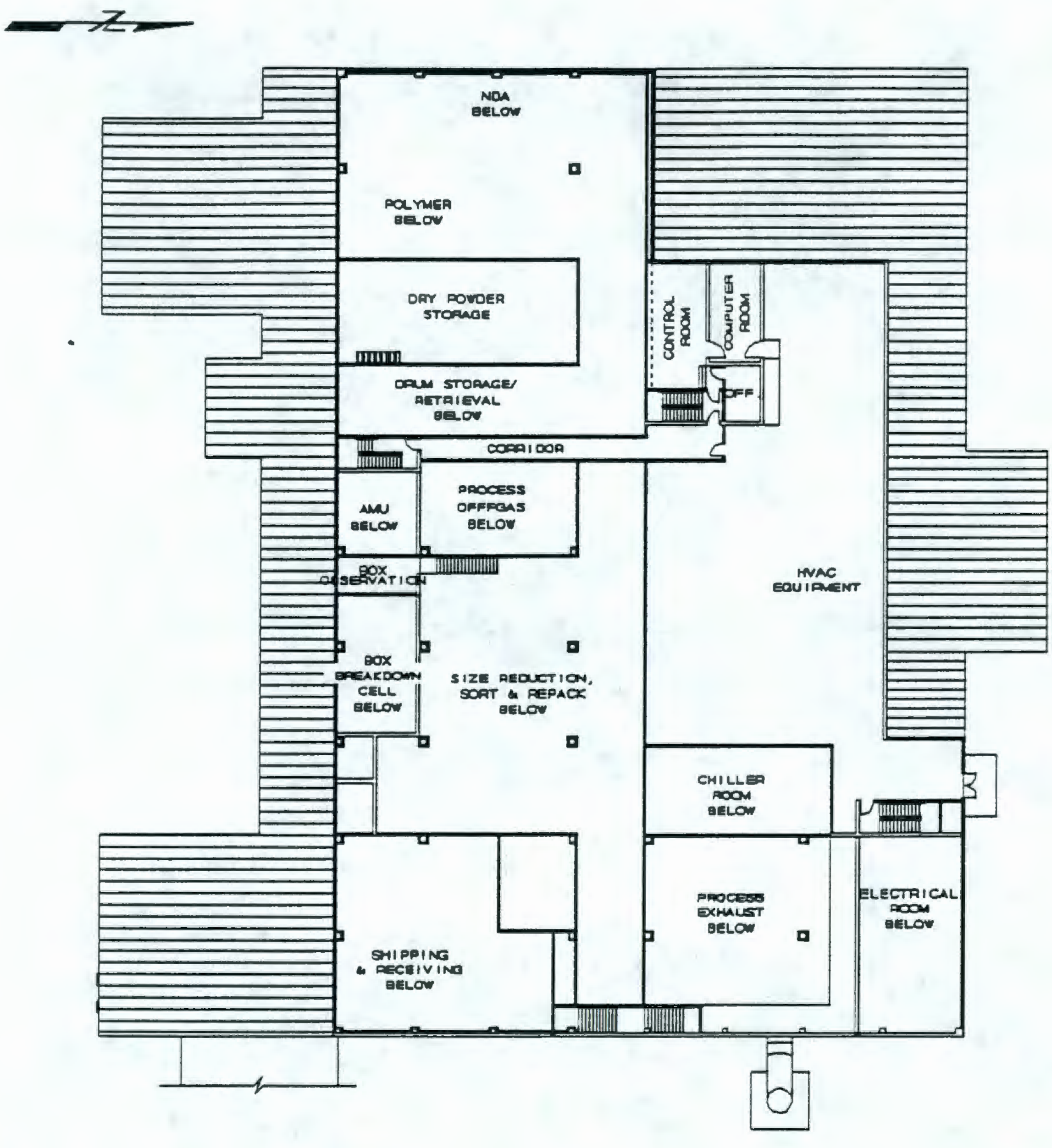


FIGURE 2-1
WRAP 2A CONCEPTUAL FACILITY LAYOUT PLAN
PAGE 2 OF 2



FLOOR PLAN - UPPER LEVEL

7. The WRAP Module 2A will receive 3,768 drums of CH LLMW waste annually (excluding low volume infrequent campaigned waste, and a limited number - one per month - of boxed waste) to be processed in 175 operating days/year, operating one (1) eight hour shift per operating day. CH LLMW wastes are primarily comprised of newly generated waste with the exception of 183-H solar basin waste and other miscellaneous waste which is currently retrieved and stored for processing at WRAP Module 2A. **Figure 2-2** illustrates the waste feed stream and the overall unit operation of the WRAP 2A process configuration. **Figure 2-3** illustrates the quantity, origin and disposal routes for secondary waste generated by the process, quantities and disposal routes will be verified during future work on the process.

8. WRAP Module 2A will be designed to provide a useful operating life of at least 30 years, with a facility availability of 70 percent during a 250 work day year. A plant throughput functional analysis was performed to evaluate the ability of the WRAP Module 2A facility to achieve the required material throughput by developing a time and motion simulation model of the facility using the WITNESS simulation program. The results of the analysis are summarized in **Appendix I**. Analysis of the simulation model indicates that at the actual maximum input of 4,174 drums per year, the facility can achieve the required throughput when the grout and polymer areas operate simultaneously 92 percent of the time. To achieve this high level of simultaneous operation, the order and size of "lots" of the incurring waste streams need to be optimized. Additionally, to reduce the simultaneous operation level below 92 percent, the process area can operate on multiple shifts or the capacity of the grout and polymer areas can be increased.

9. The conceptual design concept is based upon a zero effluent discharge facility goal. The facility will be designed to not dispose of any liquids to the Hanford soil column. It will also be designed to control gaseous effluents from processes to environmentally acceptable limits.

10. Utilities consisting of potable/process water, electrical power, and fire water will be supplied via existing systems located adjacent to the facility. A septic tank/leach field is planned for sanitary sewer discharges from the facility.

11. WRAP Module 2A will be housed in a two story metal building structure with approximately 50,000 square feet of programmable floor space as shown in **Figure 2-1**. The facility encompasses the following significant support and process areas:

- Reception Area
- Administration Area
- Change and Monitoring Area
- Central Control Room
- Computer Room
- Mechanical/Electrical/HVAC Equipment Rooms
- Waste Receiving and Shipping Area
- Size Reduction/Open/Sort/Sample/Repackage Area
- Special Waste Process Area
- Grout/Polymer Process Area
- AMU/Liquid Waste Collection and Treatment Area
- Non-destructive Assay Area
- Sample Management Area
- Lead/Lag/Cure/Drum Storage Area
- Outside Bulk Solids and Bulk Liquid Storage Area

12. The administrative area, and process/process support areas will be served by a zoned ventilation system. The administration and reception areas will contain restrooms, change rooms, offices, lunch rooms, office equipment and space necessary for administrative work and visitor control.

WRAP 2A
WASTE FEED THROUGHPUT & DESIGN BASIS DERIVATION

FEED STREAM NUMBER	SUB-STREAM	ANNUAL THROUGHPUT (3) CFT/YR	ANNUAL THROUGHPUT (3) DRUM/YR	DAILY THROUGHPUT INPUT/OUTPUT DRUMS/DAY	ASSUMED DENSITY LB/CFT	MASS IN 90% FULL DRUM (4) LB/DRUM	PROCESS SR	PROCESS SP	PROCESS G	PROCESS P
1 183H SOLAR BASIN WASTE 3,910 CFT/YR	1A 183H SOLIDIFIED LIQUID	825	112	0.64/1.82	75	500	✓			✓
	1B 183H CRYSTALLINE SOLID	1,300	176	1.01/1.82	60	400				✓
	1C 183H SLUDGE	1,400	190	1.09/2.07	69	460				✓
	1D 183H MISC. CLEANUP (11)	385	52	0.30/0.30	60	400	✓		✓	
2 ETF SECONDARY SOLIDS LL RMW 16,000 CFT/YR	2A AMMONIUM SULFATE	10,460	1,414	8.08/17.13	88	400				✓
	2B TREATMENT MEDIA - ION EXCHANGE RESINS	2,140	290	1.66/1.66	55	366				✓
	2C METAL SLUDGE	3,050	413	2.36/4.72	75	500			✓	
	2D TREATMENT MEDIA - RO FILTER ELEMENTS	350	48	0.27/0.27	50	333	✓		✓	
3 COMPACTIBLE SOLIDS (DRY ACTIVE) 2,100 CFT/YR		2,100	284	1.63/1.63	30	200	✓		✓	
4 NON COMPACTIBLE SOLIDS (CONSTR. DEBRIS) 1,155 CFT/YR		1,155	156	0.90/0.90	40	267	✓		✓	
5 METALS (CAMPAIGNED WASTE) (1) TOTAL 28,875 CFT (EQUIVALENT 1,155 CFT/YR)	5A MERCURY/MERCURY CONTAMINATED - TOTAL 12,900 CFT (3 YEAR CAMPAIGN)	4,300	582	3.33/3.92	30	200	✓	✓		✓
	5B REACTIVE METALS - TOTAL 440 CFT (3 YR CAMPAIGN)	147	30	0.17/0.35	200	1,000 (8)		✓		✓
	5C LEAD - TOTAL 12,500 CFT (4,100 IN STORAGE)(5) (14 YR CAMPAIGN)	890	606 Drums / 2 Boxes	3.46/5.16 / 0.01(12)	708	1,000/Drum (8) / 12,000/Box (8)	✓			✓
	5D MISC. METALS - TOTAL 3,035 CFT	607	273	1.56/1.56	450	1,000 (8)	✓		✓	
6 ABSORBED CHEMICALS SOLIDIFIED LIQUIDS 1,700 CFT/YR		1,700	230	1.32/2.83	90	600				✓
7 ASH FROM THERMAL TREATMENT 2,300 CFT/YR		2,300	311	1.78/3.56	35	233			✓	
8 CONTAMINATED SOILS 680 CFT/YR		680	92	0.53/1.06	90	600			✓	
TOTAL		27,845 (2)	3,768 (2)	21.57/39.77 (2)(15)						

NOTES:
(1) Campaigned Waste annual throughput based on campaign life
(2) Excludes campaign waste stream #5
(3) 1-55 Gallon Drum = 7.4 CFT
(4) 1-55 Gallon Drum (90% full) = 6.66 CFT
(5) Includes 20 Boxes x 12,000 lbs box ÷ 708 lbs/CFT = 340 CFT Lead
Remaining lead in drums = 12,500 - 340 = 12,160 CFT Lead
(6) Represents 5% of total incoming lead that is campaigned for shredding (gloves, aprons, blankets, etc.)
(7) Excludes size reduction of incoming waste drums/boxes
(8) Based on maximum weight per drum/box
(9) Represents 95% of total incoming lead (bricks & sheets) that is campaigned for cutting/shearing
(10) 1% elemental mercury for amalgamation.
99% mercury contaminated bulk waste for shredding
(11) Also includes ~14 stored boxes not shown in Throughput quantities
(12) Equivalent output from boxes included in drum output
(13) Shredded empty drums and boxes included in output
(14) Output is included in stream 5C throughput quantities
(15) Excludes treated empty drums

DERIVED DESIGN BASIS WITHOUT MARGIN (7)

WBS	PROCESS	INPUT	OUTPUT	REMARKS
1105	Size Reduction/Sort/Repack	23.13 Dr./Day 3.46 Dr./Day (9) 0.01 Box/Day (9)	44.99 Dr/Day 5.16 Dr/Day (12)	All except feedstreams 5A/5B/5C(13) Feedstream 5C - 14 Yr Campaign Feedstream 5C - 14 Yr Campaign
	Cement Grout	17.66 Dr./Day	17.66 Dr/Day	Feedstreams 1D/2C/2D/3/4/7/8 5D(13)
	Polymer Encapsulation	27.33 Dr./Day 4.27 Dr./Day 5.16 Dr./Day	27.33 Dr/Day 4.27 Dr/Day 5.16 Dr/Day	Feedstreams 1A/1B/1C/2A/2B/6 Feedstreams 5A/5B - 3 Yr Campaign Feedstreams 5C - 14 Yr Campaign
1106	Special Process Mercury/mercury contaminated bulk waste	3.33 Dr./Day (10)	3.92 Dr/Day	Feedstream 5A - 3 Yr. Campaign Size Reduction Amalgamation
	Reactive Metal	0.17 Dr./Day	0.35 Dr/Day	Feedstream 5B - 3 Yr. Campaign Deactivation of Metal Fines
	Lead	0.25 CFT/Day(6)	0.25 Dr/Day(14)	Feedstream 5C - 14 Yr. Campaign Size Reduction
1107	Secondary Waste	65 Gal/Day	65 Gal/Day	Waste Water from Dewatering of Feedstream 2B Recycled to Grout Process
1109	Shipping/Receiving	23.13 Dr./Day 3.5 Dr./Day 3.46 Dr./Day 0.01 Box/Day	44.99 Dr/Day 4.26 Dr/Day 5.16 Dr/Day (12)	All Except Feedstream 5A, 5B, 5C Feedstreams 5A/5B 3 Yr. Campaign Feedstream 5C - 14 Yr. Campaign Feedstream 5C - 14 Yr. Campaign

FIGURE 2-2
WRAP 2A WASTE FEED STREAM & OVERALL UNIT OPERATION

LEGEND:
SR = Size Reduction
SP = Special Process
G = Cement Grout
P = Polymer Encapsulation

FIGURE 2-3
SECONDARY WASTE STREAMS

Waste Description	Quantity	Origin	Disposal Route	Comments
Active Water	10 Litres (Maximum)	Grout Enclosure GB-05-201	To H-2-658	Very Rare Arising
Process Waste Liquid	42 Gallons/Day	Process Areas	Returned to Process (Grout)	
Spent Solvent	3500 Gallons/Year	Polymer Process	Collected in Hydrocarbon Waste Tank and Trucked Offsite	1# 200 Gallon Tank Flush/10 days
Decontaminated Waste Liquid	118 Gallons/Day	Process Areas	Returned to Process (Grout)	
Decontaminated Waste Solid	1 Cu Ft/Day	Process Areas	Returned to Process	
Air Filters	60/Year Total (28 Prefilters 26 Hepa " 6 Circular ")	Process Off-gas	Returned to Process	Change Filters Annually
Baghouse Filters	15/Year - 8" Dia X 100" Long Bags	Enclosure Off-gas System	Returned to Process	Assume 20% Change/ Year 74 Total
Liquid Filters	6/Year - 5" Dia X 30" Long	Secondary Waste Filter System	Returned to Process	Change Filters Annually
Carbon Filters	7/Year	Process Off-gas	Export for Disposal	Change Filters Annually
Carbon Cartridges	6/Year -3" Dia X 40" Long	Secondary Waste Filter System	Export for Disposal	Change Filters Annually
Spent Carbon	120 Cu Ft/Year	Carbon Adsorbers (2#)	Export for Disposal	Change Filters Annually

13. WRAP Module 2A building will be constructed to withstand design basis accidents required by DOE Order 6430.1A, and criteria defined in the Hanford Plant Standards, Standard Design Criteria SDC 4.1 as appropriate for a low hazard facility.

14. The building will provide confinement barriers to prevent the release of potentially radioactive materials and also the loss of hazardous waste materials. Process areas will be designed with appropriate confinement enclosures and restricted work permit (RWP) areas.

15. A Plant Management System (PMS) using distributed control and central monitoring and logging will be used, both for process control and building monitoring. The Plant Management System will provide data handling capabilities as well as electronic interface to other facilities and databases.

16. Fire protection and detection systems will be provided consistent with operations in all areas.

17. Three electrical transformers will provide building and process power. An uninterruptible power supply (UPS) will back up critical loads with immediate power in case of emergencies.

3.0 BACKGROUND

1. The Hanford Defense Waste Environmental Impact Statement (HDW-EIS) (DOE 1987) was issued by the U.S. Department of Energy Field Offices, Richland (DOE-RL), in December 1987. The purpose of the HDW-EIS was "to provide environmental input into the selection and implementation of final disposal actions for high-level, transuranic, and tank wastes located at the Hanford Site, Richland, Washington, and into the construction, operation, and decommissioning of waste treatment facilities that may be required in implementing waste disposal alternatives".

2. To comply with the Council on Environmental Quality guidance, the HDW-EIS was written early in the decision-making process and before completion of detailed design for the Waste Receiving and Processing Facility (WRAP). The decision, documented in the Record of Decision (ROD) (DOE 1988), was to implement the preferred alternative discussed in the HDW-EIS. That alternative included design, construction, and operation of a facility to sort, process, and repackage retrievably stored and newly generated contact-handled (CH) transuranic (TRU) solid waste for shipment to the Waste Isolation Pilot Plant (WIPP) located near Carlsbad, New Mexico (DOE 1987). In addition to constructing the CH-TRU WRAP facility, the HDW-EIS also recommended a separate facility for the handling, processing, and certification of remote-handled (RH) TRU waste (DOE 1987).

3. The DOE, the Washington State Department of Ecology (Ecology), and the Environmental Protection Agency (EPA) reached an agreement in 1989 that established milestones for the completion of certain activities addressed in the HDW-EIS (Ecology 1989a). This agreement, commonly referred to as the Tri-Party agreement, includes a modular approach for the WRAP Facility. Current planning is to construct the WRAP Facility in two principal modules. Module 1 is a validated 1991 Line Item under Project W-026 and is scheduled to become operational in 1997. Module 2 consists of two functional elements: Module 2A is a proposed 1994 Line Item under Project W-100 which is scheduled to become operational in 1999 and Module 2B is a proposed 1996 Line Item under Project W-255 which is scheduled to become operational in 2002.

4. The primary functions of Module 2A include processing, packaging, and certification of retrieved and newly generated contact handled mixed waste (MW). The primary functions of Module 2B include processing, packaging, and certification of retrieved and newly generated RH-TRU wastes, retrieved and newly generated remote handled mixed waste (MW), and handling, processing, repackaging, and certification for retrieved and newly generated CH-TRU waste that cannot be processed in Module 1.

5. While the combined Module 1 and Module 2 facilities are intended to be the functional equivalent of the CH-TRU WRAP facility and RH-TRU Waste Processing Facility described in the HDW-EIS, the Module 2 concept has undergone several changes since the publication of the HDW-EIS because of Hanford Waste Management mission changes. All retrieved TRU waste is suspect TRU waste which is likely to contain some low-level waste (LLW), which must be segregated as part of the processing. Similarly, newly generated waste will be a combination of TRU and LLW. In both cases, the LLW could be mixed with RCRA hazardous constituents to classify them as low-level radioactive mixed waste (LLMW).

6. The existing HDW-EIS has been considered adequate to envelope the current WRAP 2A mission and a revision to the HDW-EIS is not proposed at this time.

4.0 OBJECTIVE

4.1 General

1. In accordance with DOE Order 4700.1 and RL 4700.1, the following programmatic and facility specific objectives have been pursued during the Conceptual Design process.

4.2 Programmatic

1. Develop a conceptual design that will satisfy functional design criteria requirements.

2. Develop a conceptual design that is feasible and has achievable performance levels.

3. Develop a cost estimate and construction schedule that is reliable and realistic, meets the program and related program objectives and can support a complete project description for congressional considerations.

4. Develop a conceptual design basis and supporting documents which establish project criteria and design parameters, identifies significant codes and standards, identifies health safety and environmental issues, addresses energy conservation issues, and any other unique features necessary to define the project.

4.3 Facility Specific

1. Provide nonthermal treatment of approximately 630,000 CF of contact handled (CH) low-level MW required for disposal at the Hanford site.

2. Develop a schedule and design consistent with the integrated solid waste treatment, storage and disposal commitments, detailed by the solid waste management program plan, the tri-party agreement and the FDC.

3. Provide a treatment capability to permit permanent disposal of low-level mixed waste compliant with land disposal restrictions at the Hanford Central Waste Complex (HCWC).

4. Provide a zero discharge facility with the capability to collect liquid MW and liquid hazardous wastes generated from facility operations and recycle them for use in the treatment process to the maximum extent possible.

5. Provide all necessary support services, such as administrative areas, offices, control rooms, lunch rooms, change rooms and storage areas, necessary to facilitate WRAP Module 2A operations in accordance with the FDC requirement of 60 people.

6. Provide the ability to expand the facility areas and services as needed to support potential future addition of other waste treatment processes.

7. Provide the ability to integrate with other currently proposed (as delineated in the FDC) Hanford site facilities, and provide direct physical tie with project W-112 transfer corridor.

8. Design the facility to meet its stated mission by operating on a single shift basis five days a week with 70 percent availability, based upon a plant life goal of 30 years.

9. Comply with the applicable requirements of a radioactive solid waste facility as specified in DOE Order 6430.1A and the referenced FDC criteria.

10. Provide confinement designed to minimize the release of radioactive and hazardous materials within the Administrative Control Limits (ACLs) as delineated in WHC-CM-7-5. Attain ALARA goals for personnel radiation exposure as identified in WHC-CM-4-9.

11. Provide a process control and data acquisition system (Plant Management System (PMS) commensurate with the requirements of the FDC.

5.0 JUSTIFICATION

1. Radioactively contaminated solid waste has been generated during routine defense materials production, research, and waste management activities at Hanford since it began operations in the early 1940's, and the regulations for treatment and disposal of these wastes have evolved along with the nuclear industry. Early regulations were concerned primarily with protecting the workers who were handling these wastes from the hazards associated with ionizing radiation emitted by the waste. As waste management knowledge, technology, and awareness evolved, the regulations became increasingly more detailed and began to emphasize protection of the environment, and stability of the waste form.

2. The impact of this regulatory evolution is that stored waste that may have complied with the applicable requirements at the time of emplacement, may no longer be in compliance with (or may not be proven to be in compliance with) the current transportation and disposal requirements. Another important result of these changes is that Hanford currently has MW in storage configurations that do not meet RCRA minimum technical requirements for hazardous waste storage.

3. Historically, low level MW was disposed intermingled with LLW at Hanford using shallow land burial techniques since there was no requirement to characterize or segregate the hazardous components in radioactive waste. In June 1987, DOE relinquished the by product exclusion for regulation of MW, making the treatment, storage, and disposal of all RMW subject to regulation under the Resource Conservation and Recovery Act (RCRA), and the Hazardous Solid Waste Amendments (HSWA) which established the Land Disposal Restrictions (LDR).

4. All low level MW at Hanford since that decision has been stored for later retrieval and treatment. Initially low level MW was stored in trenches similar to CH TRU storage; in 1987 Hanford began constructing a series of buildings for storing these wastes. All MW stored in trenches and buildings at Hanford will be retrieved when permitted treatment and disposal facilities are available.

5. In 1988, DOE revised Radioactive Waste Management Order 5820.2A (DOE 1988b). This order established new criteria that requires each site to develop a specific Performance Assessment (PA) for LLW to identify specific radionuclides and activity concentrations that require more intensive management techniques (e.g., stabilization and advanced disposal configurations). DOE Order 5820.2A also requires that each LLW package be characterized, to identify treatment and disposal methodologies, and certified as meeting all transportation and disposal requirements.

6. The DOE Defense Waste Management Plan (DOE 1983) established WRAP as the facility that would provide the necessary treatment for certification of contact handled (CH) TRU waste at Hanford. In April 1988, the Hanford Defense Waste-Environmental Impact Statement (HDW-EIS) Record of Decision (ROD) was issued (DOE 1988c). The HDW-EIS ROD committed DOE to build WRAP at Hanford and initiate retrieval and treatment of TRU waste stored at Hanford for emplacement in the WIPP. In 1989, the Hanford Federal Facility Agreement and Consent Order, or Tri-Party Agreement, (TPA 1989) was signed by the U.S. Environmental Protection Agency (EPA), the State of Washington Department of Ecology (WDOE), and U.S. DOE. This agreement further reinforced DOE's commitment to build the WRAP facility at Hanford. The Tri-Party Agreement also specified WRAP as the Hanford facility that would provide necessary treatment for low level MW in addition to TRU waste.

7. In 1988, the scope of the WRAP facility was determined to need expansion to include other types of solid waste. In order to attain the objectives of the expanded scope under an expedited schedule, the WRAP facility was divided into Module 1 and Module 2. Justification for the

expanded scope and the modular approach is provided in the Module 2 Engineering Study (WHC 1990c). Because of the size and complexity of Module 2, it is currently planned to be constructed by two separate capital projects, called Module 2A and Module 2B.

8. Under the current waste management strategy, Module 1 will treat CH LLW and CH TRU (in drums), Module 2A will process low level CH MW, and Module 2B will process CH TRU waste (in large containers), RH TRU waste and RH MW.

9. The design basis volume of low level CH MW designated for processing in WRAP 2A is approximately 630,000 cubic feet. About 17 percent of this volume represents low level MW currently in storage, with the remaining 83 percent as forecasted to be newly generated from other WRAP Modules, future facilities, and various other on and off site sources.

10. Low level CH MW currently stored at Hanford primarily consists of the 183 H solar basin waste, many of whose containers are extensively deteriorated and more are being identified as breached and requiring a continuous overpacking effort to minimize the impact on the environment. Every breached storage container increases the risk of environmental contamination, and is more expensive, requiring more personnel radiation exposure for recovery and treatment. The combination of the radioactive solid waste scheduled for processing at WRAP Module 1 and Module 2A accounts for approximately 90 percent of current inventory of drummed waste at Hanford, that can be disposed for permanent burial.

11. Low level CH MW forecasted to be newly generated includes waste from other WRAP modules, secondary solid wastes from LETF operations, ash from a thermal treatment facility, waste from contamination control zones, and various other on and off site sources. Treatment and disposal of these waste forms, as they are generated, eliminates the need for indefinite RCRA compliant storage until permitted treatment and disposal facilities are available.

12. For the 30 year projection of newly generated waste (1992 and beyond), low level CH MW designated for treatment at WRAP Module 2A represents the single largest volume, estimated at 55.5 percent, of the total inventory.

13. The justification for WRAP Module 2A can be summarized as follows:

a. Low level MW volume currently in storage and forecasted as being generated over the next 30 years totals approximately 820,000 cubic feet of which about 590,000 cubic feet, or about 72 percent, can be treated, certified by WRAP Module 2A for permanent disposal.

b. Due to the deteriorated state of the CH MW waste drum inventory at Hanford, the WRAP 2A facility is required to mitigate any further impacts to the Hanford reservation environment and subsequent increased exposure to personnel during retrieval and handling operations.

c. Between 1992 and the year 2021 (the last year included in the solid waste generation forecasts, WHC 1991b and 1991d), projected solid waste generation includes over 520,000 cubic feet of CH MW. WRAP Module 2A is required now to eliminate double handling of this large solid waste volume in as much as these wastes do not have to be put in RCRA compliant storage for an indefinite period of time and then later retrieved for treatment and final disposal when a facility like WRAP 2A is built in a distant future.

d. Low level MW is accumulating in storage at Hanford because there is no treatment available for this waste at the present time and it cannot be disposed of without treatment. WRAP Module 2A is the proposed facility that would provide the necessary treatment to reduce the toxicity and mobility of this waste, allowing its disposal in compliance with Washington State/RCRA hazardous waste regulatory requirements.

e. The HDW-EIS ROD (DOE 1988c) identified WRAP as the preferred alternative for treatment of waste stored at Hanford, and committed DOE to building WRAP Module 2A. If WRAP Module 2A is delayed, implementation of this ROD and fulfillment of DOE's obligations will be delayed.

f. The Tri-Party Agreement (TPA 1989) also committed Hanford and DOE to building WRAP Module 2A. If WRAP Module 2A is delayed, implementation of this agreement will also be delayed.

g. Secondary solids from Hanford LETFs, the highest volume (55 percent) waste feedstream for WRAP Module 2A, will soon begin accumulating in storage at Hanford because there is no treatment available for this waste. It cannot be disposed without treatment. WRAP Module 2A is the proposed facility that would provide the necessary treatment to reduce the toxicity and mobility of this waste by encapsulation, and thus allowing its disposal in compliance with environmental laws and regulations.

6.0 OPERATIONS DESCRIPTION

6.1 General

1. This section provides a summary level description of the WRAP 2A facility. Detail description of each facility system are provided in **Volume V** which reference the conceptual design drawings that are compiled in **Volume IV**.

2. The primary mission of the WRAP Module 2A facility (Project W-100) is to non-thermally treat contact handled low-level mixed waste (CH LLMW), and to certify and package it for disposal. The incoming waste will be previously characterized contact handled (CH) low-level mixed waste (LLMW) from either existing inventories or from new generators on the Hanford Site. Most of the waste will arrive at Module 2A in 55-gallon drums, although boxes and drums up 110 gal will also be received. Waste will always be received from and shipped to the adjacent Phase V Radioactive and Mixed Waste Store (Project W-112).

3. Waste will have been previously characterized prior to receipt, although WRAP 2A also incorporates the capability to perform verification sampling on a portion of the waste to allow feeding of each "lot" of waste to the process. Occasionally it may be necessary to consign a sample for recategorazation if, for example, it conflicts with original characterization data.

4. A philosophy of minimum handling of the waste has been adopted, using best demonstrated available technologies (BDAT) for the plant, processes and equipment to the maximum extent. This has resulted in the facility incorporating the main unit operations of Sampling, Receiving, Size Reduction and Repackaging, Non-Destructive Assay (NDA), Grout or Polymer Encapsulation, Special Waste Treatment and Shipping.

5. WRAP Module 2A will be capable of treating the current inventory of LLMW, and all expected future arisings of LLMW from waste generators that can be non-thermally treated. "Non-Thermal", for the purposes of this facility is defined as a process where the maximum operating temperature is limited to 500°F or below.

6. Throughput Volume of WRAP Module 2A through the year 2021 is estimated at 29,000 cubic feet per year. The waste sources with container volumes that constitute the total LLMW throughput are:

a. LLMW currently in storage: 4,800 CF per year

b. LLMW expected to be generated from WRAP Module 1 operation 1997 to 2012: 700 CF per year

c. LLMW expected to be generated from WRAP Module 2B operation 2001 to 2012: 200 CF per year

d. LLMW ash expected to be generated from thermal treatment facility operation 2003 to 2021: 2,300 CF per year

e. LETF secondary solid LLMW expected to be generated 1994 to 2021: 16,000 CF per year

f. LLMW and hazardous waste from contamination control zones expected to be newly generated 1991 to 2021: 5,000 CF per year

7. A summary of the waste feed streams for Module 2A is shown schematically in **Table 6-1**. For a detailed breakdown of the plant material balance, refer to Drawing H-2-140598, located in Volume IV.

WRAP 2A
WASTE FEED THROUGHPUT & DESIGN BASIS DERIVATION

FEED STREAM NUMBER	STREAM	ANNUAL THROUGHPUT (3) CFT/YR	ANNUAL THROUGHPUT (3) DRUM/YR	DAILY THROUGHPUT INPUT/OUTPUT DRUMS/DAY	ASSUMED DENSITY LB/CFT	MASS IN 90% FULL DRUM (4) LB/DRUM	PROCESS SR	PROCESS SP	PROCESS G	PROCESS P
1	183H SOLAR BASIN WASTE 3,910 CFT/YR									
1A	183H SOLIDIFIED LIQUID	825	112	0 64/1.82	75	500	✓			✓
1B	183H CRYSTALLINE SOLID	1,300	176	1 01/1 82	60	400				✓
1C	183H SLUDGE	1,400	190	1 09/2 07	69	460				✓
1D	183H MISC CLEANUP (11)	385	52	0 30/0 30	60	400	✓		✓	
2	LETF SECONDARY SOLIDS LL-RMW 16,000 CFT-YR									
2A	AMMONIUM SULFATE	10,460	1,414	8 08/17 13	88	400				✓
2B	TREATMENT MEDIA - ION EXCHANGE RESINS	2,140	290	1 66/1 66	55	366				✓
2C	METAL SLUDGE	3,050	413	2 36/4 72	75	500			✓	
2D	TREATMENT MEDIA - RO FILTER ELEMENTS	350	48	0 27/0 27	50	333	✓		✓	
3	COMPACTIBLE SOLIDS (DRY ACTIVE) 2,100 CFT/YR	2,100	284	1 63/1 63	30	200	✓		✓	
4	NON-COMPACTIBLE SOLIDS (CONSTR. DEBRIS) 1,155 CFT/YR	1,155	156	0 90/0 90	40	267	✓		✓	
5	METALS (CAMPAIGNED WASTE) (1) TOTAL 28,875 CFT (EQUIVALENT 1,155 CFT/YR)									
5A	MERCURY/MERCURY CONTAMINATED - TOTAL 12,900 CFT (3 YEAR CAMPAIGN)	4,300	582	3.33/3 92	30	200	✓	✓		✓
5B	REACTIVE METALS - TOTAL 440 CFT (3 YR CAMPAIGN)	147	30	0 17/0.35	200	1,000 (8)		✓		✓
5C	LEAD - TOTAL 12,500 CFT (4,100 IN STORAGE)(5) (14 YR CAMPAIGN)	890	606 Drums / 2 Boxes	3 46/5.16 / 0 01(12)	708	1,000/Drum (8) / 12,000/Box (8)	✓			✓
5D	MISC METALS - TOTAL 3,035 CFT	607	273	1 56/1 56	450	1,000 (8)	✓		✓	
6	ABSORBED CHEMICALS-SOLIDIFIED LIQUIDS 1,700 CFT/YR	1,700	230	1 32/2 83	90	600				✓
7	ASH FROM THERMAL TREATMENT 2,300 CFT/YR	2,300	311	1 78/3 56	35	233			✓	
8	CONTAMINATED SOILS 680 CFT/YR	680	92	0 53/1 06	90	600			✓	
	TOTAL	27,845 (2)	3,768 (2)	21 57/39 77 (2)(15)						

NOTES:
(1) Campaigned Waste. annual Throughput based on campaign life
(2) Excludes campaign waste stream #5
(3) 1-55 Gallon Drum = 7.4 CFT
(4) 1-55 Gallon Drum (90% full) = 6.66 CFT
(5) Includes 20 Boxes x 12,000 lbs box ÷ 708 lbs/CFT = 340 CFT Lead
Remaining lead in drums = 12,500 - 340 = 12,160 CFT Lead
(6) Represents 5% of total incoming lead that is campaigned for shredding (gloves, aprons, blankets, etc.)

(7) Excludes size reduction of incoming waste drums/boxes
(8) Based on maximum weight per drum/box
(9) Represents 95% of total incoming lead (bricks & sheets) that is campaigned for cutting/shearing
(10) 1% elemental mercury for amalgamation.
99% mercury contaminated bulk waste for shredding
(11) Also includes ~ 14 stored boxes not shown in Throughput quantities
(12) Equivalent output from boxes included in drum output
(13) Shredded empty drums and boxes included in output
(14) Output is included in stream 5C throughput quantities
(15) Excludes treated empty drums

DERIVED DESIGN BASIS WITHOUT MARGIN (7)

LWBS	PROCESS	INPUT	OUTPUT	REMARKS
1105	Size Reduction/Sort/Repack	23.13 Dr./Day 3.46 Dr./Day (9) 0.01 Box/Day (9)	44.99 Dr/Day 5.16 Dr/Day (12)	All except feedstreams 5A/5B/5C (13) Feedstream 5C - 14 Yr Campaign Feedstream 5C - 14 Yr Campaign
	Cement Grout	17.66 Dr./Day	17.66 Dr/Day	Feedstreams 1D/2C/2D/3.4.7.8.5D(11)
	Polymer Encapsulation	27.33 Dr./Day 4.27 Dr./Day 5.16 Dr./Day	27.33 Dr/Day 4.27 Dr/Day 5.16 Dr/Day	Feedstreams 1A/1B/1C/2A/2B/6 Feedstreams 5A/5B - 3 Yr Campaign Feedstreams 5C - 14 Yr Campaign
1106	Special Process Mercury/mercury contaminated bulk waste	3.33 Dr./Day (10)	3.92 Dr/Day	Feedstream 5A - 3 Yr. Campaign Size Reduction/Amalgamation
	Reactive Metal	0.17 Dr./Day	0.35 Dr/Day	Feedstream 5B - 3 Yr. Campaign Deactivation of Metal Fines
	Lead	0.25 CFT/Day(6)	0.25 Dr/Day(14)	Feedstream 5C - 14 Yr. Campaign Size Reduction
1107	Secondary Waste	65 Gal/Day	65 Gal/Day	Waste Water from Dewatering of Feedstream 2B Recycled to Grout Process
1109	Shipping/Receiving	23.13 Dr./Day 3.5 Dr./Day 3.46 Dr./Day 0.01 Box/Day	44.99 Dr/Day 4.26 Dr/Day 5.16 Dr/Day (12)	All Except Feedstream 5A, 5B, 5C Feedstreams 5A/5B 3 Yr. Campaign Feedstream 5C - 14 Yr. Campaign Feedstream 5C - 14 Yr. Campaign

TABLE 6-1
WRAP 2A WASTE FEEDSTREAM & OVERALL UNIT OPERATION

LEGEND:
SR = Size Reduction
SP = Special Process
G = Cement Grout
P = Polymer Encapsulation

8. The Module 2A functional requirements are based on the facility operating one shift per day, 250 days per year, with a 70 percent availability (i.e., the facility will be assumed to operate at full production rate for 175 days per year).

6.2 Description of the Facility

1. The WRAP Module 2A facility will be housed within a pre-engineered metal building, measuring approximately 250 ft x 180 ft. External storage is provided for new drums entering the process and for the bulk constituents of the cement grout and polymer encapsulation process. This external storage is located to the south of the building where truck access is available.

2. This facility will be located in the 200-West area of the Hanford site, west of the proposed WRAP 1 (W-026) and the Enhanced Radioactive and Mixed Waste Storage Phase V (W-112) facility and will form a part of the Hanford Central Waste Complex (HCWC). The facility will be linked to WRAP Module 1 and Project W-112 via a transfer corridor for waste receipt and shipment.

3. The building will be designed to withstand design basis accidents as required by DOE Order 6430.1A and per criteria defined in the Hanford Plant Standard Design in the Hanford Plant Standard Design Criteria 4.1. The facility design life will be 30 years.

4. WRAP Module 2A is a non-reactor nuclear facility and is considered a "special facility" per Division 13 of DOE Order 6430.1A, to be designed in accordance with the requirements of Section 1324 "Radioactive Solid Waste Facilities" as appended by applicable "-99" sections and other sections of the DOE Order by using sound engineering judgement.

5. The facility design incorporates a confinement system which provides primary and secondary confinement of the radioactive materials. Primary confinement will prevent direct physical contact between the radioactive materials and facility personnel and will be provided by the process enclosures and their ventilation systems. Secondary confinement will prevent release of radioactive material to the environment and will be provided by the building shell and the the secondary ventilation system.

6. The facility will be divided into distinct areas to accommodate functional and safety requirements. These areas are:

   a. Office Administration/Facility Support Area

   b. Process Area

   c. Process Support Area

7. The arrangement and design of these areas will facilitate safe and efficient functional operations, meet programmatic needs, provide for future flexibility, and comply with current building and fire safety codes including, but not limited to, the UBC, National Fire Codes and comply with the requirements of DOE Order No. 6430.1A. (Refer to drawings H-2-140713 H-2-140714, and H-2-140599 for the facility layout and design including associated process equipment). A summary level functional area breakdown, including facility program areas and square footages, is identified in **Table 6-2**. See section 7.0 for a more detailed breakdown.

8. The facility will be of steel construction meeting Type II-N non-combustible construction requirements of the UBC. A 2-hour fire rated separation will be provided between the process and the administrative areas, and fire egress will also meet the requirements of NFPA 101, Life Safety Code.

TABLE 6-2
WRAP 2A SPACE ALLOCATION SUMMARY

SPACE UTILIZATION	NET SQ. FT.
Administrative	7,085
Personnel Support	2,502
Waste Process	16,321
Facility Support Areas	11,653
Process Support Areas	12,497
Total Net Area	50,058
Building Area	Gross SQ. FT.
Ground Level	47,432
Lower Level	1,800
Upper Level	10,565
Total Gross Area	59,797

9. The office administration and facility/personnel support area will include 21,240 square feet of programmable space excluding circulation, and occupies the north end of the facility which provides general traffic access and parking. The office administration area will consist of a lobby and reception area, offices for management/engineering/clerical personnel, RPT office, records management, storage rooms, conference room, rest rooms, and a lunch room. The facility/personnel support areas include personnel change rooms, janitorial area, laundry, telecommunication room, SWP area, and separate mechanical, HVAC, and electrical equipment rooms. Spaces are also provided for uninterruptible power supply and HVAC equipment room for HEPA filters and exhaust fans. The office administration area will be located adjacent to the main entry and personnel support areas. Personnel flow to the process areas will be through the change rooms to provide a single point of access, radiation monitoring, and regulated entry. The office administration and facility support areas occupy the entire north end of the facility.

10. The process area will provide 16,321 square feet of area excluding circulation space and is located at the south end of the facility with future expansion provisions to the west side. Connection to WRAP Module 1, Project W-112 for shipping and receiving of waste, potential expansion of WRAP Module 2A to include other waste treatment processes, and future WRAP modules will be through the 20 ft wide transfer corridor running the entire south side of the facility. The process area includes a open/sort/repack area where all incoming waste drums are opened, the contents inspected for irregularities, appropriately size reduced in shredders, and repacked in new drums in preparation for the encapsulation process. Adjacent to this area is the large item breakdown area where large boxes and drums are opened, sorted, and size-reduced. Repacked drums are non-destructively assayed at the NDA area and forwarded to either the grouting enclosure or the polymer enclosure for final immobilization prior to shipping for disposal. There is also a special waste processing area to deal with wasteforms that need pre-treatment and stabilization prior to being size-reduced and immobilized. Other process operations include areas for verification/process sampling, liquid waste (as generated by various processes) treatment, lead/lag storage for waste drums, and decontamination of enclosures and equipment. Processing areas are appropriately isolated by walls, enclosures, and airlocks.

11. The process support will provide 12,497 square feet of area excluding circulation space, and consists of the shipping/receiving area, new drum storage, grout preparation area, aqueous make-up, transfer corridor, control room, computer room, and an operations supervisor office. Shipping/receiving area will provide space for unloading, survey and staging of incoming waste as well as transportation of immobilized outgoing waste. All receipt and shipment of waste is accomplished through the radioactive and mixed waste storage facility, Project W-112, via the

transfer corridor. Supplies to new drum storage and exterior storage of bulk material is accomplished by trucks. (AMU) will provide bulk storage and dilution of concentrated acids and caustics for process control.

6.3 General Layout

1. The main process areas are laid out to the south side of a central transport corridor, with the facility change rooms, offices and administrative areas situated to the north side of the transport corridor. The main philosophies adopted in laying out the process areas have included:

a. Provision of optimized transportation routes for wastes, which are based on a "once through" principle where possible.

b. Minimization of the confinement zoning requirements by grouping together those activities where "raw" waste is exposed to the environment.

c. Minimization of internal storage requirements and utilization of external storage for potentially hazardous materials such as the polymer constituents. Also minimization of piping lengths to transport such materials.

d. Utilization of gravity flow of materials where practicable.

e. Optimization of the potential requirements for shielding, with respect to the location of lag storage areas for waste.

f. Provision of a "non-active" transfer corridor giving the capability to link W-112 with W100 and with future WRAP modules, to the west of W100.

g. Provision of appropriate personnel access routes to facilitate process operations.

2. Previously characterized waste enters the Module 2A facility from the W-112 transfer corridor and is handled by fork lift truck into a staging area within Shipping and Receiving. Drums are de-palletized here and fed to the size reduction and repackaging area via drum conveyors. Boxes and larger drums are also fed directly into the Size Reduction and Repackaging area via a separate entry port and into a separate dedicated area for box breakdown. Waste is then routed through the appropriate Size Reduction and Repackaging enclosure to be repackaged into new 55-gallon drums, which are transferred by the AGV to the lag storage area. Drums are then selected for feed to the appropriate encapsulation process (cement grout or polymer) and are transferred by AGV via the Non-Destructive Assay (NDA) area. Waste requiring special treatment (e.g., mercury, reactive metals) are routed to the Special Waste Treatment enclosure, which is located adjacent to the Size Reduction and Repackaging enclosures, for necessary pre-treatment and then transferred by AGVs to the lag storage area to await encapsulation process.

3. Drums which are stored in the Lag Storage area have been fully characterized and are ready for immobilization. Enroute to the encapsulation process they are taken through an off-line NDA system to determine the LLW class.

4. The Grout encapsulation area is located adjacent to Lag Storage for ease of waste transfer and is located towards the center of the process area, to separate the cell enclosure from the uncontrolled Zone of the building, and hence at least two levels of containment are maintained. The Polymer Encapsulation area is located adjacent to the W-112 transfer corridor to minimize the temperature controlled pipe runs from the Polymer Bulk Storage area. This Polymer Bulk Storage area is located outside the main building in a separate structure due to the potentially

hazardous/flamability characteristics of the polymer reagents. Also located outside the building to the south are the bulk cement grout materials storage silos, which are serviced by tanker truck.

5. Drums containing immobilized waste are returned via the lag storage area to Shipping and Receiving for transfer to the disposal facility, via W-112. Shipping and Receiving is positioned in the southeast corner of the building to facilitate short transfers between Module 2A and W-112. Also, truck access to deliver new drums is from the south.

6. The AMU area is located at grade level with the hazardous liquid waste effluent tanks situated below grade in the same location.

6.4 Interfaces with other Facilities

1. WRAP Module 2A forms an integral part of the overall solid waste management strategy at Hanford. Other facilities that are a part of this strategy include:

   a. Hanford Central Waste Complex, Mixed Waste Storage Facility (W-016);

   b. Mixed Waste Disposal Facility (W-025);

   c. Enhanced Radioactive and Mixed Waste Storage Phase V(W-112);

   d. WRAP Module 1 (W-026);

   e. WRAP Module 2B (W-255);

   f. Thermal Treatment Facility (W-242);

   g. Liquid Effluent Treatment Facilities (C018 and L045)

2. The Hanford Central Waste Complex (HCWC), Projects W-112 and W-016 provide the buffer and lag storage for waste transfer to and from Module 2A.

3. WRAP Module 1 is currently in the detail design phase and provides characterization and certification of CH TRU and LLW, which is either newly generated or has come from the Retrieval Project. WRAP 1 waste determined to contain hazardous waste fractions requiring immobilization and which are determined to be non-TRU will be treated in WRAP 2A. Other LLMW will be stored for treatment in other future facilities.

4. WRAP Module 2B is a future facility which will provide characterization and certification of TRU and LLW which is too large, too great in radiation levels or too heavy for WRAP Module 1 processing.

5. The Thermal Treatment Facility is a future facility which will provide thermal treatment of waste requiring such treatment, in accordance with Washington State Administrative Codes (WAC) 173-303. The ash residues from this facility will be treated in WRAP Module 2A.

6. The Liquid Effluent Treatment Facility (LETF) is a future facility which will treat liquid effluents from miscellaneous Hanford facilities. Secondary solids from the LETF will be treated in WRAP Module 2A.

7. The interface between Module 2A and the facilities described above is the Shipping and Receiving area in the southeast corner of the facility with the W-112 transfer corridor. Through this corridor all waste will enter and leave Module 2A. This transfer corridor is extended along the south side of Module 2A to allow future connection of Module 2A to handle Category 3 LLW or Module 2B and other future waste treatment modules. Waste movements within this transfer corridor are currently planned to be by fork lift truck and AGV, the waste having been delivered to the Module 2A/W-112 interface point by the W-112 transfer system. Consideration should be given to the integration and optimization of this overall transfer system.

8. Module 2A will tie-in to appropriate utilities at locations supplied by the Hanford Site Utility Upgrade project, W-112.

9. Liquid wastes generated within the Module 2A process will consist of potentially radioactively contaminated, and non-contaminated effluents. The conceptual design maximizes the internal recycle of radioactively contaminated and non-contaminated liquids by utilization of such liquids within the process to achieve a zero discharge mode during normal operations. As an option during non-normal operating conditions, such as fire conditions, there will be provision for the radioactivity containminated waste stream to be containerized and shipped to the Liquid Effluent Treatment Facility (LETF), if necessary. A tank truck connection point will be provided at the southeast corner of the building, in the area where trucks arrive to unload new drums for the process. Non-contaminated liquid effluents which contain hazardous materials will be segregated and collected within the process and will be routed into 55-gallon drums, within the AMU area to be transferred off-site for necessary treatment and disposal.

6.5 Process System Description

1. The overall process is shown on **Figure 6-1** and the Overall Block Flow Diagram (H-2-140598).

2. The Shipping and Receiving area accepts incoming LLMW waste drums and boxes transferred from the W-112 facility via the W-112 transfer corridor. In this area, 5,259 drums are received annually and boxes are received once a month. The incoming waste is received in "lots" of similar type waste. After the drums are depalletized, the drums are transferred to the Drum Size Reduction area.

3. The Shipping and Receiving area shown in **Figure 6-2** handles 9,515 new 55-gallon drums annually. These drums are processed through the area and transferred to the material handling system which delivers them to the size reduction or special waste enclosure for waste load out.

4. Waste boxes are transferred from W-112 to the WRAP 2A facility and delivered directly to the Box Size Reduction area.

5. All incoming waste will be repackaged into new drums and weighed for eventual immobilization into grout or polymer.

6. The Drum Size Reduction area consists of two enclosures, one for shredding and repacking waste and the other for processing sludge type material, as illustrated in **Figure 6-3**. The shredder and repack enclosure contains equipment to open/sort waste, size reduce waste with shredders and load out waste into new drums for immobilization at the grout or polymer enclosures. The pug mill enclosure contains equipment to open/sort waste, homogenize sludge type waste within a pug mill and load out waste into new drums for immobilization at the grout or polymer enclosures. The shredder and repack enclosure processes 3,445 drums into 6,693 new drums per year. The pug mill enclosure processes 596 drums into 1,171 new drums per year.

7. The Special Waste enclosure shown in **Figure 6-4** treats waste drums that contain mercury, lead or reactive metals. These waste streams will be processed on a campaigned basis. This enclosure is capable of simultaneously processing lead and mercury waste drums. The special waste enclosure contains equipment to load out lead bricks, size reduce (with shredders) lead or mercury contaminated solids, amalgamate elemental mercury, recover mercury from solids using evaporation, and load out waste into new drums for immobilization at the polymer enclosure. After all the mercury and lead waste drums have been treated, some equipment can be stripped out and replaced with new equipment that will deactivate and load out reactive metal waste drums if this waste feedstream is identified. The enclosure will process 582 drums of mercury into 685 new drums per year for three years, 606 drums of lead into 904 new drums per year for fourteen years, and 30 drums of reactive metals into 62 new drums per year for three years.

FIGURE 6-1
WRAP 2A OVERALL PROCESS BLOCK FLOW DIAGRAM

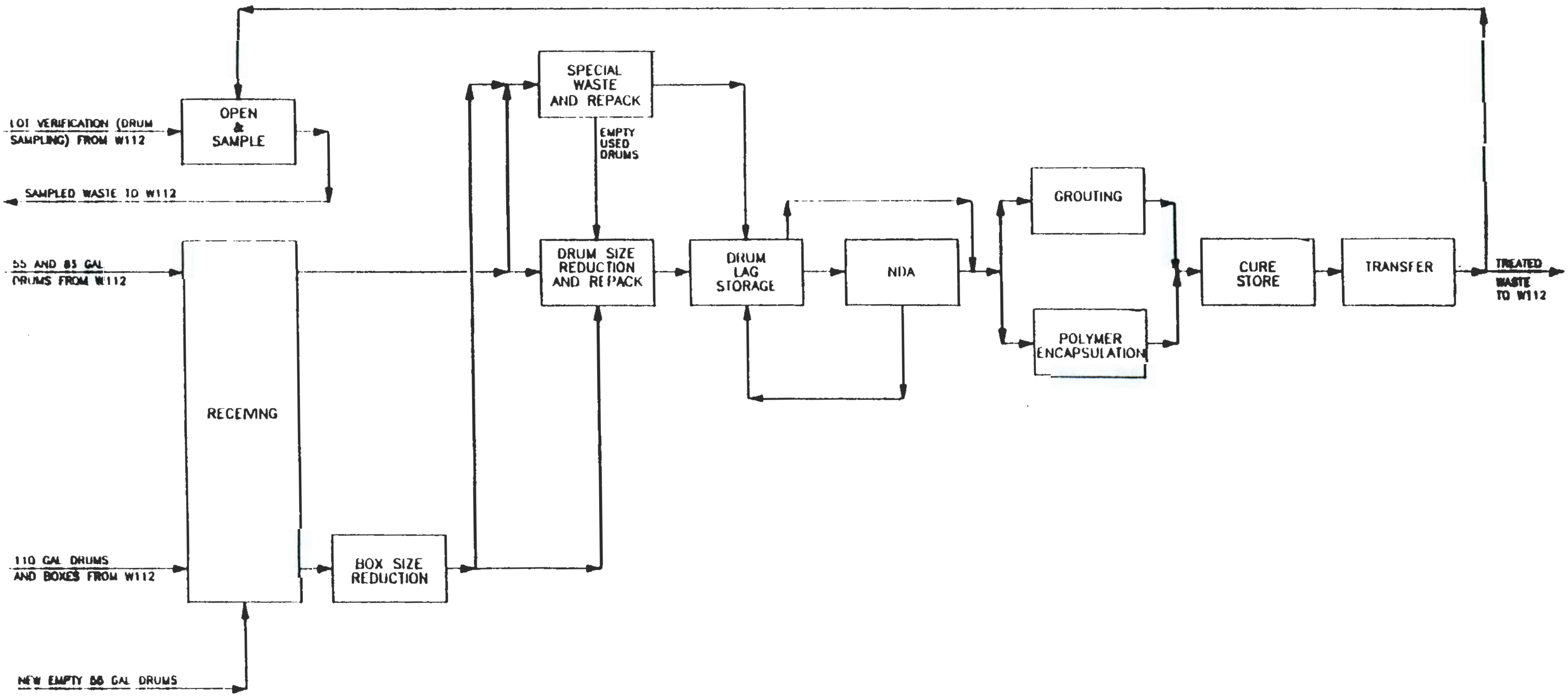
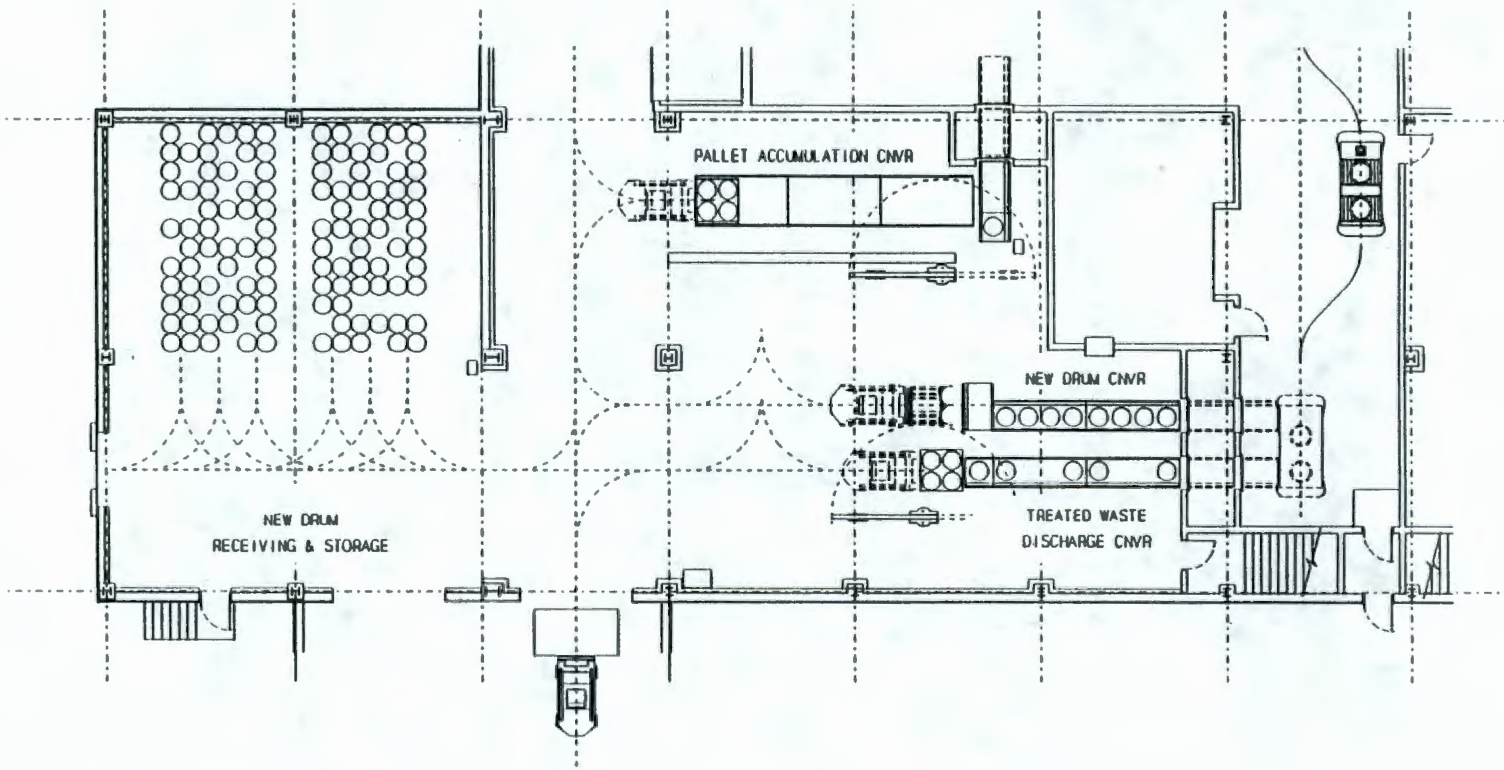
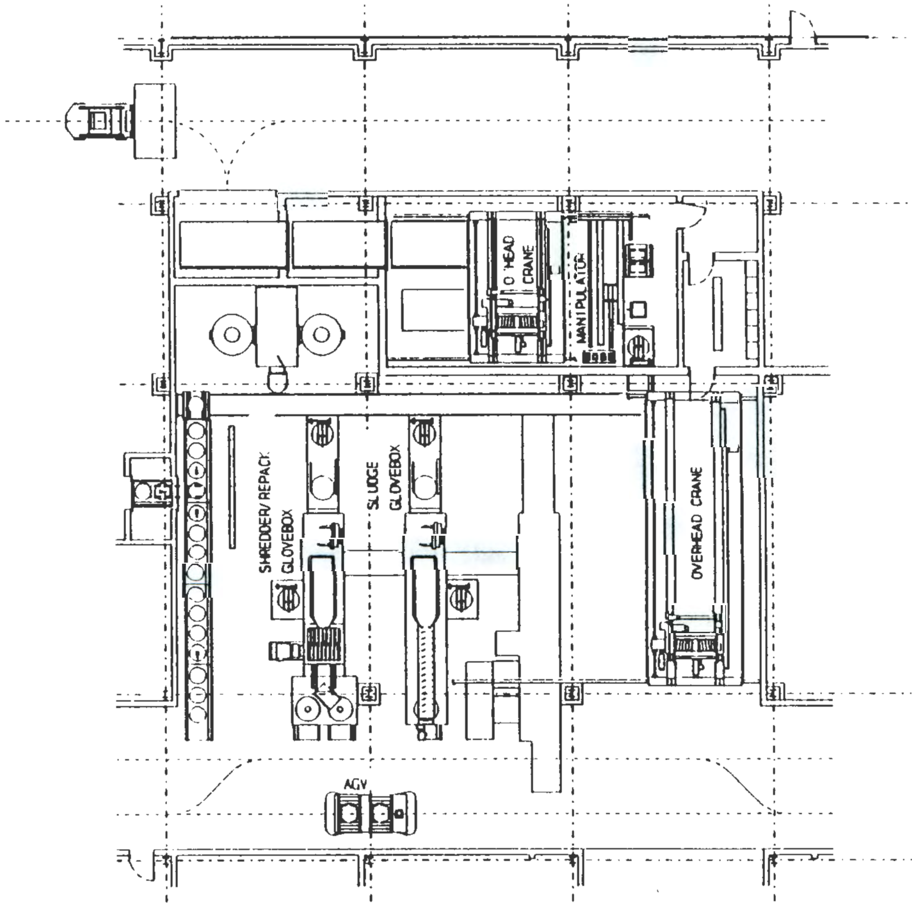


FIGURE 6-2
SHIPPING & RECEIVING



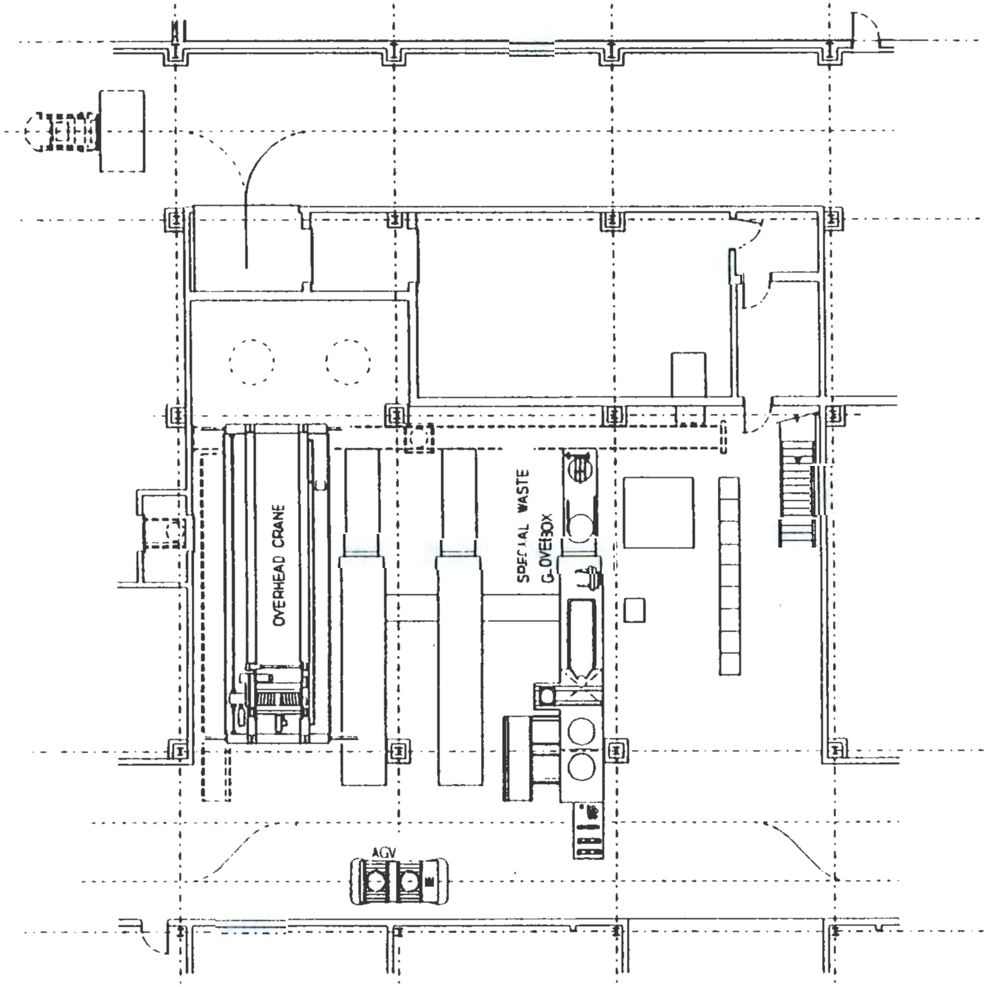
RECEIVING & SHIPPING

FIGURE 6-3
DRUM SIZE REDUCTION



SIZE REDUCTION, REPACK &
BOX BREAKDOWN

FIGURE 6-4
SPECIAL WASTE



SPECIAL WASTE

8. All incoming waste drums, after being emptied, are also shredded and repackaged in new drums for eventual encapsulation in grout.

9. The repackaged waste drums from the size reduction and special waste enclosures are transferred by the material handling system to the lag storage area. The lag storage area consists of an automated storage/retrieval system shown in **Figure 6-5** that has a storage capacity of 182 drums. As drums are requested by the grout or polymer area, the waste drums are transferred from the lag storage area by the material handling system to the NDA area.

10. The NDA area shown in **Figure 6-6** assays all repackaged drums before the waste is immobilized. The NDA area consists of two Passive Active Neutron (PAN) and two Gamma Energy Assay (GEA) machines. After the drum assay, the drums are transferred by the material handling system to the polymer or grout enclosures.

11. The Grout Enclosure shown in **Figure 6-7** has two main input paths, agitated and vibro. The agitated grout line immobilizes 1,632 drums per year and the vibro line immobilizes 1,454 drums per year. The overall enclosure contains equipment for the filling of grout, curing of the waste, removal of excess water and decontamination of the drum. Once the drum has cured, the material handling system transfers the drum from the enclosure back to Lag Storage or the Shipping and Receiving area.

12. Dry grouting constituents are stored outside the facility in bulk storage silos as shown in **Figure 6-8**. The Grout Silos are supplied with feed material by pneumatic transfer from delivery trucks. The plant has four storage silos located outside the building structure, the silos contain feed material for one month of processing. Material is transferred from the silos to the grouting process by pneumatic transfer.

13. The Polymer Enclosure shown in **Figure 6-9** has four main input paths which have the ability to load polymer into waste drums and mix by agitating or vibrating the drum. One of the input paths has the additional ability to add polymer by vacuum dewatering the drum. The polymer line immobilizes 6,429 drums per year. Polymer is loaded into drums through simple double lid doors. When the drum is full, the drum is lowered from the double lid door system and transferred to the polymer cure storage area using the material handling system. The drums remain in cure storage for temperature monitoring for at least 48 hours. Each drum is retrieved using a manually operated crane system and transferred by AGV to the Shipping and Receiving Area.

14. The Polymer Chemical Storage area shown in **Figure 6-10** is located outside and south of the main building and contains a total of eight storage tanks and one mixing tank. Two of the storage tanks contain resin filled by tank truck while five tanks separately store extender, promoter, solvent, and catalyst, and are filled by manual pumping from drums or by tank truck. One tank is used to store waste hydrocarbon liquids. The two solvent storage tanks and single hydrocarbon waste tank will be located in a vault underground. Each individual feed is pumped to a central mixing tank, with the resulting mixture pumped to the polymer process enclosure.

15. A Sample Lot Verification enclosure shown in **Figure 6-11** provided within the Sample Management area consists of one enclosure within which drums are opened and a sample of waste is taken for sample analysis. Drums are transferred into the enclosure using a simple double lid bagless transfer system. Once the sample has been taken, the drum is removed from the enclosure by placing into an overpack at a second simple double lid door. Drums enter the Sample Lot Verification area from the Shipping and Receiving area via the Size Reduction area. Drums return to the Shipping and Receiving area using the material handling system and are subsequently transferred to W-112 for storage awaiting processing. The Sample Lot Verification area also contains facilities to handle the management process of samples including limited capabilities to analyze samples within the plant. The data entry station at the Sample Management Area is provided with Bar Code label printers to tag each sample, Bar Code readers, and a printer to generate necessary documentation. The Sample Lot Verification area will also be used for the destructive examination of treated waste. The destructive examination will take the form of core sampling the grout or polymer matrix.

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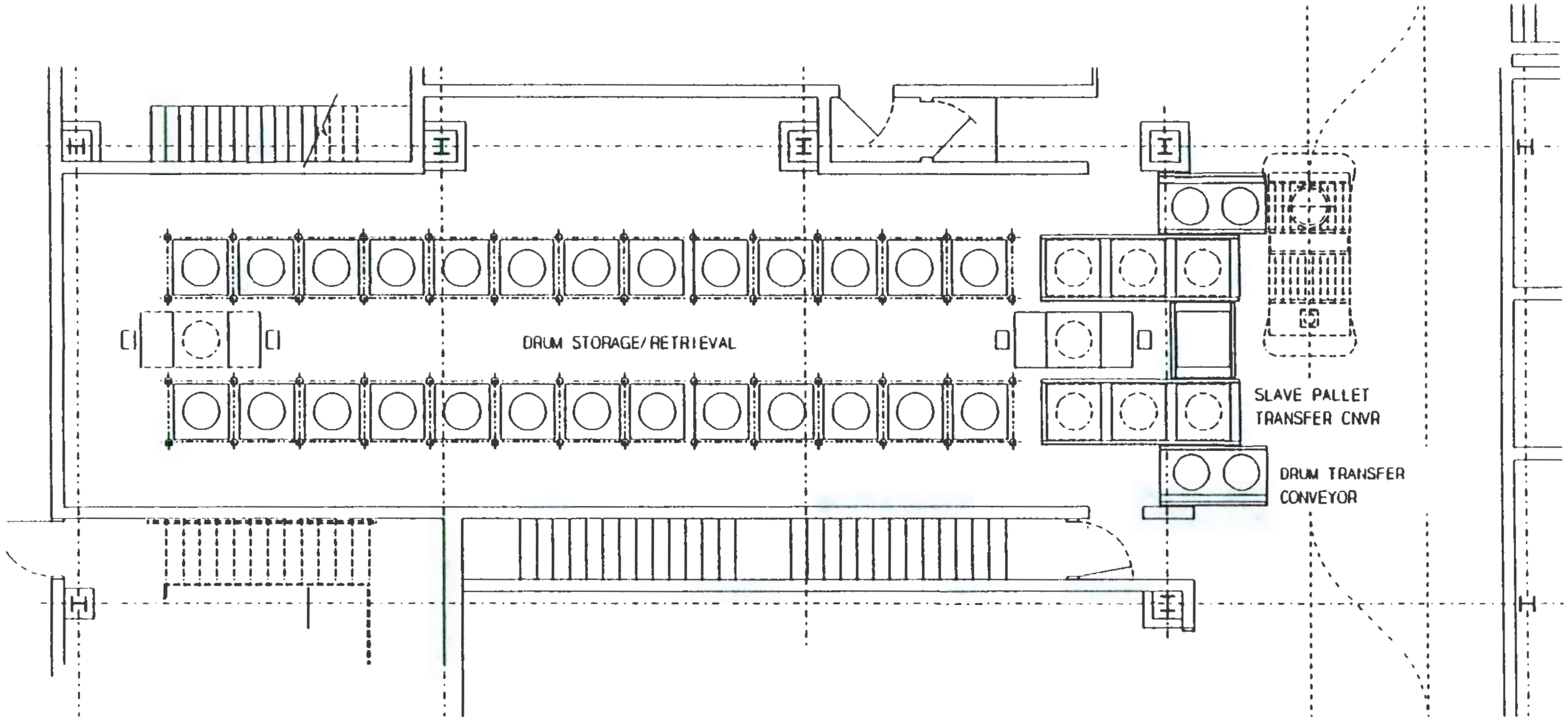
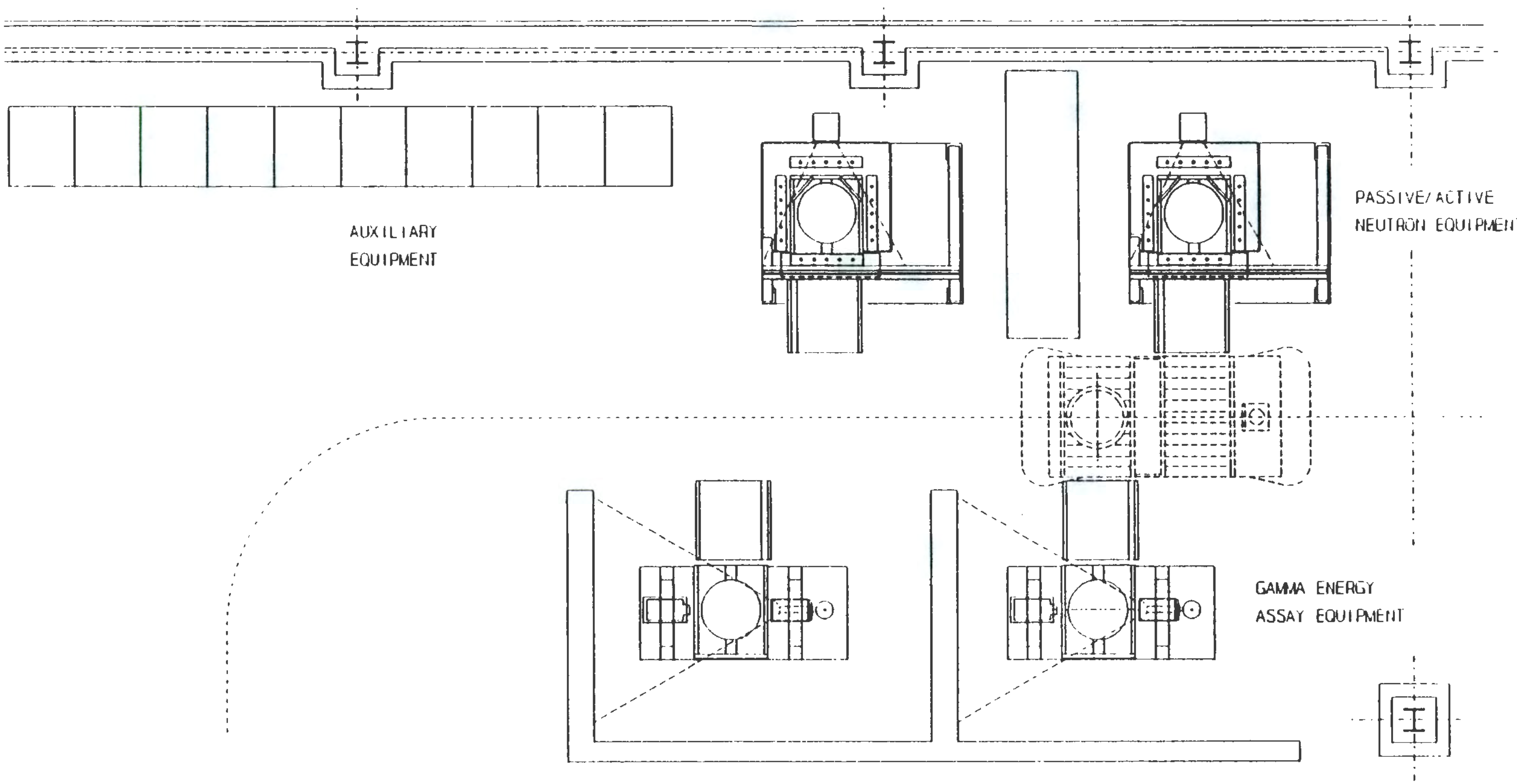
FIGURE 6-5
AS/RS



AUTOMATED STORAGE RETRIEVAL

FIGURE 6-6
NDA



NON-DESTRUCTIVE ASSAY

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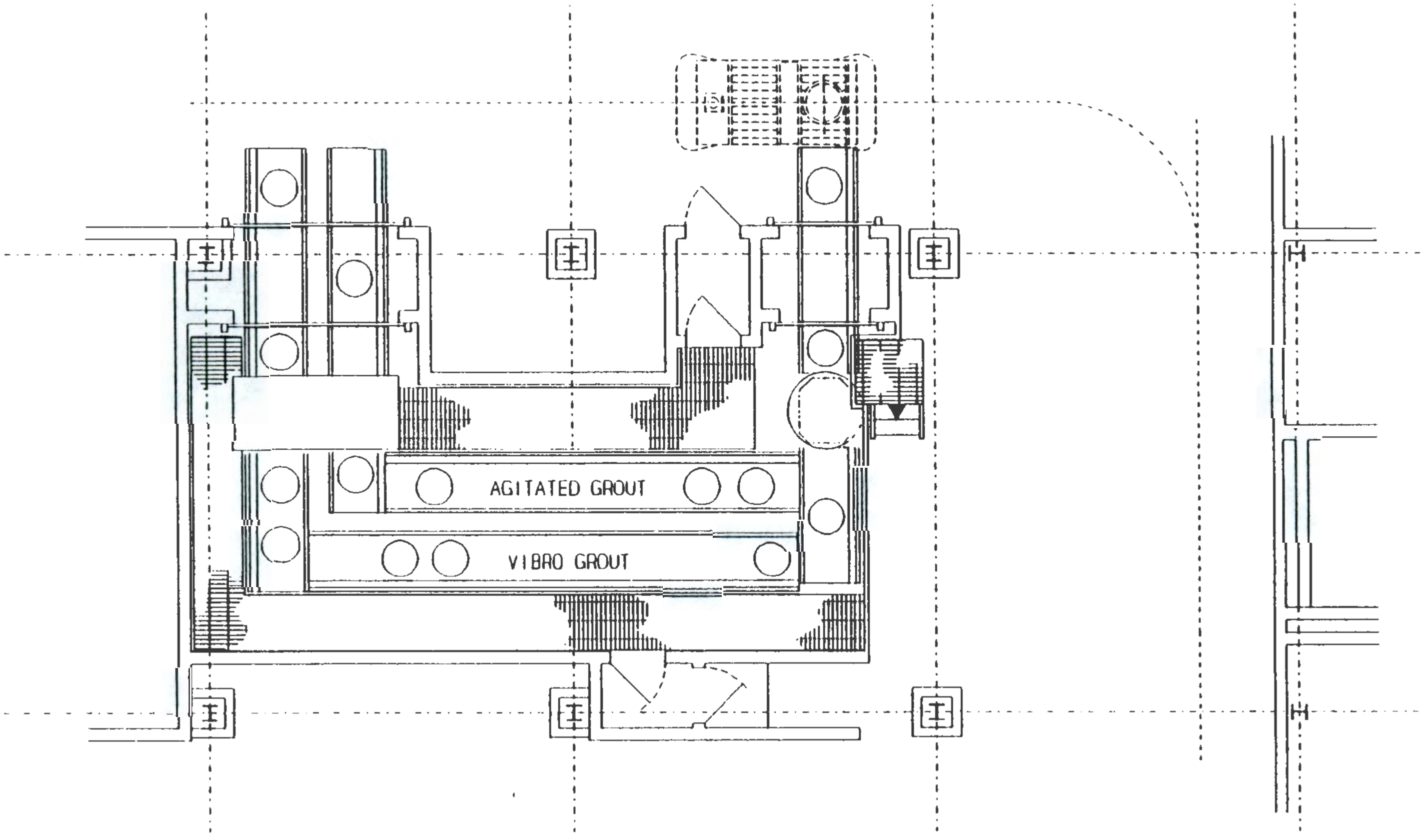
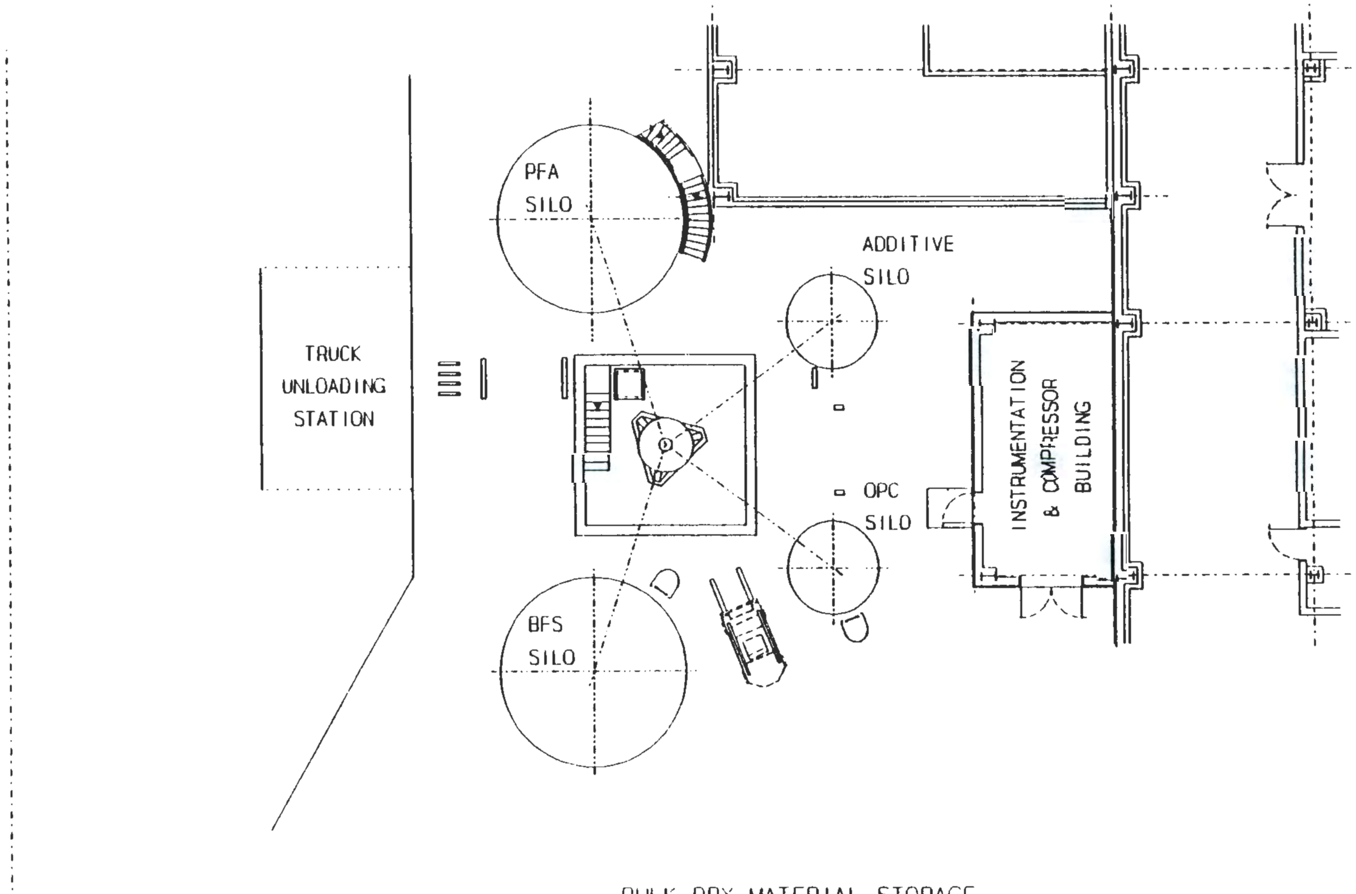
FIGURE 6-7
GROUT



GROUT STABILIZATION ENCLOSURE

FIGURE 6-8
DRY GROUT STORAGE



BULK DRY MATERIAL STORAGE

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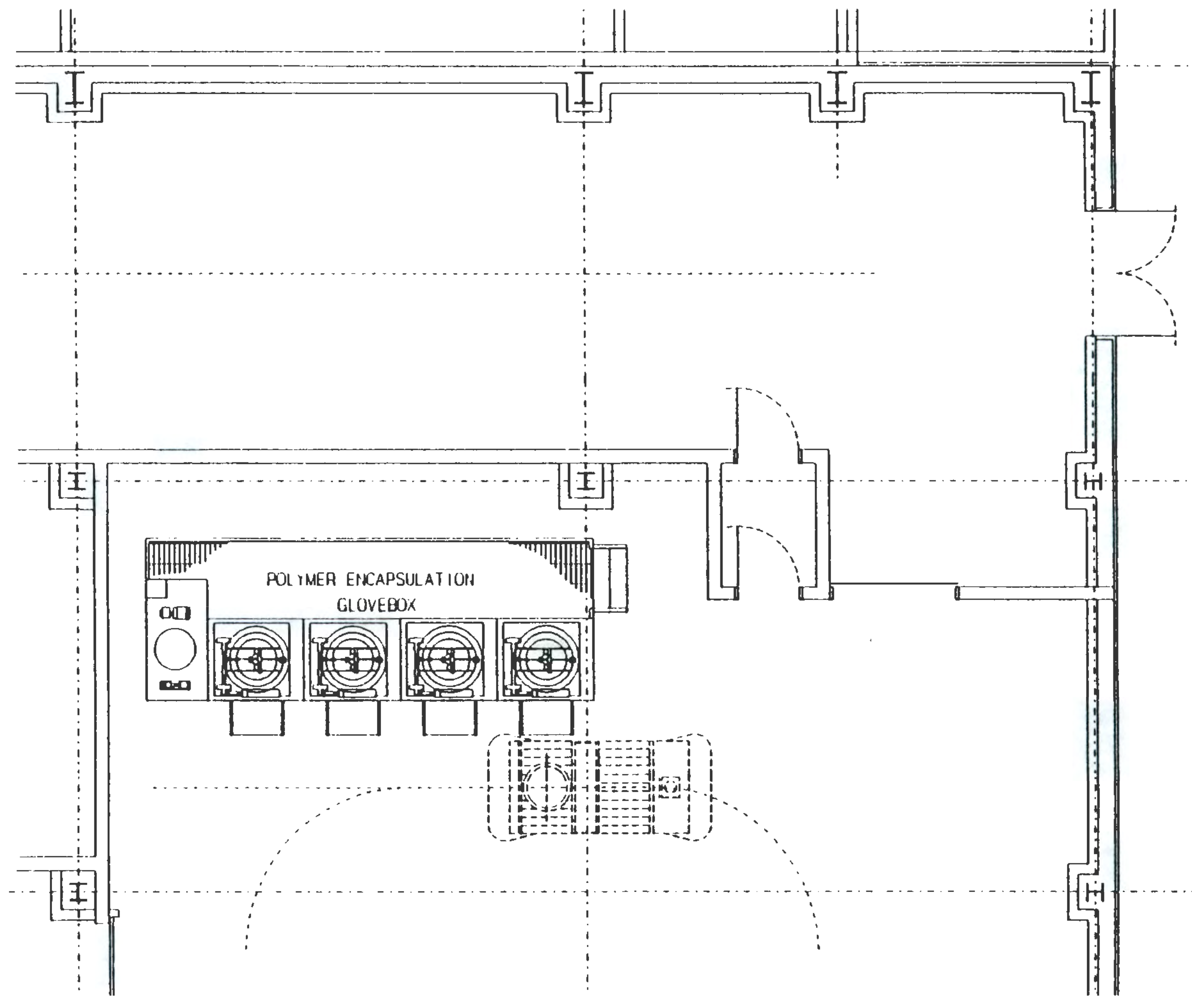
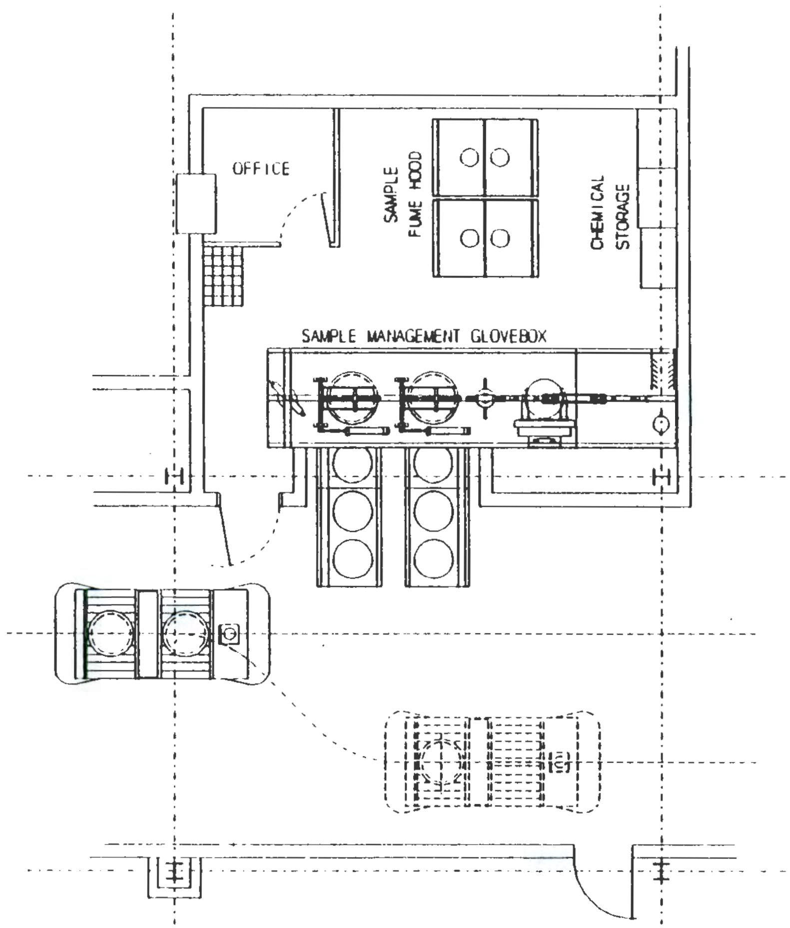
FIGURE 6-9
POLYMER



POLYMER ENCAPSULATION

FIGURE 6-11
SAMPLING



SAMPLE MANAGEMENT

6.6 Utility System Description

6.6.1 Introduction

1. Utilities provided for WRAP 2A include: electrical power, fire protection, heating, ventilation and air conditioning, compressed air, nitrogen gas, breathing air, process water, potable water, process chilled water and sanitary waste.

2. Detailed descriptions of these systems are provided in **Volume V**. The following is a brief overview of the systems.

6.6.2 Electrical Power

1. Facility electrical power will be supplied from existing Hanford facility services available at the north end of the facility. The single 9,000 KVA power feed is routed underground and terminates at the three (3) new power transformers.

2. UPS will be provided to various systems such as monitors, alarms and egress lighting. No other installed backup power is provided. The electrical demand is projected to be 6150KVA.

6.6.3 Fire Protection

1. Fire protection for WRAP 2A will be provided by a combination of automatic wet pipe sprinkler systems, automatic dry pipe systems, hose connections (stand pipes), manual dry chemical extinguishers, smoke and heat detectors, and an alarm system. A detailed description of the fire protection system is provided in **Volume V**.

2. The water supply is from an existing 12" potable (sanitary) water main. Two separate tie-ins will be provided from this main. The system is designed such that a single active failure will not disable the complete fire protection system.

3. The maximum possible fire loss (MFL) is estimated to be limited to less than $75M with the assumption (same as WRAP 1) that the contents of the drums are not included in the combustibles. This subject is addressed in Section 2.2 of **Volume V**.

4. The facility is divided into two fire areas (zones) separated by 2 hour fire rated barriers. Fire Area 1 covers all process/facility support and Administrative areas. Fire Area 2 is the process area and the glovebox enclosures; i.e., the SWP portion of the building.

5. Fire alarm and detection systems are provided in accordance with DOE Orders 6430.1A and 5480.7. The alarms will annunciate locally, at the FACP, and at a centralized alarm facility, via radio fire alarm reporters.

6. The exterior polymer storage area is a Fire Area 1, but with a higher hazard classification and, as such, will be designed to NFPA 13, Ordinary Hazard Group 2 criteria. This area will be provided with automatic dry pipe sprinkler protection for the area and also for building exposure.

7. **Figure 6-12** illustrates the Fire Areas (Zones) for WRAP 2A.

6.6.4 Compressed Air, Nitrogen Gas and Breathing Air

1. Compressed Air

Two compressors and dual heaterless regenerative air drier towers provide dry filtered air to a 200 cubic feet receiver. Air from the receiver is supplied to process users, instruments, and the nitrogen generation skid. Each compressor is rated for 200 SCFM at 125 psig. Normal operation is with one compressor in standby.

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FIGURE 6-12
WRAP 2A CONCEPTUAL FIRE ZONE PLAN
PAGE 1 OF 2

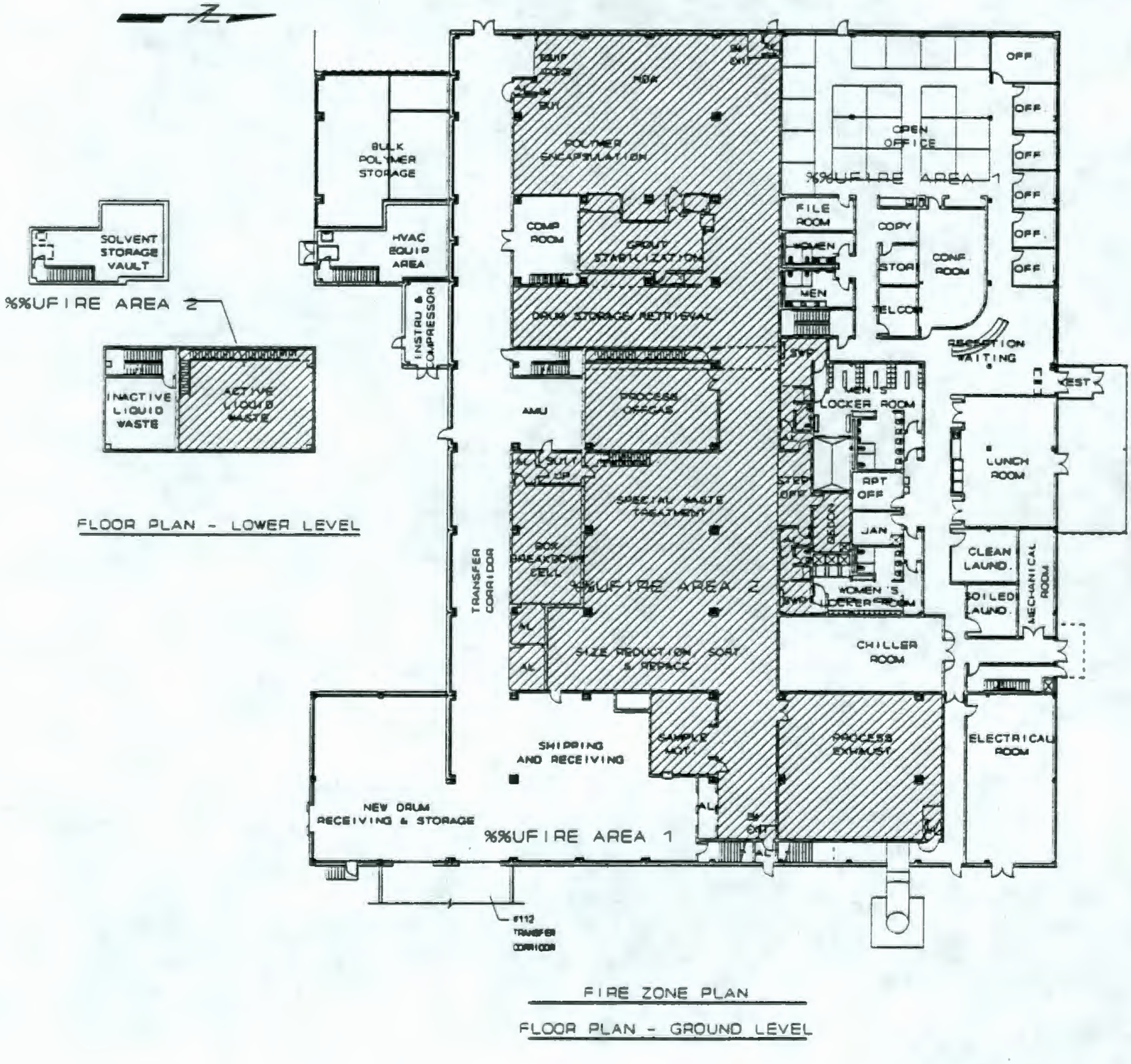
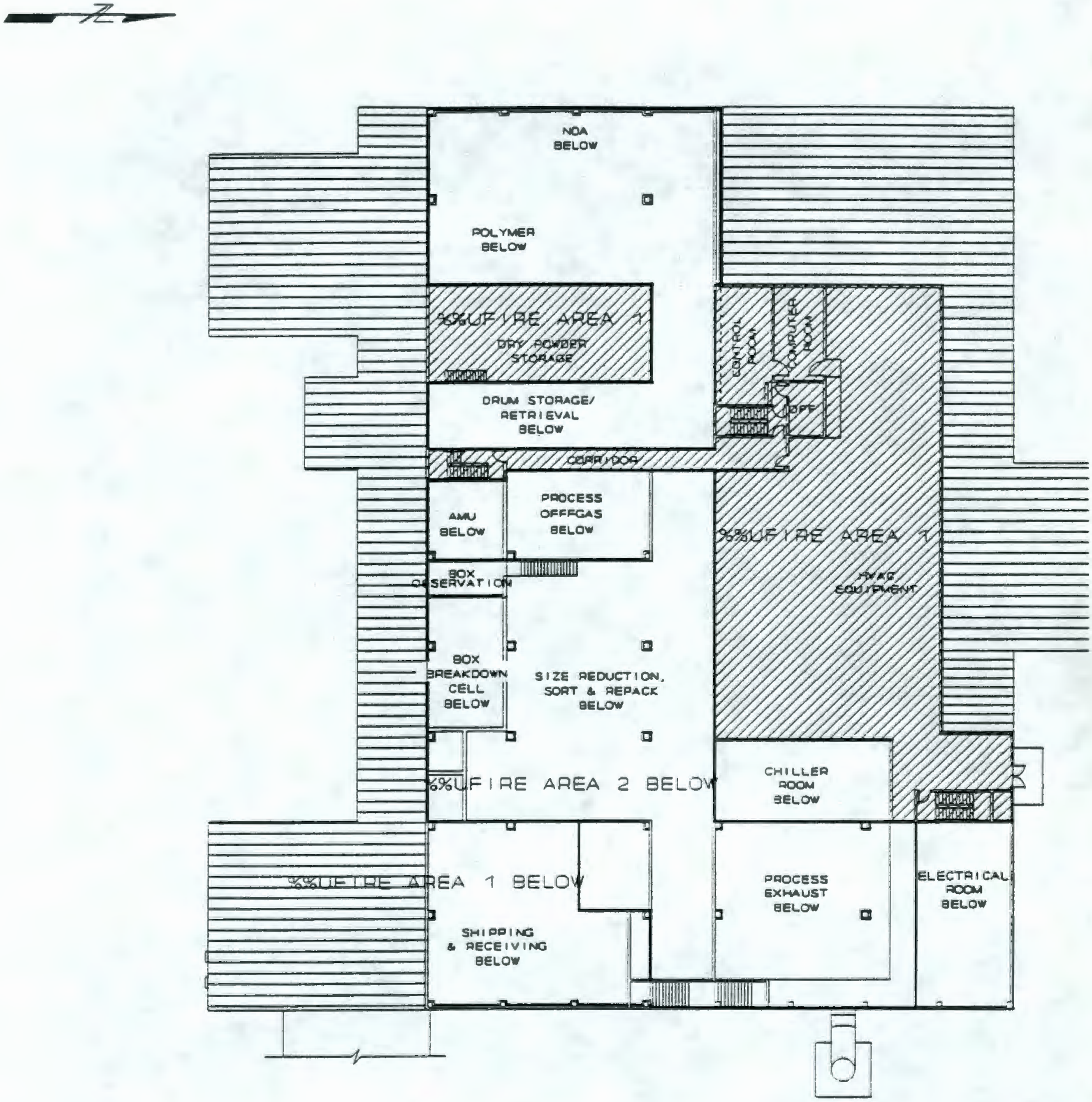


FIGURE 6-12
WRAP 2A CONCEPTUAL FIRE ZONE PLAN
PAGE 2 OF 2



FIRE ZONE PLAN

FLOOR PLAN - UPPER LEVEL

2. Nitrogen Gas

   A membrane system is utilized to separate nitrogen from compressed air and store it in a receiver for use as a blanket gas in various chemical storage tanks, or as a purge gas in waste processing.

3. Breathing Air

   Portable breathing air units with mask and hoses are provided throughout the facility, identical to WRAP 1 design.

6.6.5 Process Water/Process Chilled Water

1. Process water is provided throughout the facility. Supply is taken from the potable water system. Isolation is provided by positive backflow prevention.

2. A small chilled water recirculation loop is provided for the polymer storage tanks and to cool the recirculation loop in the process off-gas scrubber.

6.6.6 Potable Water

1. Potable water is supplied to the facility from an existing 12" 120 psig water main.

6.6.7 Sanitary Sewer

1. The sanitary sewer system collects wastes from the administrative portion of the facility. The wastes flow by gravity to a new 4000 gallon septic tank and leaching field.

7.0 DESCRIPTION OF PROJECT SCOPE

7.1 Improvements to Land

7.1.1 Existing Site Conditions

1. The WRAP 2A Facility is located in the 200 West area at the Hanford Central Waste Complex, approximately 1200 to 1300 feet southwest of the intersection of Dayton Avenue and 23rd Street. The area is generally characterized as a high desert (elevation 720') where sagebrush is the predominant flora. The site is relatively flat with an overall elevation difference of 4 feet across the site. Annual precipitation is estimated at 6-7 inches per year.

2. The site weather is characterized by large daily temperature swings, low relative humidity, and ambient temperature extremes ranging from -20°F to 115°F. Wind predominately blows from the west across the site, with gusts up to 70 mph. Refer to Hanford Plant Standards SDC 4.1 and SDC 5.1 for design conditions.

3. The surface of the site consists of generally loose and dry soils ranging in depth from approximately 2 feet to 15 feet. Underlying this layer is relatively well graded dense soils that range from approximately 3 feet to 7 feet thick. The third stratum consists of fine to medium sands that exist to a depth of approximately 250 feet where it then becomes more gravelly to a depth of about 400 feet where the basalt contact layer begins.

4. The ground water exists at a depth of approximately 310 feet below the site. No perched water exists in the vicinity of the site.

5. Surface soil conditions at the site have an estimated percolation rate of 5 minutes per inch and an estimated soil resistivity of 25,000 ohm/cm^3 at a depth of 2.5 feet. The site frost line is estimated at 2.5 feet below grade.

6. Existing utilities required to service the WRAP 2A Facility consist of potable water, sewer, and electrical power. The existing potable water underground pipeline will be tapped into to supply both potable water and fire water to the facility. The 12 inch pipeline residual pressure at flowing condition is estimated at 80 psig. Overhead electrical power transmission line in the WRAP 1 area will be extended to the WRAP 2A area for WRAP 2A to connect to via underground duct banks.

7. The proposed WRAP 2A Facility site location referenced to the Hanford Area coordinate grid, is N42725.00 and W79,542.00 (referenced to the building control lines A and 3).

7.1.2 Design Requirements

1. The general location of the WRAP 2A facility within the Hanford Central Waste Complex was determined during the WRAP 1 CDR sittings study. Further refinement was achieved by locating the facility on the top of the hill immediately west of the WRAP 1 site. This placed the facility on a more level site and also permitted the integration of WRAP 2A with WRAP 1 and future interconnecting facilities.

2. The specific location of the WRAP 2A building structure was determined based upon the conceptual dimensions for the Project W-112 facility being planned that form the interconnection between the WRAP 1 building and the WRAP 2A facility.

3. A dominant design criteria for development of the facility site plan was the trade off between the volume of earthwork required to develop the site and the longitudinal grade of the corridor that will connect WRAP 1 to WRAP 2A. This corridor will be traversed by fork lift vehicles transporting waste drums. The siting of the WRAP 2A facility used the assumption that the

longitudinal grade of this corridor would be 3 percent. This avoids placing the WRAP 2A facility in a deep excavated pocket, provides an improved drainage situation and avoids excessive earthwork volumes.

4. Project W-112 provides an upgrade to the site utility system in the vicinity of WRAP 2A. Therefore, the WRAP 2A conceptual design cost estimate provides for the termination of all utilities five feet from the building primeter.

5. The civil and structural design of the facility is based upon the geotechnical engineering design parameters specified in WHC correspondence 9155823 to UE&C. This specified a recommended soil compaction of 95 percent maximum density and an allowable soil bearing capacity of 3,000 psf.

7.1.3 Site Design

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1. The parking area was sized for a total of 66 cars, including 4 spaces for handicapped personnel. Bus and personnel automobile access and parking was designed on the north side of the building. The south side of the facility will be accessed via the truck apron development and enclosed corridor provided under the scope of project W-112. The pavement limits shown reflect only a minimum area that represent the points of required vehicle access to the south side of the WRAP 2A facility. The pavement limit shown is insufficient to accommodate the truck turning movements.

2. Asphalt pavement was designed using a CBR of 10 for the compacted subgrade, 2000 trips per year of the design vehicle, which is a standard over the road 50 foot tractor-trailer, and a design life of 20 years. This results in a typical pavement section consisting of 2 inch hot bituminous wearing course, 2 inch asphalt leveling course and 6 inch aggregate base course.

3. The floor elevation of the building was established at 720.0 feet to provide satisfactory horizontal and vertical relationships between the various areas of the building, to provide satisfactory drainage for the completed site, and to minimize earthwork. This elevation is 5 feet higher than the WRAP 1 facility, and is connected to WRAP 1 by a transfer corridor set at a longitudinal grade of 3 percent. Maximum cut and fill slopes of 4 horizontal to 1 vertical have been utilized to minimize erosion.

4. The sanitary sewage system was designed for one shift of 40 employees and 26 administrative employees. Sewage flows of 35 gallons per day and 15 gallons per day were utilized for shift workers and administrative personnel respectively.

5. Drainage design for the culvert installations was based on a 25 year design storm event of 0.8 inches per hour. An average runoff coefficient of 0.6 was used in the design calculations to account for future development in the area.

7.2 Buildings

7.2.1 Civil

1. The WRAP 2A Building has been located with a finished floor elevation at 720.0 feet. The high point of the existing site within the building area is approximately 723.0 feet and the low point elevation in the building area is approximately 719.0 feet. The building foundation will be supported mainly at or below existing grade. Structural fill will be required to bring grade to the proper elevation under floor slabs.

2. All road, maneuvering areas and parking lots will be paved with asphaltic concrete paving.

3. Drainage will be directed around the north and south sides of the facility. Drainage on the north side will flow east through culverts under the east and west access roads to the parking lot. Drainage on the south side will be directed to a storm sewer system to be provided by Project W-112.

7.2.2 Structural

7.2.2.1 Structural Considerations

1. The building enclosure for the WRAP Module 2A Facility is a metal building of the beam-and-column type which is typically supplied by pre-engineered metal building manufacturers. The building will be purchased from a pre-engineered metal building manufacturer under a performance specification. However, there are features in the building which will require structural design that is not normally provided by a pre-engineered metal building manufacturer.

2. The building structure will support a six inch thick elevated concrete slab on metal deck for the control room, computer room, HVAC room, and grout preparation floors. In addition a 15-ton bridge crane will be supported on building columns at the Size Reduction, Sort, Sample and Repackage area. Masonry walls which extend from the floor to the building roof framing or to the elevated slab support framing will be laterally supported by the building structure for differential internal pressures and seismic forces.

3. A grating platform for access to the HEPA filter in the northeast corner of the building may be supported from the building's east wall framing. Differing roof elevations will require that areas of lower roofs be designed for snow drift loading, and a structural steel access corridor bridge connecting the control room and HVAC room level at column line 8 to the stair leading down to the transfer corridor at column lines E-5 will also be supported from the building structure. Access stairs and platforms for the dry materials storage tanks above the Grout Stabilization area will also be supported by the building structure.

4. Main Building Framing has been assumed to consist of hot rolled or fabricated structural shapes of straight or tapered design (manufacturer's option). Girts and purlins will consist of cold formed "C" and "Z" shapes with intermediate support provided by sag rods. Column base plates will all be located at one elevation approximately one inch above the highest floor elevation (seven inches above process area floor). Vertical X-bracing will be used to brace the building against lateral loads, however, due to wall openings and other open area requirements, it is anticipated that lateral stability may also be provided by rigid portal frames. Roof bracing will consist of rod X-bracing to distribute forces in the plane of the roof to vertical bracing and, if required, portal frames.

5. Building Foundation: The building foundation has been assumed to be a spread footing and grade beam design. This foundation system is most commonly used for pre-engineered metal buildings and for soil conditions existing at the WRAP 2A building site. The actual foundation type to be used will be determined during Title design. There will be a lower level "Basement" located between column lines 4 and 7 from column lines E to F. The basement will be approximately twenty feet deep and contain liquid waste tanks supported on the basement floor. Access to the basement has been assumed to be by steel stair.

6. Floor slabs will be designed for appropriate vehicular traffic and to support equipment without having to provide independent foundations for the equipment. Heavily loaded areas such as the Size Reduction, Sort, Sample and Repackage area may require a continuous mat type foundation.

7. Exterior Equipment Foundations: Equipment outside of the building has been assumed to be supported on mat foundations and slabs-on-grade, except for the stack foundation which has been taken to be a pedestal on footing. Storage silos on the south side of the building have been assumed to be supported on a four foot thick mat foundation.

7.2.2.2 Design Requirements

1. The WRAP 2A facilities have been assigned a low hazard classification as defined in UCRL-15910. The building design will include the building dead load, and live loads from elevated slabs and roof, wind loads and seismic loads.

2. Dead loads consist of the weight of building components including beams, columns, horizontal bracing, vertical bracing, girts, purlins, roof panels, wall panels, elevated concrete slab, control room access flooring, and metal decking for elevated slabs.

3. Live loads consist of snow loads including the effects of snow drifting on roof areas and uniformly distributed live loads over elevated slab areas. The following values have been determined for use as live loads:

   a. Roof:

      - Snow loads uniformly distributed (minimum roof live load) 20 psf

      - Snow drift per ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures."

   b. HVAC floor .... 200 psf

   c. Control room and computer room floors .... 150 psf

   d. Bridge crane .... 15 tons

4. Wind loads will be evaluated in accordance with ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures" for winds perpendicular to each of the four main walls of the building. Wind loads will be applied in one direction at a time considering pressures on the windward wall, leeward wall, side walls and roof simultaneously and in combination with internal pressures due to wind loads.

5. The following parameters will be used in the development of wind loads:

   - Wind speed .... 70 mph
   - Importance factor 1.07
   - Exposure C
   - Tornado and missile loads .... (None)

6. Seismic loads will be calculated using the requirements of the Uniform Building Code (UBC), 1988 edition, UCRL-15910, and Hanford "Standard Arch-Civil Design Criteria Design Loads for Facilities SDC-4.1".

7. The following seismic criteria will be used:

   - UBC Seismic Zone 2B
   - Z Factor 0.2
   - Importance Factor (I) 1.25
   - Amplification Factor (C) 2.75
   - Force Reduction Factor (R_w) 6.0

   For ordinary moment resisting space frames

8. The building base shear calculated for the pre-engineered metal building, based on the above criteria is V = 0.115W.

9. A collateral load of 10 to 20 psf is assumed to occur over the total area of the building roof and under elevated floors, to account for future installation's weights, in accordance with DOE 6430.1A, "General Design Criteria".

7.2.2.3 Design Features

1. The building foundation will have spread footings at building column locations and wall footings at locations where the foundation grade beams act as retaining walls. Where wall footings and column footings are adjacent to each other, concrete will be placed monolithically.

2. The perimeter grade beam will extend six inches above the ground floor slab concrete in the Process and Process exhaust areas to provide a containment curb. Ramps, curbs and interior door stoops will be placed with the ground floor slab at overhead doors and at personnel doors leading into these areas. Door thresholds will be at the top of the grade beam and curbs.

3. The top of grade beams not adjacent to the rooms listed above will be six inches above the adjacent floor slab also except that there will be a block-out at doors to allow thresholds to be at floor level.

4. All footings on the building perimeter shall be at least 2'-6" below grade but may be deeper when required for uplift or overturning resistance. Interior and exterior column footings shall have at least six inches of compacted fill between them and the bottom of the floor slab. Floor slabs shall be placed on a minimum of six inches of compacted fill with a four mil polyethylene vapor barrier on top.

5. Floor slabs will be approximately ten to twelve inches thick in the Process areas except for the Size Reduction, Sort, Sample and Repackage area which will require a thicker mat type foundation. All other floor slab thicknesses will be six inches.

6. Floor slabs shall be reinforced to prevent or limit cracking of the concrete. Six inch thick slab-on-grade will have one layer of reinforcing. Slabs 8 inches and thicker shall have two layers of reinforcing.

7. Shielding Walls shall be constructed of normal weight concrete and have reinforcing placed vertically and horizontally in each face. Vertical reinforcing shall extend into the floor slabs which support the walls. If design indicates that the shielding wall footings should be thicker than the floor slab, the floor slab shall be thickened under the wall to provide the required footing for the wall.

7.2.3 Architectural

7.2.3.1 General Considerations

1. The WRAP 2A architectural design was developed around the process configuration requirements and the administrative requirements for the facility. The result is an architectural form that is tailored to the facility functions and provides an efficient ergonomic environment for personnel to function in.

2. WRAP 2A is a solid waste processing facility as defined by DOE Order 6430.1A, Section 1324. As such the facility is required to provide protection and confinement for the Low Level Waste processing activities that take place in the facility. The secondary confinement system must be designed to withstand design basis earthquake, fires, and other accidents that could

result in the release of radioactive or hazardous materials outside of the site boundary for a "low hazard" classification facility.

3. Radiological safety considerations were an integral part of the architectural development of the building. These included the accommodation of the building structure and the zoned HVAC system to provide containment of radioactive material contamination and also provide operator radiation protection in areas of the facility where waste storage drums/boxes are stored in sufficient quantities. Concrete shield walls are provided in the Waste Process Lag Storage and NDA areas.

4. Decontamination considerations for the facility consist of providing suitable surface coatings, minimization of sharp corners and other construction details in the floor that make surface decontamination difficult, routing of only those utilities through the waste process areas that are required for those areas, and provision of secondary containment curbs. The secondary containment curbing is provided for the Waste Handling, Process, and Process Exhaust areas where the possibility of radioactive contamination exists.

5. Personnel support services including toilet facilities, and lunch room are provided for 66 employees. The administrative area provides walled offices for 6 management personnel and open office space for 20 engineering and administrative personnel. Locker/change room facilities are provided for 40 operational personnel. A conference/training room is provided for 20 persons. The WRAP 2A Facility is <u>not</u> intended for occupancy or use by handicapped personnel; however, provisions are made to accommodate the handicapped in the administrative portion of the building.

6. Space allocation in regards to the routing of utilities and HVAC ductwork has been addressed by dedicating space envelopes within the process operational areas or in the ceiling plenum in other spaces as utility corridors. This provides for the use of common supports and minimizes interference during construction. Utilities routed above ceilings are accessed via portable ladder after removal of lay-in ceiling tiles.

7. The development of the facility layout and floor plans was a result of the architectural program analysis performed, as documented in the "Building Functional Analysis", **Appendix H.** Additionally, a building code evaluation (**Appendix G**) was conducted that determined the personnel entry/egress requirements and also contributed to the definition of "controlled area" criteria established for the facility which include:

a. The process and process exhaust spaces constitute the "controlled areas" of the facility. A single point, monitored entry and exit is provided to these spaces through the process step-off area and the SWP change rooms.

b. All entry and egress of the "controlled areas" are protected by airlocks.

c. The layout of the facility does not permit the co-mingling of personnel in the controlled areas with other facility personnel except under emergency conditions after they have exited through alarmed emergency egress doors.

d. Emergency exits directly to the outside are provided from areas which contain waste materials, or in which an identified hazard exists.

8. Based upon the facility "Low Hazard Classification" and capital cost considerations, the building incorporates a metal building system design. An architectural performance specification will be prepared that will provide all the requirements necessary to obtain a fixed price bid from a metal building vendor for a turn key design/build package.

9. The area operational requirements established the building eave height which varies.

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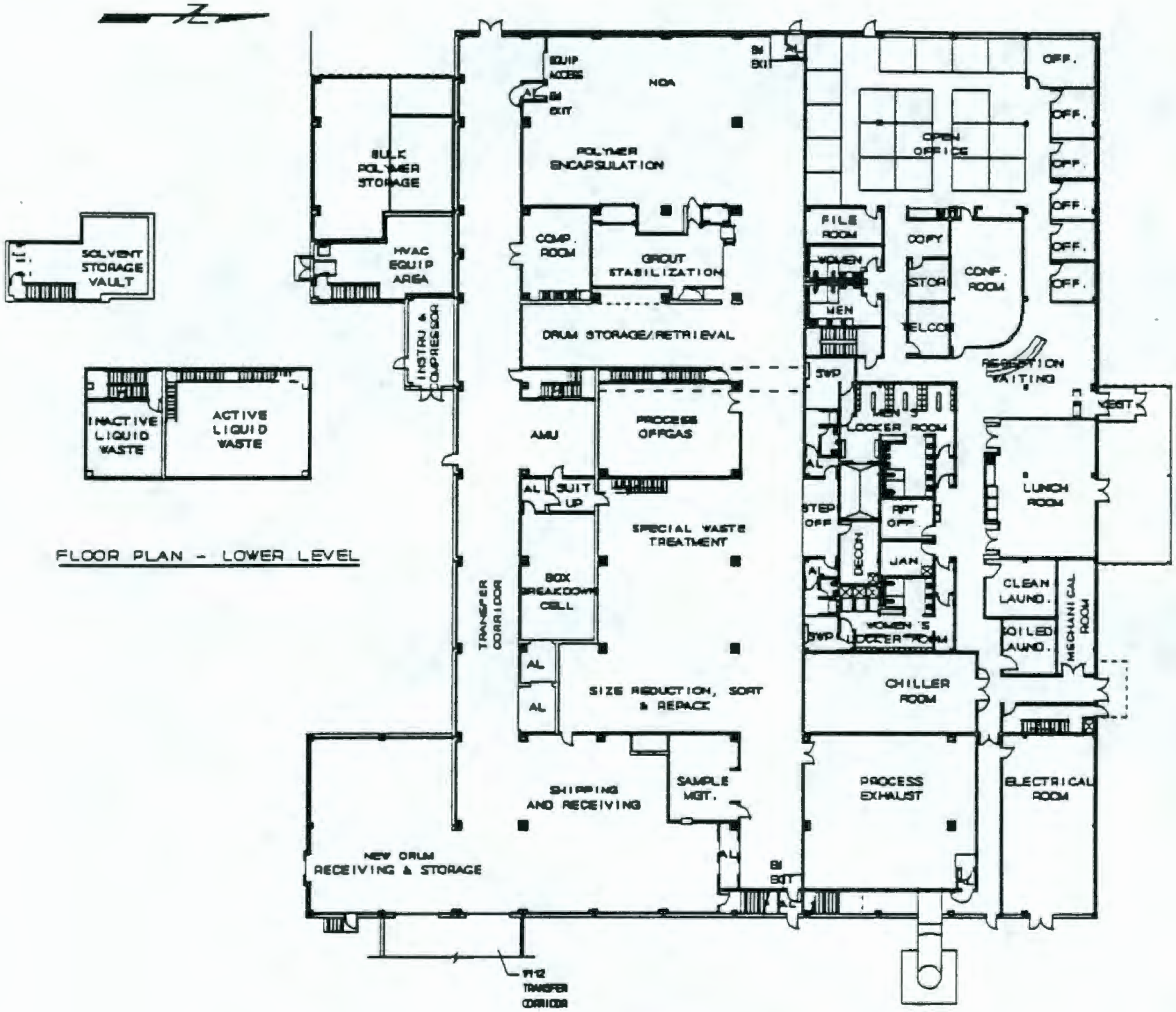
FIGURE 7-1
WRAP 2A SPACE ALLOCATION SUMMARY
(NET SQUARE FEET)

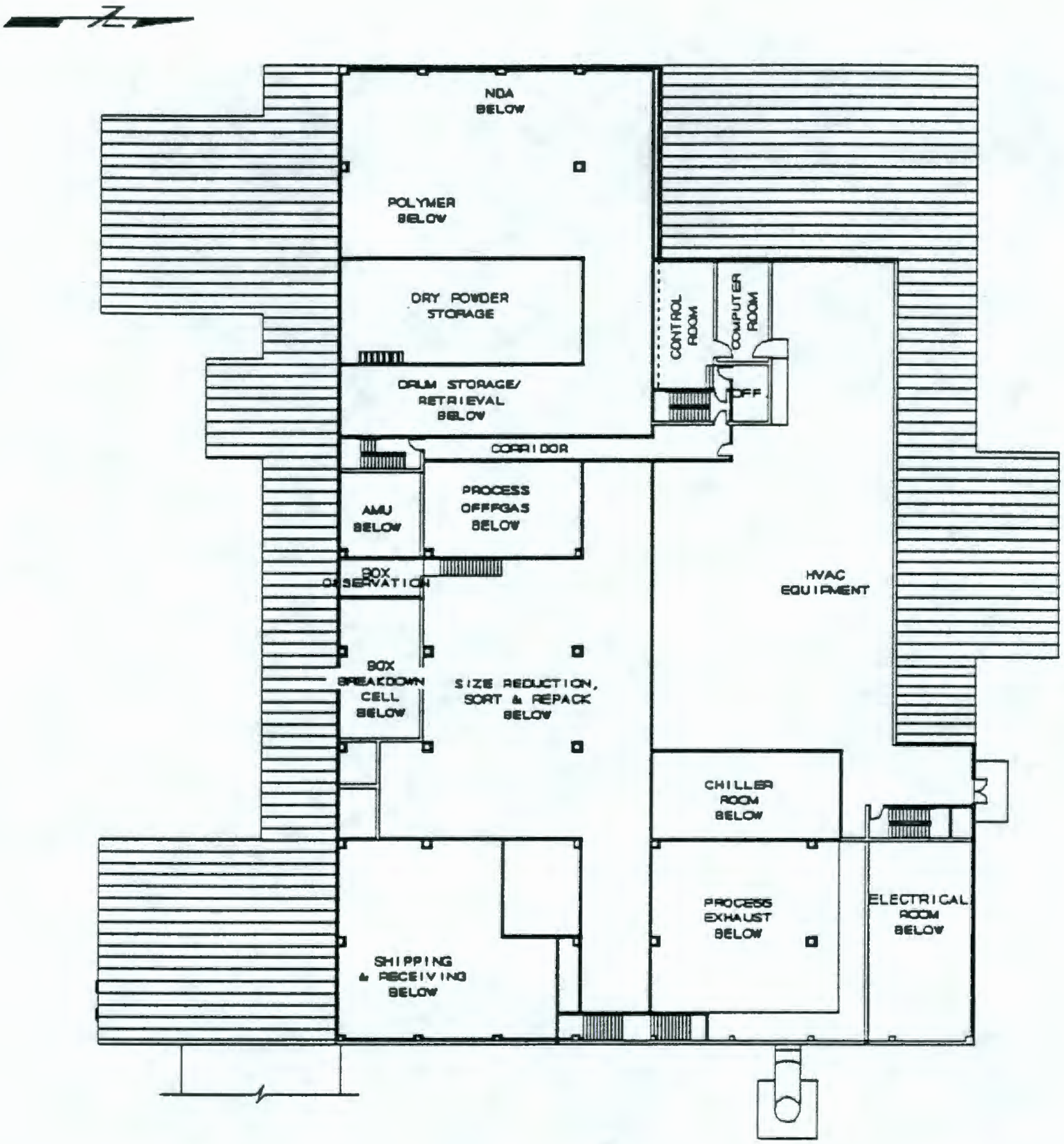
AREA	ROOM NO.	TITLE	SQ. FT.
Administrative		Operations Manager	234
		Record Management	168
		Reception Area	368
		Admin./Storage	110
		RPT Office	154
		Lunch/Conference Room	1,685
		Admin. Toilets	387
		Offices	528
		Open Office Space	3,131
		Copy Area	110
		File Room	210
		ADMINISTRATIVE SUBTOTAL	7,085
Personnel Support		Men's Locker Room	469
		Toilet	176
		Shower	80
		SWP Change	294
		Women's Locker Room	269
		Toilet	64
		Shower	88
		SWP Change	186
		Janitor Room	140
		Clean Laundry	314
		Soiled Laundry	224
		Decon Room	198
		PERSONNEL SUPPORT SUBTOTAL	2,502
Waste Process		Waste Process	13,575
		Sample Management	468
		Liquid Waste	767
		Box Cell	1511
		WASTE PROCESS SUBTOTAL	16,321
Facility Support Areas		Process HVAC	3,243
		Mechanical Room	330
		HVAC Equipment	6,774
		Electrical Room/UPS	1150
		Telecommunications	156
		FACILITY SUPPORT SUBTOTAL	11,653
Process Support		Shipping & Receiving	2,494
		Transfer Corridor	4,284
		Clean Drum Storage	2,050
		Grout Prep	2,174
		Control Room	536
		Computer Room	346
		Operations Supervisor Office	140
		AMU	473
		Process Support Subtotal	12,497
		TOTAL NET	50,058

FIGURE 7-2
WRAP 2A CONCEPTUAL FACILITY LAYOUT PLAN - GROUND LEVEL



FLOOR PLAN - GROUND LEVEL

FIGURE 7-3
WRAP 2A CONCEPTUAL FACILITY LAYOUT PLAN - UPPER LEVEL



FLOOR PLAN - UPPER LEVEL

2. Personnel Support

a. The change room facilities are located off the main circulation path to the operational areas.

b. Change rooms are sized to accommodate 40 operations personnel (28 males and 12 females). Toilet areas are sized respectively.

c. Shower facilities are provided.

d. Special Work Permit (SWP) dressing facilities are provided for approximately one-half of the operational personnel and entered from the locker rooms through airlocks. The SWP change areas will contain storage bins for the protective clothing.

e. Service spaces for these facilities include janitors closet, and clean and soiled laundry store rooms.

f. Adjacent to the building entry and change rooms, a lunch room will be located to serve 60 persons. A kitchen unit and space for vending machines are provided.

3. Facility Support

a. The air handling, HVAC equipment for the facility is located on the upper level of the facility; separated from the Process areas (containing hazardous waste).

b. All air duct penetrations in the walls between this area and the Process and Process exhaust areas are protected with 2 hour fire rated dampers. The requirements of DOE 6430.1A, Section 1530-99.0, which states that closure of fire dampers shall not compromise the function of the confinement system, shall be followed.

c. The HVAC space is accessed via either of two stair towers. A pair of doors in the exterior wall and an exterior, bracketed, platform facilitates equipment move-in to this area and the control and computer rooms.

d. Mechanical rooms are located on the ground floor which contain the firewater entries, domestic hot water heater, and HVAC chillers.

e. The Electrical room is located on the ground floor. Incoming electrical power is brought to the room via overhead bus duct from transformers located on the site at this location.

f. A Telecommunication room is located adjacent to the Administrative area on the ground floor to house this equipment.

7.2.4.2 Process Support

1. Shipping and Receiving Area

a. The Shipping and Receiving area occupies the Southeast corner of the facility. Provisions will be made by means of portal framing for connection to the W-112 waste transfer corridor.

b. The finish floor elevation of the area is 48 inches above the adjacent exterior grade to accommodate dock height unloading and loading station to receive empty drums and AMU materials and dispatch waste samples for laboratory analysis. This station will be served by fork lifts and will be equipped with a front mounted dock ramp and vehicle restraint.

c. Fork lifts and two free-standing jib cranes serve to move waste drums within the area. Mechanized conveyors passing through airlocks facilitate the movement of the drums into the Process areas.

2. Control and Computer Area

a. The Control and Computer rooms are located on the upper level (second floor) of the facility. Windows are provided in the control room to permit observation of the Process areas and are equipped with fire shutters to maintain fire code separation requirements.

b. Access to the area is an enclosed stair tower from the lower level corridor.

c. The Control and Computer rooms have an 18 inch high accessible floor system in order to facilitate running the data control cables.

3. Process Exhaust Areas

a. The HEPA filtration equipment associated with the waste process is located in two rooms. The primary process filters are housed in a room located central to the enclosures served in the process area. The HEPA filters and fans serving the overall process area are located in the process exhaust room adjacent to the east wall of the building and exterior exhaust stack.

b. Intermediate level platforms will be constructed in the space to facilitate change-out of the four tiered filter banks. These platforms are to be framed of steel members and covered with galvanized steel grating.

4. Sample Management

a. The sample management room is located within the special work permit area, adjacent to the open/sort process enclosures and the shipping and receiving area.

b. The area contains a glove box enclosure where waste samples may be taken for limited analysis. Laboratory fume hoods are provided where samples may be handled.

c. A data input terminal will be located in the room for sample records and the administrative control of samples leaving the facility for analysis.

d. A wall pass-through unit is provided between the sample management room and shipping and receiving for the transfer of sample containers for transport to an outside laboratory.

5. Polymer Storage

a. The bulk polymer storage and polymer mixing vessels are located in a curbed containment basin external to the southwest corner of the building.

b. An extension of the building roof provides overhead, weather protection for the polymer mixing area.

c. This area will be separated from the building structure by a concrete fire-resistive wall.

6. Grout Storage

a. The bulk materials for the grout process are stored in outside silos south of the building structure.

b. An appendage to the building transfer corridor structure provides a space to house the equipment and local controls associated with handling the bulk dry materials.

c. The materials are transferred to a batching operation located on an enclosed, upper level floor above the controlled area grout enclosure. A 2-hour fire horizontal separation is required between these areas.

7. AMU

The AMU equipment is located and accessed off the transfer corridor extension to facilitate the delivery of required materials via forklift.

8. Transfer Corridor

The WRAP 2A transfer corridor is a 20 ft wide extension of the W-112 transfer corridor which runs the length of the south wall of the facility. It functions to facilitate the movement of personnel, materials, and equipment to the process support areas.

9. Liquid Waste

a. The liquid waste holding tanks and related equipment are located in a lower level area approximately 23 ft. below ground floor.

b. The area is divided into two separate chambers which contain active and in-active liquid waste tanks respectively.

c. The floor walls and roof (ground floor slab) of these chambers are constructed of sealed concrete, and serve as secondary containment for the holding vessels.

d. The two, non-occupied chambers are entered independently from the controlled and non-controlled areas of the building.

7.2.4.3 Process

1. The center portion of the building contains the process area, which is separated from the administrative, personnel, and facility support areas on the north side and the non-SWP process support areas on the south side, by 2 hour fire rated separation walls.

2. An AGV access corridor runs the length of the process area, making a loop at the western end, to facilitate the transport of the waste drums between the various process enclosures. The width of this circulation corridor is sized to accommodate two AGV paths to allow for passing.

3. The open/sort/repack process enclosures are located at the eastern end of the process area adjacent to the Shipping and Receiving area. The box cell and associated air locks are also located in this area.

4. The process lag storage area is centrally located along the AGV path and is bounded on three sides by concrete radiation shield walls. This area contains an automatic storage/retrieval system with racks which allows the stacking of drums seven tiers high.

5. The NDA equipment is located on each side of the AGV path at the west end of the Process area. Concrete shield walls are located in the area as required for machine shielding.

6. The grout and polymer encapsulation enclosures are located west of the lag storage area.

7. Emergency personnel breakouts via airlocks are provided in the process area, as required, to meet travel distance requirements.

7.2.5 Exterior Building Construction

1. Refer to **Figures 7-4 and 7-5** for conceptual illustrations of WRAP 2A building exterior elevations.

2. Exterior: The building exterior skin is a "Metal Building System" consisting of preinsulated, prefinished metal, interlocking roof and wall sandwich panels applied to the structural steel framing members. The thermal coefficient of the roof panels is U=0.047 (R=21.28) and wall panels is U=0.069 (R=14.49). The roof slope is a 1/2 in 12 pitch and specified as a standing seam design. Exterior panel finish shall be "20 year" Kynar paint in a color selected to match existing buildings at the HCWC (white with blue trim).

3. Doors, Windows and Glazing: Steel doors and frame shall be enamel painted. Windows, entry doors and sidelight framing and louvers shall be clear anodized aluminum. Glazing will be gray tinted insulated glass.

7.2.6 Interior Building Construction

1. Floors

a. The ground floor generally consists of a reinforced concrete slab on grade. The floors above the small lower level tank rooms and the upper level floors will be constructed of reinforced concrete supported on corrugated steel decking and structural steel framing.

2. Walls

a. The interior walls in the process, facility support, and high use areas will be constructed of reinforced concrete masonry. Reinforced cast-in-place concrete walls will be used where radioactive shielding requirements dictate. The interior side of the exterior wall and dividing partitions in the administrative and personnel support spaces will consist of light gauge metal framing covered by gypsum board and finished.

3. Interior Finishes

a. Interior finishes shall comply with applicable sections of the NFPA Life Safety Code.

b. The interior face of the exterior wall and roof panels will be exposed and the factory applied polyester enamel will constitute the wall and ceiling finish in the operational and facility support areas. The structural framing (columns, beams, girts, and purlins) will be exposed and painted with an acrylic resin based primer and enamel. The mechanical ductwork, piping, and electrical conduit servicing these areas will be exposed and painted with enamel.

c. The floor and interior wall finish within areas of the facility subject to possible contamination will receive a 100 percent epoxy, "decontaminable" coating.

d. The remaining Process and facility support areas will have a hardener/sealer compound applied to the exposed concrete floor surfaces and an epoxy enamel applied to the wall surfaces.

FIGURE 7-4
WRAP 2A VIEW FROM SOUTHWEST

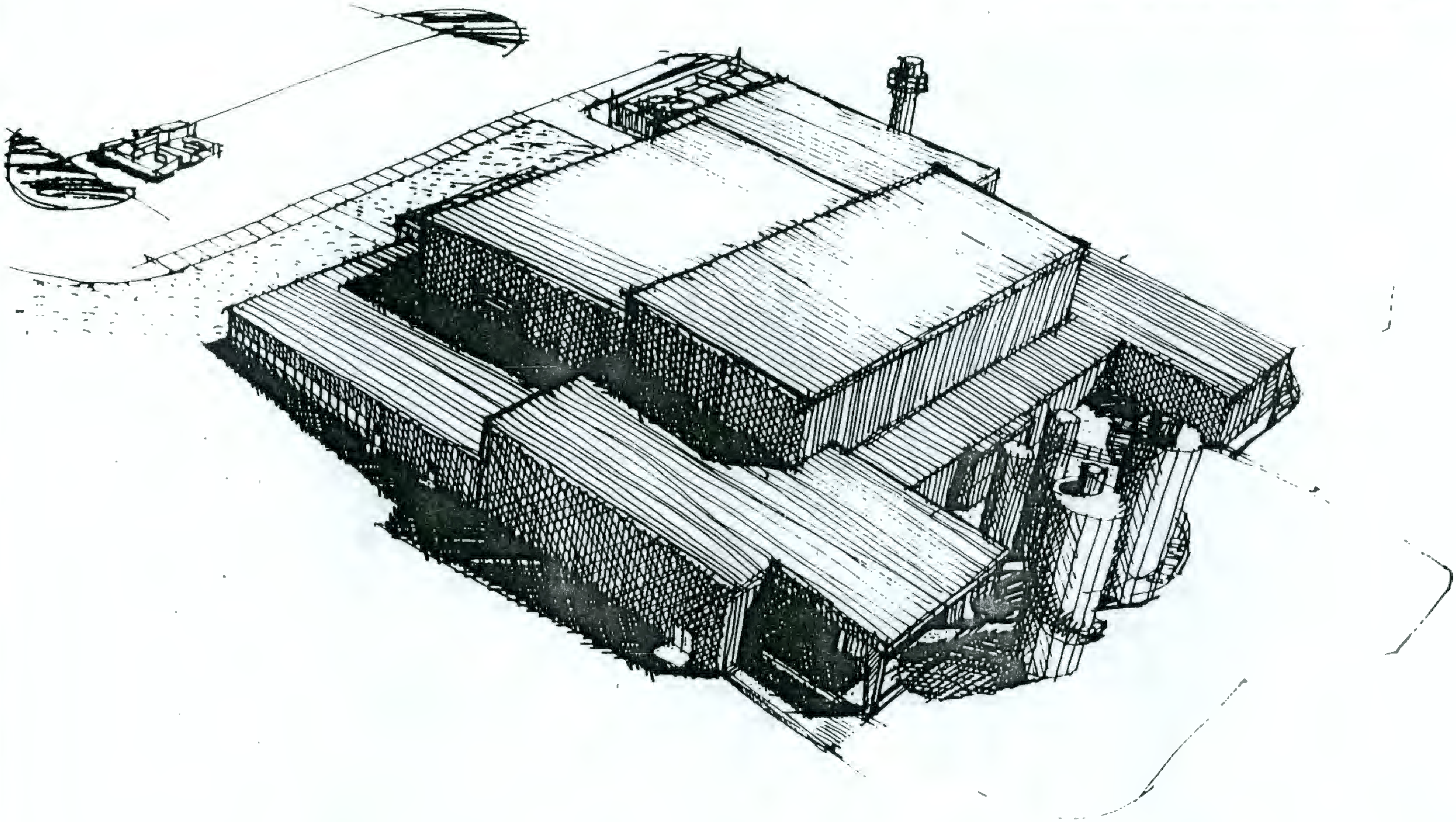
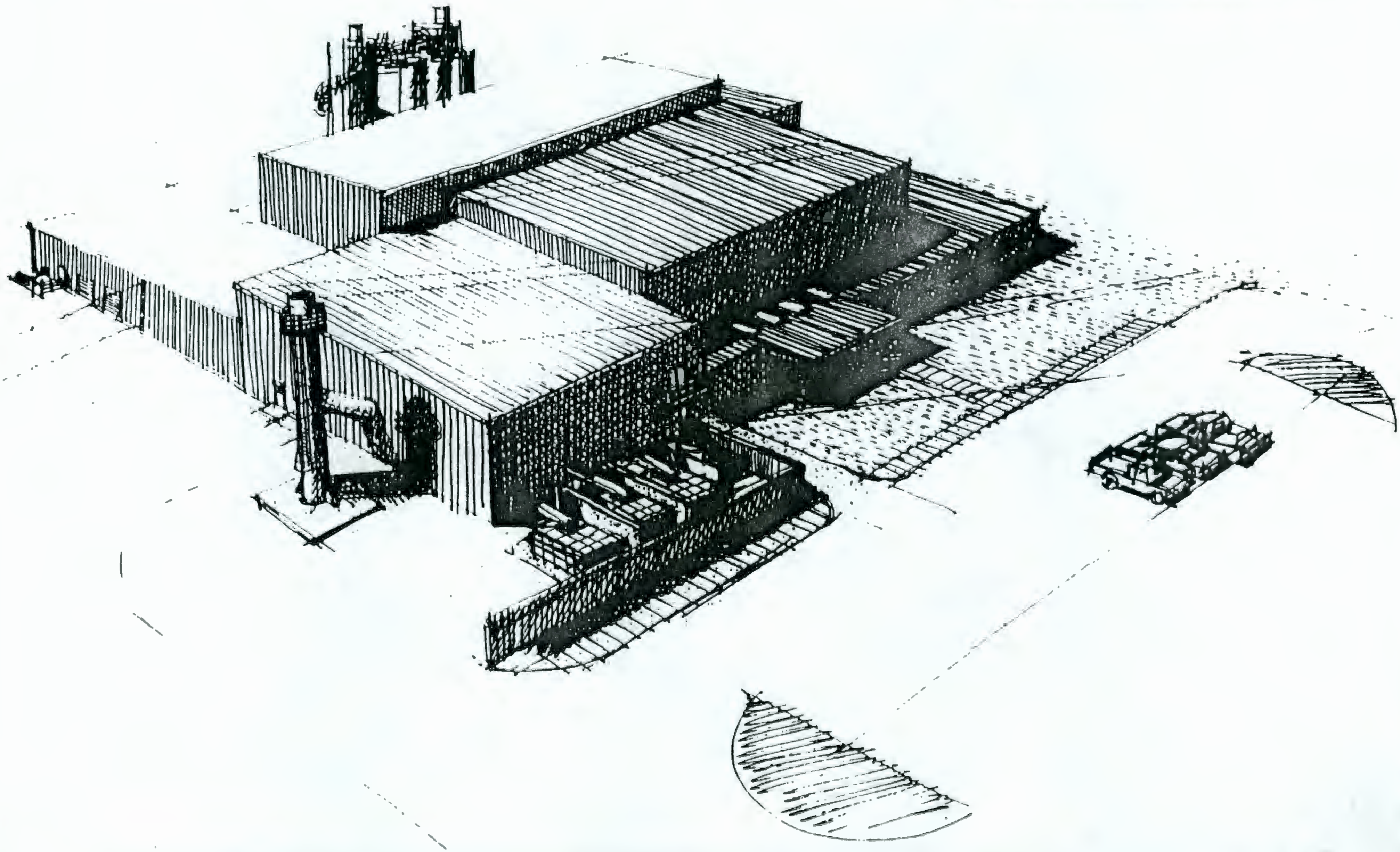


FIGURE 7-5
WRAP 2A VIEW FROM NORTHEAST



e. The finished flooring material in the personnel support spaces will be sheet vinyl, rubber tile, or vinyl composition tile where appropriate. The floors in the administration, lunch, and conference spaces will receive a commercial grade carpeting. Interior partitions in these spaces will receive texture, primer, and a two-coat system of latex paint. Vinyl wall fabric will be utilized as a design accent and where suggested for maintenance reasons.

f. Floors and wall surfaces in toilet rooms and shower areas will receive ceramic tile where appropriate.

g. Suspended ceilings in "finished" spaces will be painted gypsum board in toilet rooms, janitor closets, and service areas; and exposed grid/lay-in acoustic tile in the remainder of the spaces.

7.3 Utilities

7.3.1 Electrical

7.3.1.1 Introduction

1. The system provides power for all normal operational and standby loads. It also provides UPS power to various systems and power conditioning to sensitive systems. Primary service is brought to wrap 2A from existing Hanford facility services. The Wrap 2A interface starts at a disconnect located on the overhead system. High voltage cable is then brought underground to three 3000 KVA transformers. Secondary power distribution is from these transformers.

7.3.1.2 Feeds and Throughput

1. The maximum electrical demand is projected to be approximately 6,150 KVA. The load factor with three 3000 KVA transformers is approximately 68 percent. Three phase primary service is supplied to the site from existing 13.8 KV overhead lines.

7.3.1.3 Design Requirements

1. The electrical system design complies with functional design criteria requirements and design basis criteria. Detailed discussion is provided in Section 2.1 of Volume V.

7.3.1.4 Process Description

1. Primary Service

Three phase primary service will be brought to the site from an existing 13.8 KV overhead line.

2. Building Service

The primary power is transformed to three phase 480/277 volt solidly grounded wye at each transformer and enters the building via three overhead, 4000 amp bus ducts. The bus duct terminates at a line up of low voltage switchgear in the electrical room. Metering will be provided on each incoming feeder, and will include three phase volts, amps and watthours. In addition, each feeder will send a loss of power signal to the control room for power loss/recovery procedures.

3. Alternate Power

Alternate power in the form of emergency or standby engine generators will not be provided. However, portable engine generators up to 45 KW are available at Hanford, usually within one hour. In order to take advantage of this, a plug-in receptacle will be provided. The receptacle will be located outside, on the northeast wall near the electrical room. Such emergency generators will be compatible in voltage and power output with the building requirements.

4. Distribution

a. Utilization Voltages: Two voltage systems will be established in the plant. They include a 480Y/277 Volt, three phase; and 208Y/120 Volt, three phase, and 120 single phase.

b. Lighting: All lighting will be served by a 480Y/277 volt panelboard in the electrical room.

5. Communications

a. Communications will be provided based on criteria delineated in the FDC. Capabilities and interface requirements for systems specified are currently to be determined. Additional information will be developed during title design to complete project requirements.

b. Telephone System: Conduit, cable, junction boxes, wiring for telephone outlets, type RJ-11 or RJ-45 and LAN outlets will be provided. No end instruments are required. The number of outlets will be determined during title design.

c. PA System: Approximately seven speakers for low noise areas, nine for high noise areas, and PA system electronics. Conduit, wire, and junction boxes are included. Separate conduit system for 70V power and audio signals will be provided.

d. Emergency Evacuation System: Conduit, cable, junction boxes for sixteen speakers will be provided. A sound generator amplifier is provided. Details of Interface requirements to site system will be addressed in the Title I design. Telephone and LAN interfaces for work stations or office areas will be via power poles with appropriate telephone/LAN jacks as required. Interfaces with the CASS system and Hanford Fire Department need further definition and will be included as Title Design proceeds.

6. Uninterruptible Power Supply (UPS)

a. A solid state UPS with static transfer switch and 55 minute gel cell sealed batteries will be provided. Batteries shall be located in a cabinet attached to the UPS electronics and provided as a single shipping unit.

b. The UPS will support the following loads:

- Data Management System
- Operator Consoles (3)
- Distributed Control Cabinets
- Criticality Alarms
- Radiation Monitors
- Stack Monitor Systems
- Emergency Evacuation Systems
- Closed Circuit Television (CCTV) System

7.3.2 Fire Protection

7.3.2.1 Introduction

1. Fire protection at the WRAP 2A facility will be provided by a combination of automatic wet pipe sprinkler systems, automatic dry pipe sprinkler systems (for exterior and building exposure

protection), hose connections (standpipes), manual dry chemical extinguisher, smoke and heat detectors, and an alarm system. A detailed description is provided in **Volume V**.

7.3.2.2 Design Requirements

1. The design goal of the fire protection system is to provide safe and reliable fire protection, alarm, and detection systems with adequate interlocks and alarms to alert operators against unsafe system conditions. The systems selected incorporate best available technology, comply with the requirements of DOE and WHC criteria, conform to NFPA requirements and guidelines.

7.3.2.3 Process Description

1. The water supply for the fire protection system will be taken from an existing 12 inch potable (sanitary) water main. Two separate sources of water will be supplied to the facility from this existing main. The fire protection system will consist of two looped sprinkler systems. Each system will be supplied via two separate and independent risers. Sectional valves, complete with valve tamper devices, will be provided to allow isolation of portions of the sprinkler system (i.e., zones) and prevent a single active component failure from disabling the complete fire protection system. Sprinkler system control valves and associated alarm devices shall be located in a non-controlled (non swp) area.

2. Automatic wet or dry pipe sprinkler protection is provided throughout the facility. The glovebox enclosures will be protected with pre-action sprinkler to minimize the potential for accidental water discharge. Drum rack storage will be protected with in-rack sprinklers per NFPA 231C. The outside polymer storage area will be provided with automatic dry pipe sprinkler protection. Building exposure protection in the area of the polymer storage is also provided by dry pipe sprinklers.

3. An automatic smoke and fire detection and alarm system, combined with manual fire alarms, will be provided throughout the facility. All alarm initiating devices and alarm indicating appliances will be supervised. All trouble and alarm signals will annunciate both at the facility Fire Alarm Control Panel (FACP) and at a centralized alarm facility. All alarm signals will also annunciate locally.

4. All sprinkler system control valves and alarm devices will be located in non-contaminated areas.

7.3.3 HVAC System

7.3.3.1 Introduction

1. The HVAC system will provide the following functions.

   a. The facility will be designed to meet various plant operating requirements during the normal mode of operation and during a postulated design basis accident (DBA).

   b. In process areas, the design philosophy of the system will be to protect the outdoors from airborne contamination particulates generated by the waste treatment processes and also provide for a safe and comfortable working indoor environment within the as low as reasonably (ALARA) guidelines. The process areas will be kept at a negative pressure with respect to the outdoors.

   c. Provide proper environmental conditions for the health, safety and comfort of personnel.

   d. A detailed description of the HVAC system is provided in **Volume V**.

7.3.3.2 Design Requirements

1. The following outdoor design conditions were used as a basis for equipment sizing:

The design ground temperature ten feet below grade shall be 55°F.

Latitude 46°0' longitude 119°30'.
Elevation 710 feet above sea level.

AMBIENT AIR CONDITIONS	TEMPERATURE	
	°F DB	°F WB
WINTER		
Zone I and II Areas	9	--
All other Areas	12	--
SUMMER		
Zone I and II Areas	101	68
All Other Areas	98	66
Cooling Tower	101	68
Mean Daily Temperature Range	30°F	--

2. For heating design in conjunction with the above design temperatures, the wind velocity shall be 15 MPH from the WNW (Winter). For cooling design the wind shall be 7 MPH from the WSW (Summer).

3. The following indoor parameters were used for equipment sizing:

	CONDITIONED SPACE TEMP	
	WINTER	SUMMER
■ ZONE 1 AREAS (Zone I air will not be separately conditioned since it will be drawn from Zone II process area.)		
■ ZONE II AREAS		
Temperature °F (DB)	75	75
Relative Humidity Percentage Minimum	30	30
■ (Computer and Control Rooms)		
Temperature °F (DB)	72	72
Relative Humidity Percentage Minimum/Maximum	30/50	30/50
■ (Administrative & Support Areas)		
Temperature °F (DB)	72	78
Relative Humidity Percentage Minimum	30	30

4. The HVAC system will be designed to comply with DOE Order 6430.1A and ASHRAE 62-89. The system will be designed to be energy efficient in accordance with DOE 6430.1A. The system shall be functionally designed as follows:

a. Air quantities supplied to the spaces will be based on the dilution requirements of hazardous materials, heat gains in space via equipment and calculated heat loads.

b. The supply air will be distributed to provide uniform distribution. The air flow patterns will be downward, and designed to minimize eddies and areas of stagnation, and restrict the spread of contamination.

c. Ventilation system will establish and maintain a negative pressure gradient to provide airflow from uncontaminated areas to the areas of higher potential for contamination.

d. The ventilation system will be provided with detectors and will be alarmed to report and record its status.

7.3.3.3 <u>System Description</u>

1. The HVAC system configuration for the facility is shown schematically in **Figures 7-6, 7-7 and 7-8**. The HVAC confinement zones are indicated in **Figure 7-9**.

2. Zone I, which comprises of interior of the primary confinement, is purged with conditioned air at the rate of 15 air changes per hour. Air is supplied to the Zone I enclosures from Zone II process area. Zone II comprises of the process area surrounding the primary confinement, and the process equipment room which houses the HEPA filter units.

3. The area next to the process area which is designated as an access corridor, and Shipping and Receiving area is classified as non-contaminated Zone III. Zone III includes administration and support areas as well as HVAC equipment room located at the upper level. Zone III will be maintained at a positive pressure of 0.05 inch WG to ensure minimal potential for transfer of contamination from Zone II area into Zone III.

4. Zone I Supply and Exhaust: Makeup air handling units will provide conditioned air to Zone I via Zone II process area. Exhaust air from Zone I enclosures will be equipped with exhaust filters consisting of two stage HEPA and prefilter assembly. Air exhaust air will be directed to the stack via exhaust fans.

5. Zone II Supply and Exhaust: Zone II supply air distribution system consists of four air handling units (one of which is a standby unit) supplying conditioned air to Zone II. The entire process area air will be once through and will be exhausted to ambient via two stage HEPA filter trains.

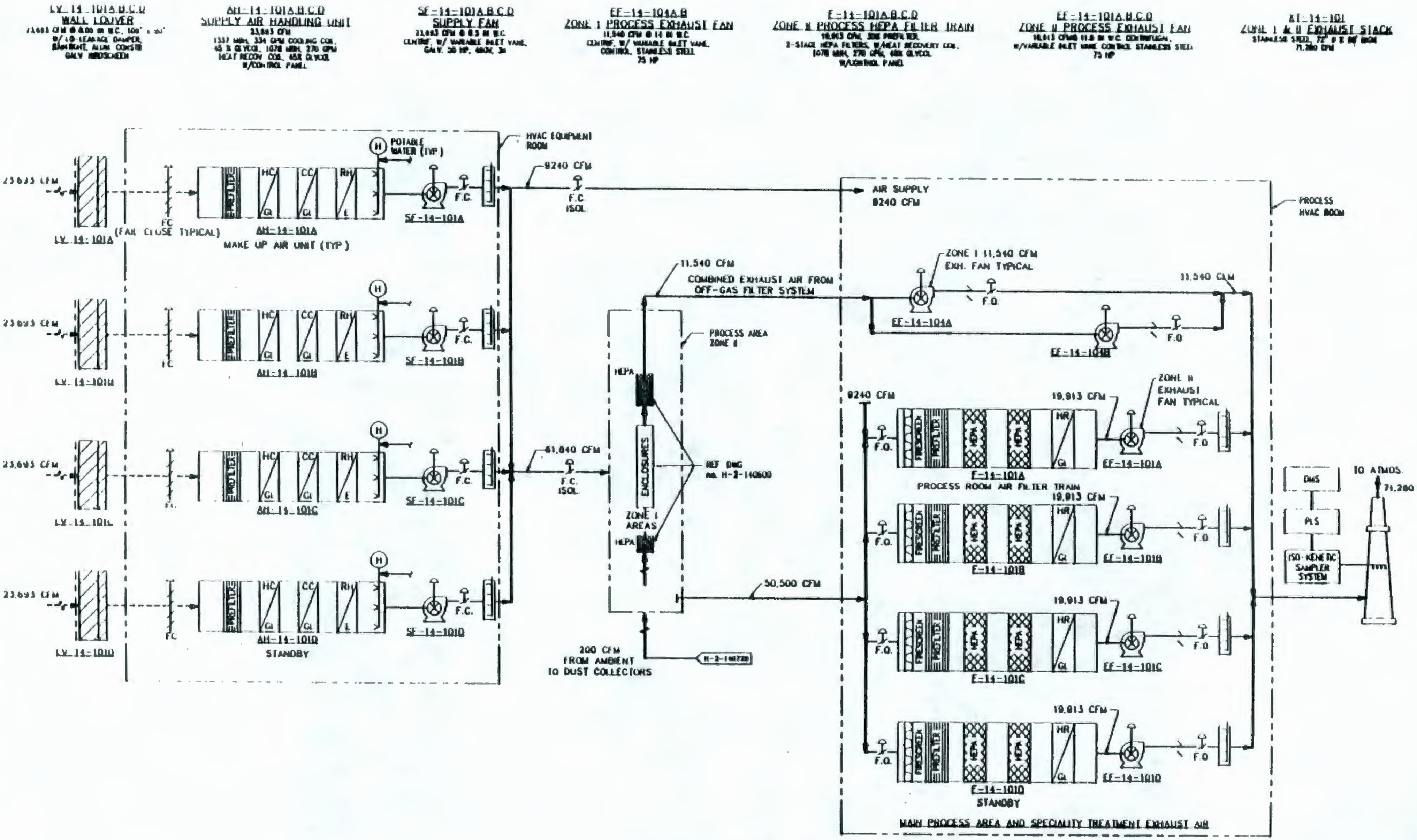
6. Zone III Supply and Exhaust: A separate air handling unit will be utilized to supply conditioned air to the administration and support areas. The HVAC system will be a variable volume type to achieve energy savings.

7. Change Rooms/Locker Rooms: A 100 percent outside air makeup unit with heat recovery wheel will be utilized for change rooms and locker rooms. Heating will be done using electric coils.

8. Shipping and Receiving: The area will be served by a package air handling unit. This system does not require a redundant unit. Air from the space will be returned back to the unit. No HEPA filtration is required.

9. Mechanical Equipment Room: The mechanical equipment room will house supply air handlers, chillers, pumps and fans. HEPA filter train units are not located in this room. A packaged makeup air unit with 100 percent outside air will serve the space for summer cooling. Heating will be accomplished using electric heating coils.

FIGURE 7-6



MASTER HVAC FLOW DIAGRAM
PROCESS AREA

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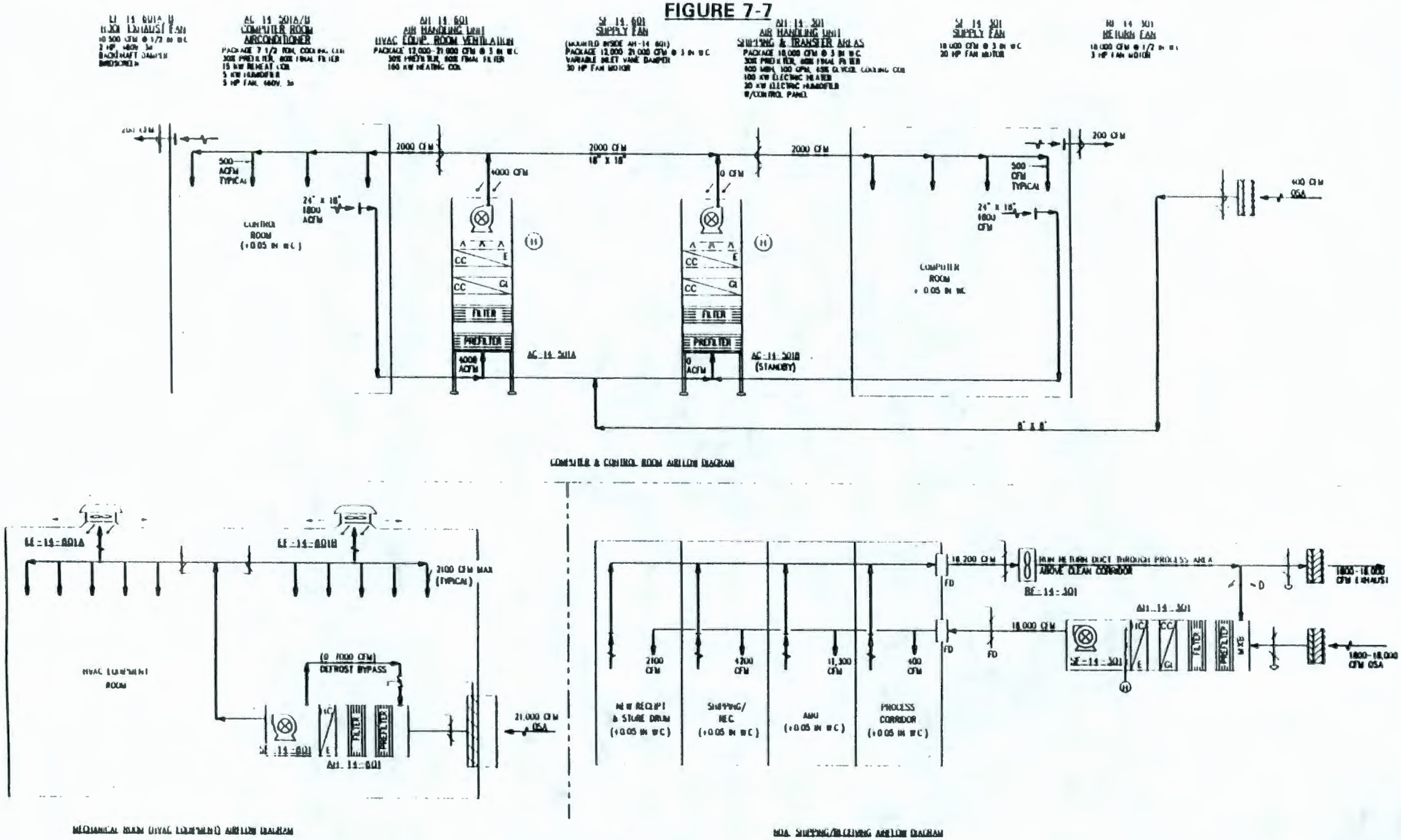
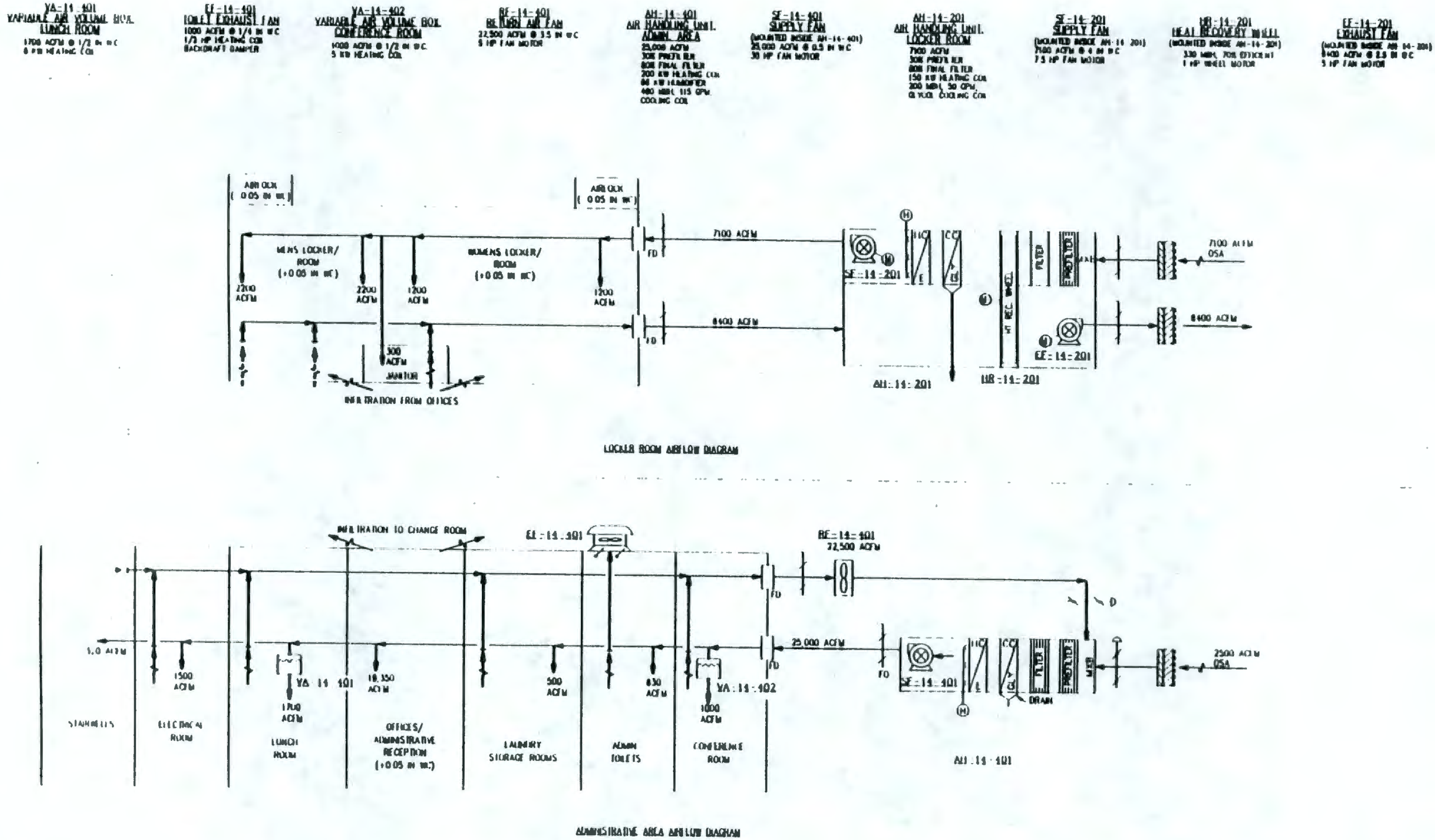
FIGURE 7-7



HVAC AIRFLOW DIAGRAM
SHIPPING/RECEIVING, COMPUTER,
CONTROL & MECHANICAL ROOMS

FIGURE 7-8



HVAC AIRFLOW DIAGRAM
ADMINISTRATION & LOCKER ROOMS

FIGURE 7-9
WRAP 2A CONCEPTUAL HVAC ZONE PLAN
PAGE 1 OF 2

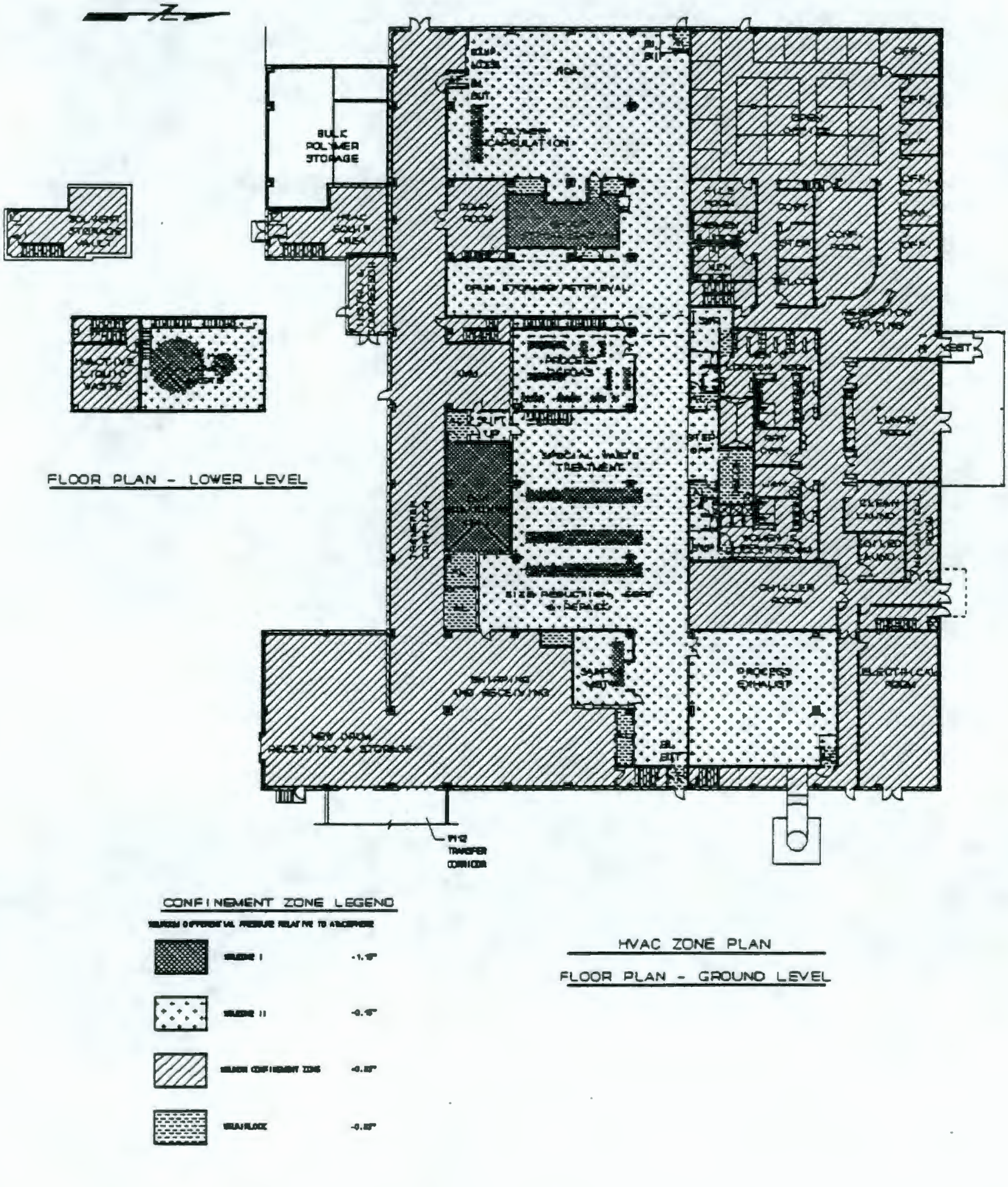


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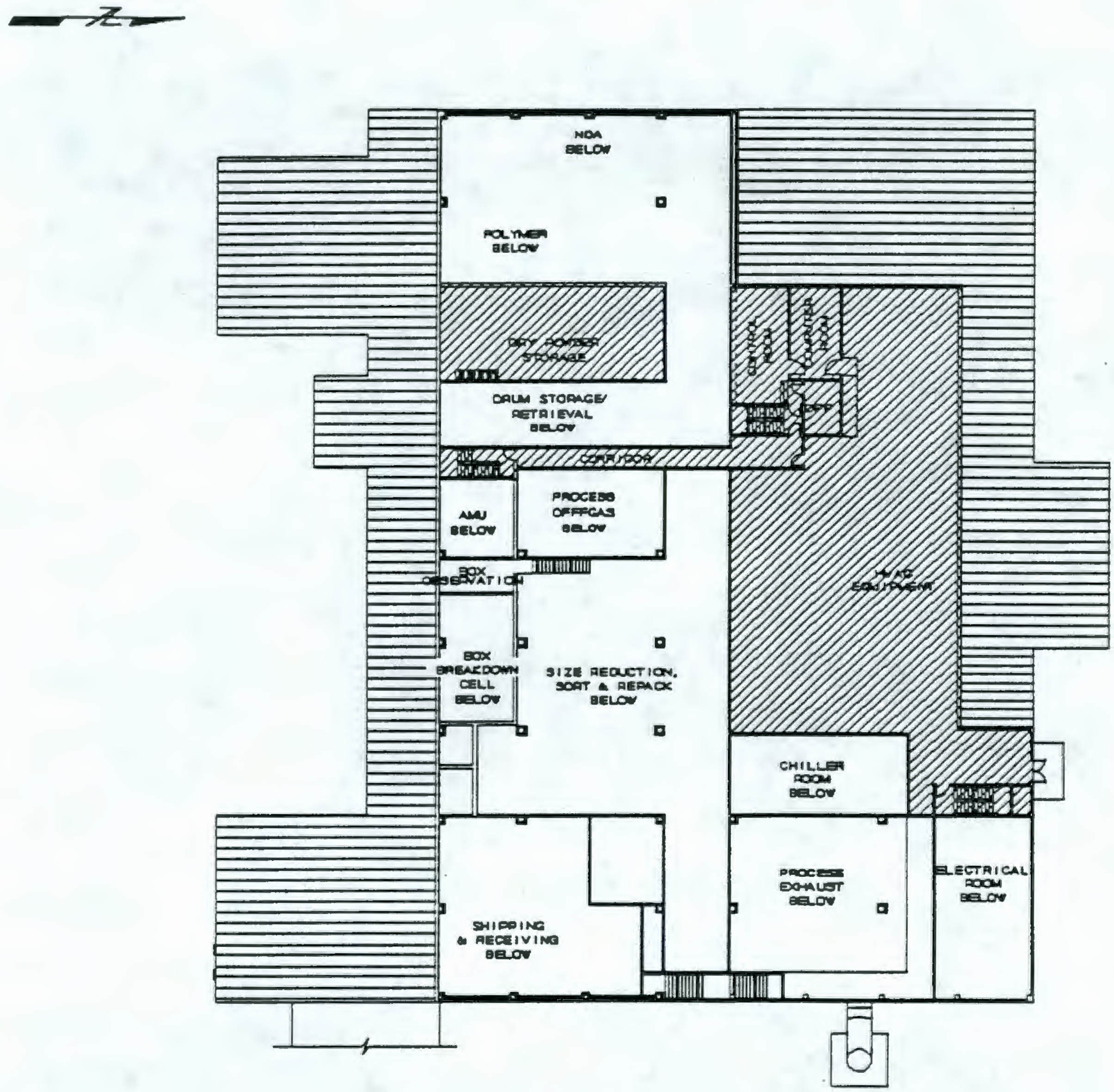
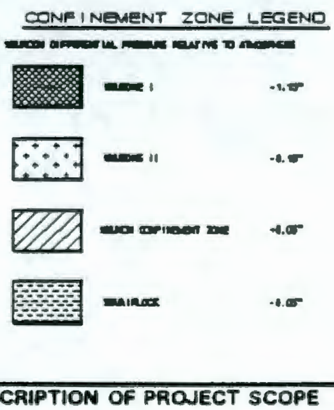
FIGURE 7-9
WRAP 2A CONCEPTUAL HVAC ZONE PLAN
PAGE 2 OF 2





HVAC ZONE PLAN

FLOOR PLAN - UPPER LEVEL

10. Computer/Control Room: Conditioned air will be supplied to the rooms via a packaged air handling unit. A 100 percent redundant unit will be provided.

11. Chilled Water System: The building cooling will be accomplished by using two water cooled centrifugal chillers and associated cooling towers. Chilled water will be pumped to the cooling coils located in the air handling units.

12. Heating Requirements: The building heating will be accomplished by using electric heating coils located in respective air handling units.
13. Controls: The HVAC system will be controlled by a state-of-the art distributed control system with mimic panels and operator control at the central control room, with the capability to start/stop and change set points of the system. Alarms and out-of-tolerance conditions will be annunciated at the control room.

7.3.4 Potable Water

1. Potable (sanitary) water will be provided within the facility in accordance with the personnel loading and administrative requirements as identified in the functional design criteria.

2. The source of supply to the facility shall be by a new 3 inch service line fed from an existing Hanford facility 12 inch, 120 psig loop water main. A regulating station in the mechanical equipment room will reduce the maximum operating pressure to 75 psig. The facility system is sized to supply peak flow requirements with a system minimum residual pressure of 30 psig.

3. Four pressure reducing stations in parallel are provided to supply the main building header and a branch connection for irrigation. HVAC makeup and process water connections are provided on branch lines with integral backflow prevention. Local pressure indication is provided on the main header.

4. A 700-gallon electric storage type hot water heater is provided with a pressurized recirculation loop. This loop assures continuous hot water to the most remote fixtures. Local temperature control is achieved via manual and thermostatically controlled mixing valves.

7.3.5 Sanitary Sewer

1. The sanitary sewer system collects wastes from the administrative portions of the facility such as toilet rooms, sinks etc. The wastes flow by gravity to a new 4000 gallon septic tank and leaching field. All process effluents are isolated from this system. Radiation monitoring shall be provided on the sewage effluent line.

7.3.6 Compressed Air/Nitrogen Gas/Breathing Air

1. This system includes the instrument air compressors, air dryer, air receiver, associated filters and distribution headers. Also included within the system scope are the nitrogen generation skid and nitrogen receiver and the portable breathing air units.

2. The system capacities are based upon the following:

■ Compressed Air	125 PSIG 200 SCFM
■ Nitrogen Gas	70 PSIG 4 SCFM @ 98 percent purity
■ Breathing Air	Portable as required, ten-two bottle units throughout the Facility

3. Compressed Air: Two Rotary Screw Compressors are utilized to run in an automatic on-off mode with one compressor in standby and alternate start logic. The compressors are rated for 200 SCFM @ 125 PSIG. Air is supplied to an air dryer package which utilizes two heaterless

regenerative towers to produce dry air with a -40°F dew point. The air is pre-filtered before drying and final filtered prior to filling the 200 cubic feet instrument air receiver. Dry air is supplied from the receiver to instrument air users @ 90 PSIG and to utility (process) users @ 80 PSIG. Additionally, compressed air is drawn off at 100 PSIG and 13 SCFM for the nitrogen generation skid. All equipment is located at grade, in an uncontrolled access area adjacent to the polymer and grout enclosures.

4. Nitrogen Gas: Nitrogen gas is generated at 4 SCFM and 98 percent purity utilizing a hollow fiber membrane system. The nitrogen is stored in a 24 cubic feet receiver and reduced to 70 PSIG prior to distribution. The nitrogen produced is utilized as a blanket gas for chemical storage and mixing tanks in the polymer system. Nitrogen is also required for the mercury evaporator and the reactive metals enclosure.

5. Breathing Air: Portable breathing air units (two bottles on portable rack with mask, hose and pressure regulators) are provided at entrance points to the following enclosures and process areas:

- NDA Area
- Grout Enclosure
- Polymer Encapsulation Area
- Hazardous (Non-active) and Active Waste Tank Areas
- Size Reduction Enclosure
- Box Breakdown Area
- Pug Mill Enclosure
- Special Waste Enclosure
- Sample Management Area
- Process HVAC Area

7.3.7 Process Water/Process Chilled Water

1. Process water consists of a distribution header which is supplied from the potable water system, with backflow prevention and system isolation provided. The system supplies decontamination, grout mixing, chemical scrubber makeup, aqueous makeup, secondary liquid waste collecton, hose stations, HVAC makeup water and sample management.

2. Process chilled water is comprised of a pair of closed loop systems. One is provided to cool the polymer bulk storage tanks (to extend polymer life); and a second is provided to cool the circulation loop in the off-gas scrubber, the mercury evaporator condenser, and the polymer encapsulation vapor condenser.

3. Process water loads are detailed in the facility overall water balance. Water is supplied to the header @ 70 PSIG. Approximately 20 GPD is used for decontamination. Approximately 50 GPD is used to make up the chemical scrubber, 2 GPD for aqueous make-up and 25 GPD in the sample management area.

4. Process Chilled Water System: Process chilled water is sized to provide a maximum of ten (10) tons of cooling with two (2) redundant 5 ton chillers. Two process chilled water loops use an air cooled chiller to cool chilled water (45 percent propylene glycol) from 57°F to 42°F. The chiller capacity is five tons. One loop is considered the "active" system for cooling potentialy contaminated process streams and the second is a non-active system for non-contaminiated process streams.

5. Active Process Chilled Water System: The active process chilled water system is designed to provide 4.5 GPM of chilled water at 42°F to "active" process users. Two active chilled water pumps P-12-501A, B (one operating and one spare) circulate warm (57°F) return chilled water through a process chiller evaporator to cool the chilled water to 42°F which then flows to the

polymer encapsulation vapor condenser, the mercury evaporator condenser and the special waste chemical scrubber circulation cooler. These condensers and coolers handle radioactively "active" streams.

6. Non-Active Process Chilled Water System: To minimize the amount of potentially contaminated chilled water in circulation, a separate non-active process chilled water system is provided. Like the active system, the non-active process chilled water system is designed to provide 4.5 GPM of chilled water at 42°F to "non-active" process users. Two non-active chilled water pumps P-12-502A, B (one operating and one spare) circulate warm (57°F) return chilled water through a process chiller evaporator to cool the chilled water to 42°F which then flows to the VES resin tank cooler, the extender tank cooler and the mixed polymer tank cooler. These cooling requirements are necessary only during the warmer months to keep these insulated polymer tanks (located outdoors) below 70°F.

7.4 Special Equipment/Process Systems

7.4.1 General

1. Waste received for processing will be in either "standard" drums (55 gallon or 83 gallon capacity) or in boxes or "non-standard" drums (up to 110 gallon in capacity). "Standard" drums will be routed through Shipping and Receiving directly in to the Size Reduction and Repackaging area. Boxes and "non-standard" drums will be routed through a large item breakdown area into the Size Reduction and Repackaging area.

2. The main processing route for the majority of the waste received at Module 2A will be through Shipping and Receiving, Size Reduction and Repackaging, Lag Storage, NDA, Encapsulation (Grout or Polymer), certification and back via Shipping and Receiving to appropriate storage or disposal. The process also includes input verification sampling, large item breakdown, special treatment, decontamination and product/process verification sampling.

7.4.2 Shipping and Receiving

1. Drums containing waste are transferred into the Shipping and Receiving area, banded four to a pallet, by fork lift truck. It is assumed at this stage that these drums have already been verification sampled, and the analysis received, enabling the operating staff to select processing parameters of a drum lot. This verification sampling is discussed in Section 7.4.11.

2. Pallets of drums are placed by the fork lift truck onto an accumulation conveyor, and roll by gravity to the depalleting station. The pallet band is manually cut and the drums are loaded by jib crane onto a powered drum feed roller conveyor. The drum bar code is read at this stage, and the drum is transferred via an airlock into the Size Reduction and Repackaging area.

3. Boxes and larger drums containing waste enters the box breakdown area double airlock via a direct transfer by fork lift trucks.

4. Storage space is provided in an adjunct to the main structure for up to 432 new 55-gallon drums which are to be utilized in the process. These drums are transferred by fork lift truck onto a powered in feed roller conveyor, and from here they are transferred through an airlock into the AGV transport corridor, for destination as required for the process.

5. Filled 55-gallon drums of outgoing encapsulated waste are transferred from the AGV transport corridor via an airlock into the Shipping and Receiving area, and are re-palleted for transfer from Module 2A, back to W-112.

7.4.3 Size Reduction and Repackaging

1. There are two separate main process lines within the Size Reduction and Repackaging area. The first line will deal with the bulk of the dry active wastes entering the facility, and will utilize shredding technology as a necessary preparation before final encapsulation. The second line will deal with the sludge, crystalline materials and absorbed chemicals, and will utilize a pug mill for these streams. Materials such as soils and incinerator ash which are dry and dusty will enter the shredding line, but will be directly dispensed into new drums without passing through the shredders.

2. The technology and equipment which has been developed for the drum entry, opening and sorting operations within a glovebox, has very similar application for their area of the WRAP 2A facility. The WRAP 1 equipment and enclosure design concepts have been incorporated where applicable, to minimize the potential for spread of contamination, and to facilitate operator access to the process area.

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7.4.3.1 Shredding Process

1. The shredding line will consist of several joined gloveboxes housing the following main unit operations:

- Drum entry
- Drum opening
- Drum elevation and tipping
- Waste sorting
- Shredding
- Waste metering
- Repackaging in new drums

2. The first four operations listed above will be based very closely on the similar operations from WRAP 1. Drums will enter the entry glovebox via a simple double lid system, and will be handled through an airlock door onto a drum pusher. The drum will then be transferred to a delidding station, which will utilize saw units to cut the clampband, and a suction lifter device to remove the lid. The opened drum can then be elevated by the drum grab and tipper at one of two locations either into the shredding line or directly into the waste repack line. Waste will have been fully characterized prior to entering the process, and hence the decision as to which of the two tipping stations to use will already have been made within the Plant Control System. There will be provision made for a CCTV inspection into an opened drum to verify contents prior to tipping.

3. Waste requiring size reduction will be elevated to the higher tipping station and tipped into a reciprocating sorting table where manipulator access can be utilized to remove any items which may not be shreddable. Such items will be transferred out of the glovebox by bagless transfer means and returned to W-112. The bulk of the waste will be tipped by the sorting table into the shredders, which are located one on top of the other, in a confinement "tunnel".

4. The first stage shredder will be a standard hydraulically-powered heavy industrial shredder, of approximately 300 hp. The cutter-box of this type of shredder contains two low RPM counter rotating sets of teeth which tear the material apart. The second stage shredder will be approximately 150 hp and will utilize a shaped grid below the cutter box to ensure a relatively uniform output of material which has no envelope dimension greater than 2 inches.

5. This shredded material falls onto a vibrating conveyor which discharges into a weigh hopper. This can then be utilized to meter a pre-determined amount of waste into drums. This metering is necessary to access formulations for grout or polymer in order to achieve required product quality.

6. Waste which can be directly metered into drums can be tipped at the lower of the two tipping and sorting stations, and can be tipped directly onto the vibrating conveyor from the sorting table. Again the ability exists to inspect waste and remotely remove unsuitable items at this stage.

7. All emptied original drums which enter this area will also be shredded. The shredding process will be required to deal with items which are as difficult to size reduce as a supercompacted waste drum (from WRAP 1) or a drum of cement (previously Sorbonded 183H Solar Basin Waste). At this stage it is assumed that the shredders proposed will cope with such materials, although further consideration will need to be given to size reduction of such items. For instance, "pre-treatment" may need to be provided either within the large item breakdown area, or may be provided immediately prior to the first stage shredder.

7.4.3.2 Pug Mill Process

1. Waste forms which are sludge-like in nature (e.g., absorbed solids, 183H Basin sludges) require processing through a pug mill, in order to better homogenize the material and to meter it into drums for encapsulation. This will be accomplished in a separate process line from the shredder line, within the Size Reduction and Repackaging area. Again, the pug mill and associated equipment will be housed in a glovebox suite within the area.

2. The front end processes of drum entry, drum opening, drum elevation and tipping and waste sorting will be the same as previously described in the shredder line. The sludge-type waste remaining on the sorting table will then be tipped into the pug mill.

3. The pug mill itself consists of two intermeshing screw conveyors with paddles attached down the length of the screws. The capability to add fluid to the pug mill will be provided in order to produce a relatively homogeneous product. Fluid type and quantity will be determined during development trials. Material will discharge from the pug mill into a weigh hopper, which can then discharge metered amounts into new drums ready for encapsulation.

7.4.3.3 Large Item Breakdown

1. A large item breakdown area is situated between Shipping and Receiving and the Size Reduction and Repackaging areas. This area will receive waste boxes measuring up to 5' x 5' x 9' and large drums up to 110 gallon capacity. Boxes may weigh up to 12,000 lbs. and 110-gallon drums may weigh up to 3000 lbs.

2. Waste will enter this area on fork lift trucks via a double airlock from the extended W-112 transfer corridor. Within the area an overhead gantry crane will be utilized to maneuver boxes to a lay down area, where an overhead mounted power manipulator system can be utilized to open the box and remove and deal with the contents. Operations within this area will be initially remotely controlled from a local control console situated in the operating area immediately to the west of the cell. A range of tooling will be available to be operated from the overhead manipulator, to assist in these operations.

3. Once the main sources of radioactivity have been removed from the waste containers and drummed out of the areas into the Size Reduction and Repackaging area, it will be possible for the power manipulator to facilitate size reduction of the box or oversize drum. Again, the cut-up pieces of these containers will be removed in drums for further treatment in the Size Reduction and Repackaging area. The capability also exists to decontaminate and remove empty boxes from the cell for reuse.

4. It is expected that waste will be loaded into 55-gallon drums from this area, and will be shuttled between this area and Size Reduction in 83-gallon overpacks, utilizing a simple double lid bagless transfer arrangement.

5. Also included within the Large Item Breakdown area will be a large band saw, which will be utilized not only for cutting up large items from the boxes, but will also be utilized for cutting up drums of 183H basin wastes which are found to be solidified (i.e., "Sorbonded" waste). In the extreme case, a drum of fully cured "Sorbonded" waste will be difficult for the shredder to deal with, and will be cut into several smaller pieces which can then be fed to the shredders.

6. It is anticipated that the bulk of the boxed waste to enter this area will consist of HEPA filters that are too large for placement into 55-gallon drums. Therefore, a filter compactor will be included in this area which will allow filters to be placed into 55-gallon drums.

7.4.4 Lag Storage

1. The Lag Storage area will be utilized to take the drums from the Size Reduction and Repackaging area and provide a buffer storage capability, prior to immobilization, and also to take immobilized drums which are enroute to Shipping. The AGV will deliver drums to a transfer station and from here an automated aisle stacker will take the drums into a storage rack system.

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2. The capacity of the Storage is 182 drums. This will be confirmed by a Time and Motion study and continuously reviewed as the design evolves. The storage rack system will allow stacking of a single row of drums either side of the aisle stacker, and will stack drums up to seven high within each single row.

7.4.5 Grout Treatment

1. The bulk grout ingredients are stored in large silos adjacent to the main facility. Solids distribution is effected by pneumatic powder transfer into the facility day silo within the main building.

2. The Grout Encapsulation area will be of a cell-type glovebox enclosure, and will contain the grout filling equipment, grout curing lag storage space, excess water inspection and removal, drum contamination checking and drum decontamination. As much of the grout mixing and transfer equipment as is practicable is kept outside the cell, in order to prevent it from becoming contaminated.

3. The wastes to be grouted are shown on **Table 6-1**, and are in summary those wastes which do not contain significant quantities of soluble salts, which would have an adverse affect on cementitious grouts. These waste feedstreams consist mainly of the dry active materials, and construction debris type materials.

4. The grout process utilizes the in-drum mixing of grout and waste. Two in-drum grouting processes will be utilized within the Grouting area, namely vibro-grouting and agitated grouting. Both processes are based on existing processes operating in the UK by BNFL.

5. The capability will be provided to produce required grout formulations from mixtures of Blast Furnace Slag (BFS) and Ordinary Portland Cement (OPC) or from Pulverized Fly Ash (PFA) and OPC. The precise formulations will need to be defined during a later study phase, on receipt of further waste characterization data. Collection of such data may involve development work also. For certain waste streams (e.g., construction debris) it is probable that a typical grout mix will be 3:1 BFS: OPC, with a 0.35:1 water to solids ratio. For other waste forms such as soils, further characterization data will be needed.

6. The shredded dry active solid wastes will be vibro filled. The waste drum will be offered up to a grout filling head, and it's lid will be removed by a double lid system into a grout filling enclosure which is within the cell. While both the cell and the grout-fill enclosure will be

ventilated to Zone 1 standards, it is anticipated that the cell will be operated as a Zone 2 level of allowable contamination buildup. Release of activity will be restricted to within the grout-fill enclosure where possible.

7. The drum weight and contents will be known prior to entering the Grout area, and a carefully metered amount of wet grout will be added to the drum, while it is vibrated from below. The lid will then be replaced on the drum and it will be moved by roller conveyor and crane hoist to a storage zone capable of storing sufficient drums to allow a 48 hour curing period. Following the curing period, the drum lid will be removed and a check made for excess water on top of the grout. Any excess water will be removed and recycled.

8. The throughput of the grout enclosure meets the FDC requirement for one shift per day. If this operational requirement is changed in order to increase throughput, advantage could be taken of the ability to move grouted drums after only twelve hours. Experience indicates that grout will cure sufficiently in twelve hours to be moved to storage outside the enclosure.

9. Sludge or soil type wastes will be grouted using an in-drum mixer system. Such drum will enter the Grout area on a second conveyor and will be positioned under a second grout-fill station within the grout fill enclosure. These drums will have been pre-fitted with an in-drum mixer, and will contain a known weight of characterized waste. Water will be added to the waste at this stage. Use will be made, where possible of the recycled contaminated water arising from decontamination operations, or recycled bleed water. A drive unit will then be connected to the in-drum mixer, and the material will be homogenized to a cream-type constituency. Dry mixed grout materials, which have been carefully blended and batched will then be added to the drum and the contents will be agitated for a sufficient period of time to homogenize the contents. The drum will then be re-lidded, and moved to the gravity accumulation roller conveyor for curing.

10. The in-drum mixer is a "lost paddle" system, which means that the mixer (paddle) will be left to remains in the final waste monolith and will not be retrieved. Following the check for excess water, drums of grouted waste will be checked for external contamination by an operator at a station outside the grout cell, using through wall penetrations and gloved access. If a drum is found to be contaminated above acceptable levels, then it will be decontaminated, first by manual wiping methods but if this proves ineffective then by high pressure, low volume water jets. Clean drums will then exit the cell via on airlock and be transferred by the AGV to the Shipping area via Lag Storage if necessary. Personnel access, primarily for maintenance is also provided to the grout cell.

7.4.6 Polymer Encapsulation

1. Wastes which are not suitable for grout encapsulation due to their high soluble salts (e.g., ammonium sulphate from the LETF) content will be encapsulated in a vinyl-styrene ester (VES) polymer. Such wastes will have been metered out in the Size Reduction and Repackaging area and transferred to the Polymer Encapsulation enclosures by the AGV. There are four polymer-filling stations, which will be enclosed in a similar manner to the grout filling stations. All four stations will be equipped to accommodate either vibro-filling or in-drum mixing. Additionally, one station will have the added capability of removing displaced liquids from the waste form to be encapsulated (e.g., from resin beads). There are four stations in order to meet throughput and availability requirements.

2. The bulk polymer storage materials are stored in an adjunct to the building, as they are potentially hazardous low flash-point materials. There are four main constituents which make up the polymer, namely vinyl ester styrene (VES) resin, promoter, extender and catalyst. The extender is a viscosity controlling reagent while the promoter and the catalyst accelerates the polymerization process. Additionally, a solvent is used to periodically flush out the tanks.

3. The bulk VES resin and the extender both contain styrene and, therefore, need to be kept at a relatively controlled temperature (optimally below 75°F) in order to prevent polymerization. An external heat exchanger is used for this purpose. The polymer mixing tank, for the same reasons stated above, also needs to be temperature controlled, and has an external heat exchanger circuit. As an additional safety feature, all bulk storage tanks and the mix tank will be blanketed with nitrogen.

4. The polymer encapsulation stations are located adjacent to the W-112 transfer corridor, in order to minimize the length of lines which handle the materials. Further it is necessary minimize the length of the lines in which the fully mixed polymer is handled, and this is traded-off against the need to minimize the hold-up of material within the building. Three of the polymer ingredients (VES resin, extender and promoter) are mixed externally to the main building in a mixing tank, and are piped to the filling stations. At the filling stations, there are very similar capabilities provided as for grout encapsulation i.e., damp or sludge like materials will be in-drum mixed with polymer, and dry materials will be vibro-filled. In the case of the former, the pre-mixed resin and the catalyst will be mixed within the drum, and in the latter case these ingredients will meet and be mixed in a static in-line mixer, immediately above the drum to filled.

5. A compressed air supply will be run to each in-line mixer, to allow the mixed resin to be blown out after each operation. Eventually, it is anticipated that resin will build up in the in-line mixer and lines to the drum, and this will then need to be removed and cleaned with appropriate solvent. Spent solvent will be transferred to the hydrocarbon waste tank and loaded out to drums or tank truck and treated offsite as hazardous waste. Consideration will be given later in the design to use of disposable in-line mixers.

6. As noted above, one of the four filling stations has a vacuum liquid removal system, to allow removal of displaced water which is known to arise from the polymer encapsulation of ion exchange resin beads. This water will be collected and routed to waste water treatment, and may be recycled to the grout encapsulation process.

7. Once filled with polymer, the drums will remain at the filling head for approximately 20-30 minutes to allow the resin to set-up, and then they can be re-lidded and moved to the Lag Storage or to Shipping.

8. The much quicker "curing" time in the case of polymer encapsulation over grout encapsulation is the main reason for the absence of a Zone 1 ventilated cell around the polymer encapsulation station. There is no need to store the drums for curing in the enclosure as with grout. Polymer encapsulation operations will be locally controlled from an appropriately located console.

9. After initial gelling of the polymer, and subsequent inspection for free water, each treated drum will be capped and transferred to the polymer cure storage area for cure monitoring. The drums will be monitored for 48 hours for temperature exotherm. Any additional monitoring requirements which may be required will be defined by the polymer treatability test program.

10. The polymer encapsulation process itself is not totally proven at this scale of operations, and hence is the subject of a development and testing program which is in-process and will continue during the Advanced Conceptual Design phase of this project.

7.4.7 Special Waste Treatment

1. Co-located within the Size Reduction and Repackaging area are the two Special Waste Treatment gloveboxes. These gloveboxes contain the pretreatment processes for lead and mercury wastes, and treatment for reactive metals, prior to their being encapsulated. These are

infrequent and low volume wasteforms and, therefore, are programmed to be campaigned through WRAP 2A, and hence it is not anticipated that both lead and mercury materials will be dealt with at the same time.

2. The process for treatment of lead involves the drum containing such waste being opened, and the contents tipped within the glovebox onto a sorting table. Here, pieces of elemental lead (e.g., lead bricks) can be segregated and placed into a basket, which will then be placed in a new output drum for macro polymer encapsulation. The basket is provided to centralize the waste within the drum, and provide a layer of polymer all around the lead items. Lead contaminated items such as lead-lined gloves, aprons, blankets etc. can be tipped from the sorting table into a small shredder, and then loaded into discharge bins, sampled for proper material size distribution, and then loaded into new 55-gallon drums for polymer encapsulation.

3. Mercury is anticipated as arising in two forms within the waste, either as elemental mercury or as mercury contaminated items. Mercury contaminated items will be routed from the sorting table, into the shredder and will then be transferred within the glovebox to be processed in a mercury evaporator, to reduce any mercury contamination to concentrations required per BDAT. Recovered elemental mercury will then be collected in bottles, and will be combined with other mercury which was covered during sorting of bulk contaminated solids. An amalgamating agent will be added to this elemental mercury, and the resultant amalgamated mercury will be bottled and loaded out into a drum for polymer encapsulation.

4. Reactive metals will be deactivated in the Special Waste enclosure. It is anticipated that the bulk of such wastes will be limited in the form of zirconium and beryllium fines, which will be screened from coarse metal and fed through a humidifier, and the resultant deactivated materials will be drummed for polymer encapsulation.

5. Off-gases from the mercury evaporator and the reactive metals humidifier will be routed through a reheater, an activated carbon absorber, and through "standard" HEPA filters, to remove hazardous and radioactive contaminants.

7.4.8 Decontamination

1. Decontamination systems are provided in all major process enclosures, and for specific design purposes, such as for drum decontamination in the grout enclosure. In areas such as the drum decontamination, the grout enclosures, and the polymer enclosures, fixed low volume, high pressure water sprays will be strategically placed to allow periodic clean-down of areas which will be anticipated to become contaminated, in order to reduce dose exposure to operators. In particular, the drum decontamination booth will supply water at approximately 1500 psi to clean drums, and it is anticipated that this water will be recycled and reused, until an unacceptable concentration of contaminants is reached. It will then be routed to the in-drum mixing grout encapsulation process (via sampling and analysis) as previously described.

2. In other areas of the process, decontamination wands will be provided and utilized to decontaminate areas, mainly in advance of maintenance activities.

3. The capability of adding proprietary decontamination solutions to the decontamination water supply will be provided. All used decontamination fluids will drain to appropriate storage tanks, which are located at subgrade level below the AMU area.

4. The Box Breakdown Area will be supplied with the capability to do ad hoc decontamination of large items transported from other areas (i.e., manipulators, shredders).

7.4.9 Secondary Waste Treatment

1. As an intrinsic part of the various process and process support operations, both radioactive and non-radioactive (but potentially hazardous) liquid waste will be generated at WRAP 2A. Sources of these wastes include decontamination, aqueous solution make-up, chemical scrubber blowdown, polymer displaced liquid waste, HVAC condensate etc.

2. Radioactive and non-radioactive streams are kept segregated to avoid cross-contamination. Both streams are collected, sampled, treated, and recycled to the fullest extent possible back into the process.

3. A back-up capability is provided to dispose of any excess radioactive liquid waste by transporting it to the CO18 LETF facility, and any excess non-radioactive liquid waste to be drummed and transported to another approved treatment facility. No untreated (regulated quantity) liquid effluents are released to the Hanford soil column.

4. Treatment of non-radioactive liquid waste is limited to collection, sampling, pH adjustment and recycling back to the vibro-grout process.

5. Treatment of radioactive liquid waste consists of collection, sampling, pH adjustment, carbon adsorption to remove organics, filtration to remove suspended/residual solids, and recycling back to the agitated grout process.

6. pH adjustment is accomplished by utilizing dilute sulfuric acid and dilute sodium hydroxide supplied from the aqueous make-up area.

7. Provision is also made to collect any excessive water generated by an upset plant condition, i.e., fire conditions, and pump to a truck-fill station.

8. All collection and treated waste storage tanks are located in suitable diked areas provided with sumps and sump pumps.

7.4.10 Off-Gas Treatment

1. The off-gas treatment system is designed to prevent the spread of airborne contamination, radioactive or hazardous, from process enclosures, vessels and tanks to the general process area or to the environment.

2. The off-gas system is a closed system which normally maintains process enclosures, vessels and tanks under a negative pressure; collects and treats off-gas from these confined areas; and then discharges to the Zone I ventilation exhaust system.

3. The enclosures, vessels and tanks serviced by this system are as follows:

- Acid and caustic feed tanks
- Decontamination solution tank
- Active and non-active liquid waste collection tanks
- Treated liquid waste storage tank
- Size reduction area shredders enclosure
- Size reduction area pug mill enclosure
- Box breakdown cell
- Special waste shredder enclosure (also used as campaigned reactive metals enclosure)
- Grout treatment enclosure
- Polymer encapsulation enclosure
- Sample management hoods
- Indoor grout silos

4. Filtered air is drawn into the confinement systems held at negative pressures. HEPA filters are used to protect against possible air flow reversals due to development of positive pressures within the tanks or enclosures. Inlet air filters are installed with upstream dampers to adjust negative pressure inside the confinements.

5. Tanks are vented at a flow rate of four air changes per hour while the enclosures are designed for a flow rate of 15 air changes per hour.

6. Exhaust gases from all tanks and enclosures located inside the process building are treated by various methods before being exhausted through redundant fans to the exhaust stack.

7. A double HEPA filtration is used on all streams to prevent contamination by active off-gases to non-active areas.

8. Off-gases from the AMU Tanks and the active and non-active collection/storage tanks are heated between 60°F to 100°F to prevent moisture condensation before passing through the downstream HEPA filters.

9. Off-gases from the size reduction shredder and pug mill enclosures are passed through an off-gas dust collector system, which are reverse pulse jet baghouses designed to remove a majority of the dust generated in these enclosures. Off-gas from the baghouses is combined with off-gas from the box breakdown cell before being exhausted through the HEPA filtration system. In the case of the special waste shredder enclosure, the downstream filter also includes two carbon filters capable of removing elemental and organic mercury which may be present in the special waste enclosure.

10. Off-gas from the polymer encapsulation enclosure is cooled to 45°F with chilled water in a vapor condenser in order to condense as much organic hydrocarbon vapor as possible. Non-condensed gases are passed through a pre-filter and HEPA filter to a carbon absorber to remove residual organics, before being exhausted through the final HEPA filter.

11. Sample management hoods are designed to draw air at 100 feet/minute through hood openings. Off-gas from the hoods is combined with off-gas from the drum sampling enclosure to flow through an off-gas HEPA filtration system which includes two carbon filters to contain mercury and organic hydrocarbon vapors.

7.4.11 Sample Management

1. Sample management operations in WRAP 2A encompass five (6) major objectives. They are:

- Lot verification
- Recharacterization (infrequent)
- Process Control
- Certification
- Destructive Examination
- Archival

2. Radioactive solid waste entering the facility will be sampled to verify the waste characterization for the "lots" of waste, so that the process treatment selection can be confirmed at entry. During process operations, samples will be taken routinely throughout the facility to ensure process quality control. Representative samples of the treated waste for a given "lot" will be sampled and, in conjunction with the results from the NDA, will provide information to allow waste disposal certification. Destructive examination of treated and immobilized waste from samples will be performed to establish integrity of the waste form. Finally, one (1) liter samples of each waste form from each waste lot will be retrieved and archived for the life of the facility.

3. Three (3) categories of samples are proposed for the facility:

   a. Samples for local analysis at the process area.

   b. Samples for analysis at the facility but within the environmentally controlled Sample Management Area (SMA).

   c. Samples for transport to external analytical facilities.

4. The SMA is not intended to provide full scale analytical service capabilities to support the process. It will physically handle and administratively control all samples taken at the facility, and will have a limited capability to analyze samples. Majority of the samples handled at the SMA will be for transport to the Hanford Analytical Laboratories for analysis of radioactive and hazardous components, while in-plant analyze will be limited to pH testing, moisture and specific gravity determination, and other tests to ensure formulation of immobilization (grout/polymer) agents additives and mixtures.

5. The SMA will also have the capabilities for bar coding and tracking samples; archiving storage of samples; administrative controls, including repackaging of samples if necessary, to transport and receive samples to the from external laboratories; and quick turn around on process samples to support the operation.

6. The SMA is provided with four (4) glovebox enclosures. Two (2) are intended for handling radioactive samples in transit, one (1) for handling non-radioactive samples in transit, and one (1) for the limited scale analysis to be performed within the SMA.

7. The SMA will have the capability to store archive samples of immobilized product throughout the life of the facility.

7.4.12 Non-Destructive Assay

1. Drums exiting the Lag Storage area on their way to be immobilized will be routed through Non-Destructive Assay (NDA). The class of low-level waste (LLW) will be determined at this stage, prior to the addition of the encapsulation matrices, as it may otherwise make a meaningful determination of LLW classification level(s) within the tolerance limits of detection extremely difficult to achieve. The equipment used in this area will be very similar to that designed for WRAP 1, and will consist of two Passive-Active Neutron (PAN) instruments, and two Gamma Energy Analysis (GEA) units. The instruments will need to be duplicated in order to achieve throughput requirements.

2. The PAN unit will be used to determine TRU content, with reference to Class 1 waste being less than 10 nCi/g transuranic nuclides, and the GEA unit will measure the key gamma emitting nuclides (e.g., 137 Cs and 60 Co) which can then be combined with analysis data to give the key nuclides required by the relevant waste acceptance criteria.

7.4.13 Aqueous Solution Make-up/Bulk Chemical Storage

1. The aqueous solution make-up (AMU) systems provides for receipt, storage, mixing and delivery of aqueous reagents that are needed for (1) decontamination, (2) pH adjustment of liquid wastes, and (3) caustic feed to the special waste system chemical scrubber.

2. Segregated bulk storage is provided for acids, caustics, oxidizers, and organics.

3. A generic feed system is provided for make-up of decontamination solutions to allow flexibility of feeding a variety of chemicals.

4. Concentrated decontamination solutions, received in 55-gallon drums, are pumped to a decon solution feed tank. Decon solution is then metered from this tank, on demand, in accordance with the flow control system signal received from a proportional flow instrument located on the discharge of the decon water booster pump.

5. Dilute sulfuric acid is prepared in an acid feed tank by mixing concentrated acid with water. The diluted acid is then pumped on demand to the secondary waste treatment area by an acid metering pump. The flow rate of the pump is controlled by a pH control signal received from the secondary waste treatment area.

6. Dilute sodium hydroxide is prepared in a caustic feed tank for use in both the secondary waste treatment and the special waste treatment areas. The methods of dilution and feed to the process areas are the same as for dilute sulfuric acid described above.

7. In the event that dilute acid or caustic can be directly purchased from a chemical supplier, both the acid and caustic feed tanks have the capacity to hold the entire contents of a 55-gallon drum.

7.4.14 Material Handling

1. The material handling for WRAP 2A is largely provided by two (2) Automated Guided Vehicle (AGV) systems. This is an automated system controlled by a central computer and services the size reduction and repack area, special waste processing area, grout area, polymer area, NDA station, and the lag storage area.

2. The principal function of the AGVs is to efficiently manage material flow, by way of transferring drums, between the process areas without creating bottlenecks. This automated design for transferring drums from one area to another also achieves the ALARA objectives and the facility throughput requirements.

3. The AGVs are supplemented by the appropriate use of fork lift trucks, transfer conveyors, lift tables, and overhead cranes as required by the operational design.

4. Incoming waste is received by fork lift trucks to unload pallets of drums or boxes from the W-112 transfer vehicle. Pallets of waste drums are transferred from the fork lift trucks to an accumulation conveyor where they are depalletized using a jib crane. Individual waste drums are then placed onto a drum scale/conveyor and then released onto a drum feed conveyor where they are fed to the size reduction and repack area entry airlock.

5. Waste boxes are transported by the fork lift trucks directly to the box size reduction area entry airlock.

6. The AGV brings new drums from the shipping and receiving area to the size reduction area, and feeds them via lift tables to the appropriate air lock for load out of the processed waste. After filling the drums, the lift table returns the drums back to the AGV for its destination to the lag storage area. The material handling of special waste treatment area load out is similar to the size reduction area.

7. The lag storage area includes a AS/RS stacker crane, storage racks, and transfer conveyors. As drums are requested for treatment by the central computer, the AS/RS stacker crane retrieves the drums and places them on transfer conveyors for conveyance back to the AGV.

8. Enroute to their final immobilization process, the drums pass through the NDA station where transfer back and forth from the NDA equipment to the AGVs is accomplished by transfer conveyors.

9. Drums scheduled for grouting are picked up by the treatment area AGV at the transfer conveyor and delivered to the agitated or vibro grout infeed conveyor as needed. After completion of the grouting process, a grout discharge conveyor transfers the drums back to the AGV. The AGV brings the drums to the shipping and receiving airlock transfer conveyors for transport through the airlock into the shipping area.

10. For drums destined for polymer encapsulation, the material handling system is the same except that the AGV directly offers the drums to one of the four (4) polymer filling station lift tables. After completion of polymerization, the lift tables return the drums to the AGV for destination to the polymer cure storage.

11. A Time and Motion Study (WITNESS) has been used to simulate material handling requirements throughout the facility in order to identify and solve problems relating to material flow "bottlenecks". The study and the results are summarized in **Appendix I.**

8.0 METHODS OF PERFORMANCE

8.1 Off-site Architect Engineer Work

1. In accordance with the DOE-RL Prime Contract DE-AC06-91RL11946, the Architect-Engineer (UE&C) has options specified in their contract for the performance of the Advanced Conceptual Design, Definitive Design, and the Title III construction technical support services work.

2. Justification for the off-site A/E performance of the WRAP 2A follow-on Design phase is based upon the synergy that the A/E can apply between WRAP 1 and WRAP 2A, and the relevant technical expertise the UE&C/BNFL team can bring to WRAP 2A.

8.2 Procurement Strategy

1. In general, all equipment for WRAP Module 2A including the non-destructive assay and size reduction equipment will be purchased via procurement specifications prepared by the off-site architect engineer. No specific equipment or material is envisioned to be furnished to be furnished by the Government.

2. The Plant Control System (PCS) and the Data Management System (DMS) plant computers will also be procured via performance specification from a qualified vendor(s). The software for these computers (PCS and DMS) will, however, be procured separately, again via performance specifications from a qualified vendor(s).

3. Long lead item procurement will be identified early in the design phase and incorporated into the integrated construction schedule. Procurement actions will be implemented in sufficient time to meet construction needs.

8.3 Off-site Construction

1. Construction work by off-site contractors will be performed under fixed price contracts managed and administered by the engineer/constructor contractor, who will also be responsible for providing any required escort to the off-site constructor.

8.4 On-site Construction Contractor

1. All on-site construction will be managed and administered by the on-site construction contractor under fixed price construction contracts.

8.5 Operating Contractor

1. The operating contractor workscope for WRAP Module 2A will include the following as a minimum:

a. Tie-in to site power distribution system.

b. Preparation of the Preliminary Safety Analysis Report.

c. Implementation testing of the PCS and DMS configuration, using the vendor supplied configuration software, with architect engineer assistance as necessary.

d. Overall project integration during design, procurement, construction, and acceptance inspection.

9.0 REQUIREMENTS AND ASSESSMENTS

9.1 Safeguards and Security

1. The WRAP Module 2A facility is located in the 200 West Area which is a Property Protected Area, which provides all of the physical security measures required by DOE Order 5632.6. The WRAP Module 2A facility is a LLW processing facility and as such will not receive or handle reportable quantities of nuclear materials, as defined in DOE Order 5633.3.

2. The Plant Management System will not be required to handle any classified information, as defined in DOE Order 5650.2B and will not interface with any classified data processing capability. Alarms or CCTV signals will not be sent to any WHC security post or AMS.

3. Existing safeguards and security measures will not be impacted by this project. No new measures beyond the current practices will be required.

9.2 Health and Safety

1. This section presents the Health and Safety considerations applicable to the construction and operation of the WRAP Module 2A facility.

9.2.1 Regulatory Requirements

1. The Occupational Safety and Health Administration (OSHA) regulations contained in 29 CFR 1926 and 29 CFR 1910 are applicable to the construction and operation of the WRAP Module 2A facility.

2. Additionally, the design criteria presented in DOE Order 6430.1A, General Design Criteria, DOE ES&H Orders, the Washington Department of Labor and Industries Job Safety and Health Regulations, and the Westinghouse Hanford Company (WHC) Safety Standards presented in Volumes 1 - 3 of the Industrial Safety Manual for the Hanford site, are also applicable.

3. WHC-CM-7-5 requires that releases of hazardous air contaminants shall not result in exceeding the permissible exposure limits (PELs) at any routinely-occupied ground level location or at the closest point of personnel occupancy, whichever is more limiting. WRAP Module 2A facility will be designed with zoned pressure differentials to facilitate compliance with this requirement.

9.2.2 Safety Objectives, Primary Safety Concerns and Unacceptable Safety Consequences

1. The following lists the safety objectives of the WRAP Module 2A facility:

   a. Protect the public from hazards associated with the use of radioactive and other hazardous materials as a result of normal operations, anticipated operational occurrences, and accident conditions, including the effects of natural phenomena pertinent to the Hanford site.

   b. Ensure compliance with DOE policies regarding nuclear safety, criticality safety, radiation safety, chemical safety, industrial safety, fire protection, and environmental protection.

   c. Protect the health and safety of on-site personnel, government property, and essential operations from the effects of potential accidents.

   d. Minimize exposures of personnel and the general public to hazardous materials by emphasizing these concerns during all design, construction, and operational phases.

2. In achieving the above stated objectives the WRAP Module 2A facility design will be guided by the following primary safety concerns regarding the waste to be processed.

a. The waste generates ionizing radiation in the form of fixed and loose radioactive contamination, and airborne radioactive contamination, requiring shielding for protection of workers. The waste material also presents potential inhalation and ingestion hazards so that contamination control within the plant and minimization of discharges to the environment are essential design features.

b. Contaminated particulates in the waste may potentially escape from drums and gloveboxes during handling and/or waste processing. Contamination may cause health injury to the workers if inhaled. Confinement of contamination is a primary safety requirement.

c. Radioactive waste in containers may contain liquids. Liquids are required to be processed within the plant. Measures are required to prevent leaks, spills, or inadvertent transfer of these liquids to the environment or in inappropriate areas of the plant.

d. The waste may contain chemically hazardous liquids. Liquids generated from waste sorting and compaction require sampling, collection and treatment within process confinement areas.

e. The waste may contain pyrophoric materials, reactive materials, chelating compounds, lead, mercury and chemically incompatible materials. These materials will be removed from the waste, segregated, treated and/or repackaged for treatment at other facilities.

f. Wastes processed within the WRAP Module 2A facility may contain measurable quantities of fissile materials. Equipment and facility designs must address the potential for criticality excursions in accordance with DOE 5480.5 and WHC-CM-4-29, Nuclear Criticality Safety.

g. The waste may contain flammable gases. The waste containers retrieved from storage require venting and sampling of gases for volatile organic compounds and hydrogen prior to shipment to the WRAP Module 2A facility. Newly generated waste containers are required to have filtered vents where appropriate (per WHC-EP-0063) on the waste containers from the time they are filled. In addition, all waste containers within the WRAP Module 2A facility require venting with carbon composite filters to preclude buildup of gases within the waste containers.

3. WRAP Module 2A facility is conceptually designed to ensure no single credible component failure will result in unacceptable safety consequences including:

- Nuclear criticality
- Explosion
- Fire (other than localized minor fire, such as might be caused by shorting of electrical equipment)
- Exposure of personnel to ionizing radiation in excess of DOE Order 5400.5 values
- Exposure of personnel to toxic chemical agents in excess of Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists
- Instantaneous release of radioactivity (airborne or liquid) from the facility in excess of 5000 times the Derived Concentration Guide (DCG)-Public described in WHC-CM-7-5, **Appendix A**, at point of discharge

9.2.3 Safety Classification

1. The WRAP Module 2A facility is classified as a "Low Hazard" facility in accordance with the criteria presented in WHC-CM-4-46. The facility-use category definition of the WRAP Module 2A facility as "Low Hazard" is determined and documented in "Preliminary Safety Evaluation

W-100 Waste Receiving and Processing Module 2A facility, WHC-SD-100-PSE". The PSE is included in **Appendix J.**

2. Low hazard facilities are of importance due to their waste disposal mission dependent considerations. The performance goal for these facilities per UCRL-15910 (UCRL 1990) is to maintain both capacity to function and occupant safety. Therefore, criteria for the design of low hazard facilities such as WRAP Module 2A facility will allow only relatively minor structural damage in the event of natural phenomena hazards. That is damage that results in minimal interruption to facility operations and that can be easily and readily repaired following the event.

3. The performance goal for low hazard facilities is to limit the annual probability of exceedance of structure/equipment damage, with the facility being able to function with minimal interruption. To achieve this performance goal, low hazard facilities must be designed to survive natural phenomena hazards with an annual probability of exceedance of 5×10^{-4}.

4. The WRAP Module 2A facility systems, components and structure are classified as "non-safety" class items per the General Design Criteria, DOE Order 6430.1A (DOE 1989). Based on the WRAP 1 Facility Preliminary Safety Evaluation report, it has been established that risks associated with the WRAP Module 2A facility normal operation, as well as risks assessed on a case-by-case basis for a spectrum of postulated accidents, do not adversely affect the environment or the safety and health of the public.

5. In addition to the Safety/Non-safety classification of systems, components and structures per DOE Order 6430.1A, structures, systems and components at the Hanford site are also classified through the implementation of WHC-CM-1-3, MRP 5.46, Management Requirements and Procedures "Safety Classification of Systems, Components and Structures" (WHC 1989b). This procedure defines four safety classes based on well defined safety criteria.

6. The WRAP Module 2A systems, components and structures are classified as Safety Class 3. The safety function of the Safety Class 3 items is to ensure industrial safety, reduce environmental releases, provide personnel protection to ALARA and to provide occupational safety.

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9.2.4 Safety Design Criteria

1. The following lists the principal criteria for the design of safety class 3 items:

   a. DOE Order 6430.1A Design Criteria - Division 13 - Section 1324 provides criteria for the design of radioactive solid waste facilities. In conjunction with Section 1324, requirements of Section 99 of all other divisions of DOE Order 6430.1A would also be applicable.

   b. Natural Phenomena Hazards - Design and analysis for natural phenomena hazards for Safety Class 3 items are according to requirements for a low hazard facility as specified in SDC-4.1 and UCRL-15910.

   c. The structural and mechanical design criteria for the WRAP Facility Module 2A are formulated to provide both capacity to function and occupant safety, and allow only relatively minor structural damage in the event of severe natural phenomena hazard that exceed the design basis criteria. The WRAP Module 2A building structure is designed in accordance with UCRL-15910 and SDC-4.1 to withstand the following Design Basis Natural Phenomena Hazard:

   - Wind - 70 mph
   - Seismic - UBC Seismic Zone 2B
   - Flood - 100 year, 24-hour storm

d. Environmental Qualification - Equipment will be commercial grade designed for normal operating environmental conditions (e.g., heat, humidity). Special testing will ordinarily not be required.

e. Single Fault Failure - Redundancy and/or separation of equipment and systems in accordance with the IEEE 379-1988 (IEEE 1988) and IEEE 384-1981 (IEEE 1981) is not required.

f. Protection Systems - Fire protection systems conform to NFPA 13 (1992) without additional redundancy or seismic qualification.

g. Emergency Power - Backup power source that meets single-fault failure and natural phenomena requirements will not be required.

9.2.5 Safety Design Consideration

1. The WRAP Module 2A facility is designed conceptually to meet applicable requirements of DOE Orders including DOE Order 6430.1A (DOE 1989), Division 1300-6, Radiation Protection, DOE 5480.11, Radiation Protection for Occupational Workers, and DOE Order 5400.5 (DOE 1990), Radiation Protection of the Public and the Environment; and site specific procedural criteria from WHC-CM-4-9, Radiological Design, WHC-CM-4-11, ALARA Program Manual, WHC-CM-4-10, Radiation Protection Manual, WHC-CM-4-29, Nuclear Criticality Safety, WHC-CM-4-46, Nonreactor Facility Safety Analysis, and WHC-CM-7-5, Environmental Compliance, which apply to the design of new facilities.

2. Radiological engineered design features are conceptualized in accordance with the intent of WHC-CM-4-9, Radiological Design. Radiological designs of WRAP Module 2A facility provide highly reliable equipment to minimize the risk of personnel exposure or release of radioactive material.

3. During the conceptual design of the WRAP 2A Facility, the design objectives for personnel exposure from external sources of radiation in continuously occupied controlled areas are ALARA and not exceeding 0.5 mrem (5 microsieverts) per hour on average (the initial design target being 0.2 mrem per hour). The design objectives for exposure rates for potential exposure to a radiation worker where occupancy is generally not continuous are ALARA and not exceeding 20 percent of the applicable standard in DOE 5480.11, Radiation Protection for Occupational Workers. Radiation exposure rates in controlled workplace areas have been conceptually reduced to as low as reasonable achievable levels by facility design and control. The primary means for maintaining exposures as low as reasonably achievable are through physical controls, e.g., confinement, ventilation, remote handling, and shielding.

4. The WRAP Module 2A facility conceptual design meets or exceeds radiological protection criteria specified in DOE Order 5490.11 (DOE 1988d), Radiation Protection Requirements, at the "20 percent of maximum allowable dose" design basis criteria for new facilities, as mandated in DOE 6430.1A, General Design Criteria. These criteria limit personal doses to 10 mSv (1 rem) dose to the whole body, 30 mSv (3 rem) dose to the lens of the eye, and 0.1 Sv (10 rem) dose to any organ, tissue, or extremity of the body. Credit for internal radiation exposure from ingestion and inhalation has been included in dose calculations for workers. Internal dose evaluation programs will (including routine bioassay programs) demonstrate compliance with the radiation protection standards in DOE 5490.11, Radiation Protection for Occupational Workers.

5. Primary protection from exposure to ionizing radiation in the WRAP Facility Module 2A conceptual design is provided by use of design engineered features including:

a) Shielding

b) Confinement of radionuclides through ventilation systems making use of differential pressure zones and HEPA filtration

c) Physical barriers (sealed penetrations, airlocks, etc.) for containment of radionuclides have been incorporated into the facility structure and process equipment.

Secondary radiation protection is provided through administrative controls.

6. Personnel protection against ionizing radiation is provided by fixed mounted direct radiation monitoring systems for local and remote (data echoed to control room computer and annunciators) level indicators and alarms. Should the level of radiation at any monitoring point exceed a preset level, audible alarms are to sound at the monitoring point and in the control room so that immediate action can be taken to address the alarm condition. Area radiation monitors provide coverage in areas where exposure rates can exceed 5 mR/hour.

7. Air monitoring and warning systems are located in work areas. Continuous air monitors (CAM) provide real-time measurements of the presence of airborne radioactive contamination in the breathing zone. Air sampling heads will provide a representative sample of airborne radioactive materials. CAMs detect, indicate levels, and alarm (when prescribed setpoints are exceeded) airborne radioactive contamination levels.

8. Entry into the WRAP Module 2A Facility building is limited through regulated entry areas or access control zones. Access control points are located between clean areas (e.g., outside, administrative offices, the control room) and potentially contaminated areas (e.g., waste process areas). Adequate physical protective features are provided in WRAP Module 2A facility conceptual design so that administrative controls are minimized. Movement of personnel into and within the operating areas of the WRAP Module 2A Facility is in accordance with well-defined traffic patterns. Restrictive access into the waste process area is ensured by facility design.

9. The WRAP Module 2A Facility is designed to facilitate the arrival and entry of emergency personnel and equipment in the event of an emergency and to allow access for repair/corrective action personnel. The design criteria for response to emergency or accident conditions is in accordance with guidance in WHC-CM-4-9, Radiological Design.

10. Waste processing cells are conceptually designed to permit easy decontamination, achieve verifiable containment of radionuclides, provide convenient access to personnel decontamination and monitoring areas and maintain negligible environmental impacts due to radioactive effluents.

11. Remote handling equipment is utilized when dose rates to extremities approaches the maximum dose guidance in DOE Order 5480.11 or where contaminated wounds might occur per DOE Order 6430.1A.

12. In accordance with WHC-CM-4-29, Chapter 1.0, Section 5.5, the WRAP Module 2A facility is currently classified as an "exempt facility" that handles only low-level waste, and will require confirmation at a later design phase. As an exempt facility, WRAP 2A is not subject to the criticality controls of WHC-CM-4-29. However, the facility will be subject to the criticality alarms requirement (Chapter 11) per the FDC.

13. Additional safety features include:

a. The operation of the HVAC system is designed to limit the concentration of hazardous materials in work spaces below the Threshold Limit Values.

b. Curbs are provided to contain spills of hazardous materials.

c. Segregated storage space is provided for incompatible chemicals.

d. Emergency showers/eyewashes are located in work areas containing hazardous materials in accordance with ANSI Z358.1.

e. Emergency response and first aid equipment is stored at a readily accessible location in the facility.

f. Breathing air (Grade D) is supplied and used in conjunction with a respirator per OSHA requirements.

g. Personnel protection equipment (clothing, gloves, boots, goggles, face shields, etc.) are utilized to provide protection from hazardous materials.

h. A UPS is provided to maintain power to health physics and fire protection monitors and alarms, life safety communications equipment, and the control system.

i. Emergency lighting is provided in the process areas and at emergency exits.

9.2.6 Construction Hazards

1. During the construction period, contractors will be required to take all reasonable precautions in the performance of their work to protect the health and safety of their employees, subcontractors, operating contractor, and DOE personnel. The construction area must remain accessible to emergency vehicles at all times, and emergency evacuation of personnel will not be obstructed. The hazards that exist during construction will be mitigated by safety training and adherence to referenced codes, standards, regulations, and accepted safety practices.

2. Routine construction hazards will exist while the facility is being constructed. Construction will be conducted in conformance with recognized safety codes and practices to ensure a safe working environment.

3. Dangerous Waste, as identified in WAC 173-303, will be generated during construction. These wastes will be disposed of by the onsite construction contractor in accordance with WAC 173-303 requirements and WHC implementing procedures.

4. During construction, measures shall be taken to minimize the generation of fugitive dust. Examples of fugitive dust generating operations are clearing, grading, leveling, excavating, and construction. Examples of measures to be taken are, application of water, use of windbreaks, or curtailment of operations on dry, windy days. Measures to be taken for fugitive dust control also include revegetation or gravel placement, upon completion of earth-moving operations.

9.2.7 Operational Hazards

1. Potential hazards associated with the activities within the WRAP Module 2A facility are presented below. These hazards are mitigated by appropriate preventive and mitigation measures. These features are conceptualized in this design and will be fully detailed during subsequent design evaluations.

- High voltage
- Flammable gases, liquids
- Exposure to hazardous materials
- Exposure to radioactive materials
- Nuclear criticality
- High noise levels
- Toxic and noxious emissions
- Mechanical and moving equipment dangers
- Inadequate ventilation
- Material handling dangers
- Temperature extremes
- Inadequate illumination
- Compressed air
- Explosive substances
- Fire
- Oxygen Deficient/Inert Atmosphere

2. The effects of principal component failure, including control and monitoring and utility failures have been evaluated for unacceptable consequences and documented in the Preliminary Safety Evaluation Report included in **Appendix J.**

3. All electrical, mechanical and instrument systems are conceptually designed to fail in the safest mode. Interlocks and alarms are provided on all systems and components to prevent operation in a manner that may affect safety or product quality or that may be detrimental to the equipment. Systems required for environmental impact control, safety and/or crucial processes are provided with redundant or back-up systems. Human factors engineering principals are applied as it relates to design of the work environment and man-machine interaction. These items will be fully characterized during the subsequent design evaluation phase.

9.3 Decontamination and Decommissioning

1. Provisions are made within the design for routine decontamination of process plant and equipment, both in preparation for maintenance and for routine housekeeping/dose reduction purposes. Fixed and directable decontamination spray systems are provided in key locations within the process, where contamination build-up may be expected. Such areas include the shredders and pug mill, the grouting and polymer encapsulation enclosures and the special waste treatment enclosure. Equipment will be designed and installed to enable access for the in-situ mechanical breakdown into component parts prior to removal.

2. A grout drum decontamination system is provided which will non-routinely be used to decontaminate drums leaving the grout encapsulation process.

3. All such systems are piped to appropriate liquid waste collection tanks, and this system is described in some detail in **Volume V.**

4. All process enclosures (including gloveboxes) will be designed to facilitate decontamination and eventual decommissioning. Such design considerations are also described in Section 9.5, as they also facilitate maintenance activities, and can be summarized as follows:

   a. In general, smooth surfaces, rounded corners and junctions, and non absorbent materials are used for enclosures. Crevices, corners, ledges and other potential contamination traps will be avoided where practicable.

   b. Clear surfaces and readily decontaminable surfaces (i.e., stainless steel) shall be used where practicable.

   c. Design will ease/simplify dismantling. Large gloveboxes will be capable of subdivision via flanges. Equipment will be modularized and modules will be sized to avoid unnecessary size reduction or demolition, and to enable removal and packaging for disposal. Equipment removal paths will be considered during the design process.

5. Equipment located within process enclosures will become radioactively contaminated, and there is a potential for non-enclosed equipment to become contaminated. Therefore, the system design shall incorporate the following design features which aid in decontamination, decommissioning, and future utilization, wherever practical.

   a. Polished surfaces, coatings or liners on walls, floors, and ceilings suitable for washing or wipedown.

   b. Air exhaust filters at or near individual radioactive material or other containment enclosures to minimize contamination of ventilation ducts.

c. Surfaces free of crevices, corners, ledges and/or protrusions which can collect contaminated materials.

d. Surfaces shall be designed to be easily flushed with minimum quantity of water or decontamination solution.

e. Surface coatings compatible with decontaminating agents, taking into consideration any degradation expected to occur.

f. Access ports (e.g., doorways, ventilation ducts) shall be structurally designed to minimize technical and construction problems when closing and/or sealing penetrations at the time of decommissioning.

g. Waterproofed fixtures and outlets with ground fault circuit Interrupters.

h. Processing and chemical storage areas with monolithic, nonporous floors and sloped towards the sumps or drains.

i. looped and trap free piping systems.

j. Physical provision for cleaning and draining the piping.

k. Wide aisles to facilitate movement of equipment and material.

l. Adequate overhead clearance for remote transfers.

m. Raised floor grades for personnel change and rest rooms.

n. Skid mounted equipment or systems with fasteners, piping, and service connection designed for easy access and manipulation.

o. Rigging and attachment points to facilitate removal of skids and/or equipment.

p. Piping and service connections designed for easy access.

q. Spill cleanup and recovery equipment.

6. The Box Breakdown Area will provide the capability to perform ad hoc decontamination of large equipment taken out of service for maintenance or disposal.

9.4 Provisions for Fallout Shelters

1. There is no provision for a fallout shelter within the scope of this project.

9.5 Maintenance and Operation

1. The primary maintenance philosophy for WRAP 2A is that equipment will be maintained in-situ wherever possible. If removal of equipment from a glovebox or enclosure becomes necessary, it will be safely transported to the Box Breakdown Area where it will be decontaminated and maintained, if return to service is desirable. If equipment is deemed not worthy of reuse, it will be cut up/dismantled and routed with other sized equipment. The Box Breakdown Area is designated as the maintenance area for WRAP 2A but will only be used infrequently.

2. The proposed design accommodates process operations which take place in glovebox type enclosures, and also operations which take place in cell-type enclosures. In both cases, sufficient access will be provided for operability and maintainability.

3. Operability considerations have been built into the proposed design, and include the following key features:

a. Safety: Operator safety is of paramount importance and will result in the provision of appropriate shielding to control dose exposure, of an engineered HVAC confinement system to minimize the risk of contamination outside the enclosures, of readily cleanable and decontaminable surfaces where practicable, of appropriate warnings alarms, hard-wired interlocks and means of recovery from such situations, of appropriate data management systems to allow monitoring and control of operations, and of accessibility to minimize the necessity for routine wearing of safety clothing.

b. Operations: All process operations will be provided with adequate viewing, either directly or by CCTV. Consideration will be given to local or remote control of operations, utilization of mechanization and automation, and to location of operator interface units. During all such considerations cost effectiveness and "fitness for purpose" engineering judgements will need to be made. Questions of throughput, reliability and availability will be considered.

4. The design of project components shall facilitate for ease of maintenance of plant and equipment per the following guidelines:

a. Use of interchangeable parts.

b. Provide access for visual inspection.

c. Provide access for disassembly.

d. Allow maintenance with standard tools.

e. Provide labeled piping, valves, instrumentation and equipment.

5. In addition, capabilities to flush, clean and decontaminate equipment as appropriate, to allow hands-on maintenance shall be provided. Design shall reflect the following order of preference for performing maintenance:

a. Adjust item or unit in place,

b. Repair item or unit by contact maintenance with radiation dose rates consistent with As Low As Reasonably Achievable (ALARA) principles.

c. Replace item or unit with spare unless it is more economical to remove, decontaminate, repair and return to service or perform remote maintenance.

6. Equipment items that require special and unique maintenance tool(s) shall be identified. Special instructions shall be included with the equipment, and any special tools required to maintain equipment shall be provided by the project.

7. Maintenance considerations generally applicable throughout the plant shall include:

a. WRAP Module 2A Building System shall be designed, fabricated, and constructed for a minimum of routine maintenance.

b. The building system components shall be designed for a minimum service life of 30 years.

c. The building layout shall provide access for visual inspection of operational equipment. Adequate visual access shall be provided to support maintenance through proper lighting and placement of windows for direct viewing. The Equipment shall be located and space envelopes designed to provide access for removal and reinstallation.

d. Maintenance planning shall include definition of space requirements, special routing, tools and handling equipment.

e. Commercially available equipment and parts shall be used to the greatest extent practical. Reliability shall be part of all specifications and design requirements.

f. To simplify maintenance and minimize inventory requirements, where similar functions are being performed, e.g., drum opening and sorting a single type and size of device should be selected for all locations to the maximum extent practical.

g. Complex components or those having a high probability of failure shall be located outside of normally contaminated areas to the extent possible.

h. Instrumentation and monitoring equipment systems shall be specified and designed to facilitate troubleshooting and replacement.

i. 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.

j. Low accessibility equipment, e.g., installed in glove boxes, shall be modularized for convenient removal and replacement. Modules shall be sized where practicable to fit into 55-gallon drums for removal from glove box.

k. Equipment shall be located and space envelopes designed to provide access for removal and reinstallation.

l. The flexibility and limits of material handling and lifting devices shall be considered for their maintenance utility, e.g., reach, lead capacities and clearances.

m. Wiring logic for glove box installed devices shall emphasize component-level troubleshooting by extending wiring leads outside the box. Independent functioning modules are exempt from this requirement where troubleshooting to the module level can be performed.

n. Where practicable, all maintenance on contaminated equipment shall be performed in-situ unless the equipment maintenance requires specialist support or will lead to unacceptable risk to personnel or plant downtime. Equipment shall be located outside of potentially contaminated areas wherever practical in order to minimize personnel radiation exposure and reduce unnecessary waste arisings.

o. Modular equipment design shall be used whenever practical in order to reduce to a minimum problems usually associated with removal and repair.

p. Quick release fastening systems shall be utilized in conjunction with modular design to further assist in easier maintenance techniques.

q. Through glove box wall penetrations, such as turntable drives, shall use a cartridge type bearing assembly to allow one way posting of a worn assembly and assist in easier maintenance techniques.

r. Maintenance aids shall be installed as required to assist in removal and replacement of equipment, components and modules.

s. Any in box hoisting equipment shall be electrically and mechanically maintainable. The hoist motor or whole hoist shall be demountable and a facility to receive the equipment shall be determined, the system must be reversible to accept the new equipment, or at least the drive motor must be replaceable through gloves. Consideration shall also be given to the Festoon cable and limit switches.

t. Internal window wiping system in wet boxes shall be easily replaced by a clip on or clamp method.

u. The removal, decontamination and repair or disposal of failed contaminated equipment shall be considered in the space layout. The facility requirement need for laydown and for access to; transport of; and limited repair shall be provided.

v. Low maintenance finishes shall be provided to protect all building components. protective coatings shall be used on all exposed carbon steel. Corrosive environment protection shall be provided to spaces and equipment where appropriate.

w. Bollards, bumper rails, and opening guards shall be installed to protect the Building where components are directly exposed to vehicle traffic or damage.

x. Access ports will be provided in ductwork to provide access to and inspection of dampers.

y. Housekeeping pads shall be placed under all floor mounted motors and mechanical equipment.

z. The process utility systems shall be designed to minimize the exposure of operations and maintenance personnel to radioactive and hazardous substances.

aa. Process utility equipment shall be located and space envelopes designed to provide access for removal and reinstallation. Equipment access into and out of the building shall also be provided in the design.

bb. 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.

cc. Suppliers of equipment shall be required to provide appropriate maintenance instructions.

9.6 Automated Data Processing Equipment

9.6.1 Plant Management System

1. A central processor based Plant Management System (PMS) shall be utilized to satisfy seven basic objectives; (1) data acquisition, (2) data analysis, (3) process system control and surveillance (4) inventory control of samples and waste (5) control and surveillance of building utilities (6) electronic data transfer with WRAP Module 1, WRAP Module 2B, and thermal treatment facility PMS and other solid waste data bases and (7) compile and report data required to support waste certification on an individual container basis. The PMS is comprised of two sub-systems; the Plant Control System (PCS) and the Data Management System (DMS). The PCS provides the hardware and software functions for control and surveillance, while the DMS satisfies the data handling requirements. Central control and computer rooms shall be provided for remote control and surveillance of the plant as well as for entering and retrieving data. These rooms shall be environmentally controlled for temperature humidity and dust so as not to impact

the operation of the PMS. Satellite stations shall be located at key areas of the facility where data can be manually or automatically entered into or obtained from the DMS and where the process may be controlled locally. The central and local control stations shall be provided with terminals and electronics suitably designed for the environment in which they must operate. Process instrumentation with graphic displays that mimic the process shall be used throughout WRAP 2A to operate and control each work station.

2. The PMS shall have all the required hardware and software to perform the following:

   a. Accurately collect, display, store, and report all process and safety parameters in real time.

   b. Display information in an orderly manner on video display terminals with color graphic features.

   c. Provide a display console with a crucial process alarm selection and detection screens. A main alarm menu screen shall provide an audible and visual alarm calling attention to the display screen upon which the crucial parameter has been programmed to appear.

   d. Generate all required permanent and backup records to include magnetic media and hard copies.

   e. Generate all required shipping papers.

   f. Provide bar code reading.

   g. Provide capability for data reduction such as input averaging, parameter trend display, and data recording.

   h. Compile and display estimated fissile content within all process enclosures, components and areas.

   i. Track status of all incoming waste containers and contents as they are processed through the facility.

   j. Identify location of all waste containers within the facility.

   k. Store information on each incoming waste container.

   l. Provide trend analysis on process parameters and other plant parameters (e.g., radiation levels) recorded by the PMS.

   m. Interface with the Hanford solid waste data bases and laboratory data management systems. WRAP 2A shall have access to the Solid Waste Information Tracking System (SWITS). SWITS is the centralized database for all Hanford including other WRAP phases. Through SWITS, WRAP 2A will have access to databases for all WRAP phases, especially the W112 storage area.

   n. Provide capabilities for connecting personal computing devices to the Hanford Local Area Network (HLAN).

   o. Provide facility performance information such as numbers of containers of various waste types processed per shift, cumulative number of containers of various waste types processed, waste volume reduction factors, running fissile material inventories, radiation exposure per time, average and peak radiation levels of containers.

p. Store and transmit data required by the Hanford WAC data reporting requirements on each container.

q. Provide a link between analytical results and end product container.

r. Permit overall management and control of plant operation from a central control room.

s. Provide regulatory closed loop control and sequential logic control.

t. Provide alarm processing, display, annunciation and printout capabilities.

u. Maintain status of sample analysis.

v. Produce and maintain data backup files.

w. Provide real-time display of process data and status.

x. Interface between Phase V Storage and WRAP 2A.

3. The Plant Control system interfaces directly with the process by means of sensors, transmitter, solenoids, motor starters and other status and control devices. The PCS provides the sequential logic as well as analog control to meet the requirements of the various processing steps. These various process control requirements include:

a. Receiving

- Weigh the container prior to sending to process.
- Read container bar code and initiate data record.

b. Material Handling

- Track the waste container and its contents entering the treatment area to the exiting container.
- Store container in lag storage and record its location.
- Transport waste containers among the various process enclosures and areas.

c. Process Enclosures

- Automatically survey loaded 55-gallon drums to measure surface dose rate.
- Provide leak detection devices, electrical interlocks and fail safe design to prevent overfilling the liquid waste containment system.
- Provide all sensors, controller and control logic to process waste including, opening, sorting shredding, segregation, screening, treatment and packaging.
- Control the addition at deactivation agents to the process.
- Control conveyance systems for handling dry waste material.
- Control delivery system for dry and liquid agents.

- Real time monitoring and control of all major process parameter (e.g., liquid level of tanks, temperatures, and differential pressure) with capability for trend monitoring and hard data recording.
- Capability to determine and control the weight of container during treatment by addition of volume fillers as needed.
- Capability to provide radionuclide data required to support low-level waste category determination assay.
- Track sample results back to the container of origin.
- Capability to make up days requirement of immobilization agents and mix agents with conditioned waste in a controlled manner. The systems must be capable of easily changing the immobilization formulations.

d. <u>Specialty Enclosure</u>

- Capability for remote operations.
- Leak detection, electrical interlocks and fail safe design to protect against overfilling of collection devices or release of liquid waste.
- Controlled addition capabilities from the AMU tanks.

e. <u>Sample Management</u>

- Provide capability for coordination and tracing of sample transport, chain-of-custody and results.
- Obtain analytical results electronically from the laboratory.
- Read bar code labels.
- Data entry and retrieval capability.

f. <u>Aqueous Make-Up Area</u>

- Instrumentation for local and remote detection and alarms for liquid level, leaks, temperature and pressure.
- Local operator monitoring and control capabilities and remote monitoring.

g. <u>Liquid Waste Handling</u>

- Real time monitoring and control of major process parameter (e.g., liquid tank level) provided locally and in the control room.
- Spill prevention and detection instrumentation.
- Capability of operating locally and from the control room.
- Monitoring and control of chemical injection.
- Leak detection, electrical interlocks and fail safe design to protect against overfilling of collection devices or release of liquid waste.

h. Receiving, Shipping and Labeling

- Capability to produce hard copies and electronic copies of all shipping documentation.
- Capability for installing and reading bar code labels.
- Capability to weigh boxes up to 12,000 pounds and drums up to 3,000 pounds.
- Capability to review shipping and packaging documentation and entering applicable information into the central Plant Management systems.

i. Fire Protection

- A stand-alone Fire Protection systems separate from the Plant Management systems shall be provided to notify the Hanford Fire Department of all fire alarm signals.
- Fire alarms and trouble alarms from the Fire Protection system shall be routed to and annunciated by the Plant Management system.

j. Radiation and Contamination Control

- Provide capability to monitor high radiation or detector system failure alarms from a frequently or continuously occupied location.
- Annunciate, log and trend radiation and system failure alarms.

k. Heating, Ventilation and Air Conditioning System

- Provide capability for effluent record sampling and continuous on-line monitoring for display in the central control room.
- The HVAC system shall be supervised by a central control system.
- Monitor for radioactive material in the duct work down stream of HEPA filters.

9.6.2 Health Physics System

1. All rooms and spaces within the facility which could potentially contain radioactive material will be continuously monitored for direct radiation (neutron) and airborne contamination (beta). The design shall provide:

a. Permanently installed monitors for air sampling, record sampling, dose rate and count rate.

b. Permanently installed effluent monitoring and sampling devices.

c. Self-survey stations equipped with hand, foot counters and body friskers.

d. Permanently installed area radiation monitoring and alarm equipment.

e. Monitoring equipment to process a minimum of 40 personnel within a 10 minute period.

9.6.3 Closed Circuit Television System

1. The design shall provide a Closed Circuit Television System (CCTV) to assist in monitoring process operation. The CCTV system shall have the following features:

a. Provide remote monitoring of process operations and areas from the central control room and locally at the waste processing glove boxes. Monitors with switching circuitry shall be installed. The CCTV system shall provide video cassette recording.

b. All cameras shall be easily accessible for maintenance.

c. Some cameras shall have multi-function capabilities including pan, tilt, and zoom. These features shall be controllable from remote panels mounted next to each monitor. All cameras shall be controllable from any control panel. The process operators' stations shall have priority of camera selection in the process area and process enclosures.

d. Cameras shall be provided in sufficient numbers to provide the operators visual access to the processing areas and the waste processing enclosures.

e. Monitors shall be provided at local control stations and in the central control room. Monitors shall be capable of selecting any camera.

f. The CCTV system shall be resistant to electrical system interferences. UPS power will be provided.

g. The CCTV system shall have the capability to record from any camera. A title and time block feature shall be provided to identify the camera which is making the recording and the time and date of recording.

9.7 Quality Categories

1. The QA requirements for DOE facilities at Hanford are stated in DOE-Richland operations office Order 5700.1A. This order establishes the American National Standards Institute/American Society of Mechanical Engineers, Quality Assurance Program Requirements for Nuclear Facilities, NQA-1 as the basis to be utilized for formulating a Quality Assurance program. A graded quality criteria application approach is implemented for the WRAP Module 2A Facility based on the importance of the item and the postulated consequence of failure of the item to the environment and the health and safety of the workers and the public. The NQA-1 requirements are adapted in the WRAP Module 2A Facility QA program consistent with the low-hazard facility classification. This approach facilities containment of cost and at the same time provides a total quality program which meets the requirements of DOE Order 5700.1A.

NOTE: New DOE Order 5700.6C (10 criterion) "Quality Assurance" will replace DOE Order 5700.1A (18 NQA criterion). Based on a preliminary review by DOE-RL, WHC and UE&C, UE&C's current approved and implemented QA plan meets the requirements of 5700.6C without revision or scope/cost impact.

2. The Quality Assurance program for the WRAP Module 2A Facility consists of the description of the technical and administrative procedures that implement the applicable criteria of the elements listed below.

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ELEMENT	TITLE
1 1S-1	Organization Supplementary Requirements for Organizations
2 2S-3 2S-4	Quality Assurance Program Qualification of Quality Assurance Audit Personnel Personnel Indoctrination and Training
3 3S-1	Design Control Supplementary Requirements for Design Control
4 4S-1	Procurement Document Control Supplementary Requirements for Procurement Document Control
5	Instructions, Procedures, and Drawings
6 6S-1	Document Control Supplementary Requirements for Document Control
7 7S-1	Control of Purchased Items and Services Supplementary Requirements for Control of Purchased Items and Services
10 10S-1	Inspection Supplementary Requirements for Inspection
11 11S-2	Test Control Computer Program Testing
15 15S-1	Control of Nonconforming Items Supplementary Requirements for Control of Nonconforming Items
16	Corrective Action
17 17S-1	Quality Assurance Records Supplementary Requirements for QA Records
18 18S-1	Audits Supplementary Requirements for Audits

3. The WRAP Module 2A facility QA program for the design is structured to provide the following assurances:

- Organizational interfaces are identified and controlled
- Design is independently verified to be adequate
- An effective document control system is in place
- An effective change control system is in place

4. Activities and items at WRAP Module 2A facility are assigned a controlled safety classification that is consistent with the relative impact to offsite, onsite and occupational safety-related items and activities. This safety classification approach classifies items and activities into one of four classification (Safety Class 1, 2, 3 and 4) and assists in the selection of QA requirements and measures to be applied to these items and activities consistent with their importance. This classification is accompanied by deliberate quality planning and selective application of QA requirements to the item or activity performed with varying degrees of QA applied depending on the function, complexity, consequence of failure, reliability, replicability of results and economic justification.

5. The PSE (**Appendix J**) forms the basis for the "project critical characteristics" list. This list currently identifies all WRAP Module 2A facility systems, structures and components to be Safety Class 3 per the requirements of MRP 5.46. This list will be verified and augmented during the PSAR and FSAR preparation process.

6. The inspection activities are classified as functional, general and detailed as described below based on the detail evaluation of the impact on safety of the failure of the item. The classification of inspection activities for elements of the WRAP Module 2A Facility will be addressed in the Preliminary Design Report.

- Functional Inspection is performed to determine overall compliance with AFC drawings and specifications. It may very from inspection of minor items to extensive testing of operating equipment. It may also serve in making initial determination of the adequacy of the design effort. The field element and the operating contractor participate in functional inspections from the viewpoints of owner and user.

- General Inspection is the fundamental and comprehensive inspection to ascertain that workmanship and kind and quality of materials conform to the contract specifications.

- Detailed Inspection includes, but is not limited to, verification of details, such as checking location and size of reinforcing bars, maintaining records of concrete batching plant operations, verifying the use of proper welding rods, checking riveting and welding, and performing other inspection for quality assurance purpose. It starts with initial construction operations and extends through all construction stages.

9.8 Environmental Compliance

1. This section describes the environmental compliance requirements applicable to the WRAP Module 2A facility.

9.8.1 General Requirements

1. Mixed wastes are to be managed in accordance with the requirements of RCRA subtitle C, as implemented in WAC 173-303, and the AEA, as implemented in the U.S. Department of Energy (DOE) Order 5820.2A, "Radioactive Waste Management".

2. WHC environmental compliance manual WHC-CM-7-5 describes the environmental compliance requirements and guidelines applicable to all WHC managed DOE facilities at Hanford that involve or support the generation, handling, treatment, processing, possession, transfer, storage, disposal or release of gaseous, liquid or solid radioactive, dangerous or regulated substances. The WHC-CM-7-5 manual also presents requirements for the Environmental Monitoring Plan (EMP) which consists of an effluent monitoring plan and an environmental surveillance plan. The WHC environmental compliance manual incorporates all applicable regulatory requirements of WAC 173-303 and DOE Order 5820.2A, and will be utilized as the basis for environmental compliance requirements for WRAP Module 2A facility design, construction and operation.

9.8.2 DOE Orders and WHC Policy for the Management of Mixed Waste

1. Radioactive mixed waste handling and disposal activities at Hanford are subject to DOE Order 5820.2A, Radioactive Waste Management, and related WHC policies found in WHC-EP-0063, Hanford Radioactive Solid Waste Packaging, Storage and Disposal Requirements. Radioactive mixed wastes treated in WRAP Module 2A facility include low-level waste (LLW).

2. The LLWs are those wastes that are not TRU and are not highly radioactive. The LLWs are disposed of at Hanford in the 200 Area Burial Grounds. Certified contact handled mixed LLWs are currently being stored in the 200 West Area, pending future disposal in a permitted burial trench scheduled to be operational in 1992. Preliminary acceptance criteria for wastes to be disposed of in the 200 West Area permitted trenches are found in WHC-EP-0063 and include the following:

- Wastes must be packaged in DOT certified containers constructed of a fire retardant material and provided with two containment barriers (e.g., a lined drum)

- Wastes must not be capable of generating toxic gases, vapors, or fumes

- Wastes must not contain free liquids

- Wastes must be in a stable form (e.g., cemented, compacted, or in a non-leachable matrix)

- Void space within the waste packages shall not exceed 10 percent.

3. Both DOE Order 5820.2A and WHC policy require that hazardous, radioactive and mixed waste generation be minimized to the maximum extent practical. When possible, mixed wastes are to be reduced to radioactive wastes by treatment to eliminate the hazardous constituents; TRU waste generation is to be minimized. Significant savings could potentially be achieved by minimizing TRU and mixed wastes.

9.8.3 Low Level Mixed Waste

1. The following presents environmental compliance requirements of low-level mixed waste as described in WHC-CM-7-5.

a. Low-level mixed waste shall confirm to the requirements of DOE Order 5820.2A and shall be regulated by the appropriate regional authorities under the RCRA.

b. Low-level mixed waste operations shall be managed to protect the health and safety of the public and preserve the environment of the waste management facilities.

c. Low-level mixed waste shall be managed on a systematic basis using the most appropriate combination of waste generation reduction, segregation, treatment, and disposal practices so that the radioactive components are contained and the overall system cost effectiveness is maximized.

d. Waste acceptance criteria specific to low-level mixed waste shall be established to comply with the following performance objectives:

1) 25 mrem/year to the offsite public from all exposure pathways (i.e., crop ingestion, inhalation, direct radiation, etc.).

2) 4 mrem/year to the offsite public from consuming 2 liters per day of groundwater.

3) 100 mrem/year for a continuous exposure resulting from inadvertent intrusion into the waste 100 years after loss of institutional control.

4) 500 mrem/year for a single acute exposure resulting from inadvertent exposure resulting from inadvertent intrusion into the waste after loss of active institutional control (100 years).

5) Engineered features and waste form stabilization may be considered for compliance with these performance objectives.

e. Low-level mixed waste generation shall be managed such that waste volume and toxicity reduction efforts shall include consideration of process modification, process optimization, materials substitution, and decontamination, including a waste certification program. An auditable program shall be established to ensure waste generation minimization. The program shall include separation of uncontaminated waste, dangerous waste, radioactive waste, and mixed waste to facilitate cost-effective treatment and disposal.

f. Low-level mixed waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal as required under DOE Order 5820.2A.

g. Low-level mixed waste shall be managed such that waste acceptance criteria, waste treatment, shipment, long-term storage, and disposal meet the requirements of DOE Order 5820.2A.

h. Low-level mixed waste shall be stored and handled according to the most restrictive requirements of the Part J and Part H of this manual (WHC-CM-7-5).

i. Disposal of low-level mixed waste shall only occur in an "existing" dangerous waste trench (one that was constructed and had waste placed in it on or before November 23, 1987) or in trenches constructed with double liner and leachate collection systems. Approval by Ecology is required.

j. Remote-handled low-level mixed wastes that exceed 200 mR/h may be buried at Hanford without prior Ecology approval.

9.8.4 Low-Level Mixed Waste Acceptance Criteria

1. The Hanford site radioactive solid waste acceptance criteria are presented in WHC-CM-0063-3. These criteria have been developed by WHC from state and federal regulations as interpreted by DOE orders.

2. A summary of the pertinent waste certification and acceptance criteria is presented in **Table 9-1** and **Table 9-2.**

9.8.5 List of Environmental Protection and Waste Management Standards and Regulations Which Apply to the Design and Construction of the WRAP Module 2A Facility

- 40 CFR 129, Toxic Pollutant Effluent Standards
- 40 CFR 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants
- 40 CFR 190, Environmental Radiation Protection Standards for Nuclear Power Operations
- 40 CFR 191, Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes
- Washington Clean Air Act, Title 70, Chapter 94
- Washington Environmental Quality Laws, Title 43, Chapter 43.21A
- Washington State Solid Waste Rules, Title 173, Chapter 304
- Washington Environmental Coordination Procedures Act of 1973, Title 90, Chapter 90.62
- Washington Air Pollution Control Regulations, Title 173, Chapters 173.400 through 173.490
- General Regulation 80-7, Benton-Franklin-Walla Walla Counties Air Pollution Control Authority
- PSD-X80-14, Approval to Application to Construct (EPA Region X document)

TABLE 9-1
SUMMARY OF RADIOACTIVE WASTE CERTIFICATION CRITERIA
LOW-LEVEL MIXED WASTE

Criteria	LLMW
General	Minimum void spaces. Must be categorized as Class 1 or Class 3 using interim Hanford LLW classes.
Containers	Good condition and constructed of fire retardant materials. For storage use DOT 7A Type A, Specification 17C, galvanized 30- or 55-gallon drums--83 gallon drums, subject to appropriate approvals. No incompatible materials in same container. At least two levels of containment.
Package Weight	Drums weighing greater than 1,000 lbs are accepted on a limited bases.
Corrosives	None permitted.
Free Liquids	No free liquids allowed.
Explosives & Compressed Gases	No explosives permitted. Gas cylinders and aerosol cans must be permanently vented & drained. No reactive metals. No chelating compounds.
Particulates	No restrictions.
Interim Void Space	Not to exceed 10 percent of container volume.
Thermal Power	Containers with >0.1 watt/ft^3 must be identified in Data Package
Fissile Material	Containers with over 15 grams non-TRU fissile material (e.g., U-235) require individual review & approval. Less than 100 nCi/g of alpha emitting radionuclides with half-lives greater than 20 years.
Plutonium Equivalent Activity	Not Applicable
Surface Dose Rate	Maximum 200 mRem/hr at surface
Surface Contamination	Maximum 220 dpm/100 cm^2 alpha. Maximum 2,200 dpm/100 cm^2 beta-gamma.
Labeling	DOT Labels, RCRA Labels, Bar Code ID Number, Gross Weight, weight category, "WRAP 2A" as Point of Origin.
Data Package	Data Package required for each container with certification statement and all data identified in WHC-EP-0063.
Comments	Additional requirements may apply to specific LLMW types based on physical and radiological characteristics. Special waste form requirements for liquid waste, asbestos, long-term radioactive wastes, alkali metals, explosives, compressed gases, pyrophoric materials, lead waste & mercury wastes. 6 empty drums can be compacted into one 83-gallon drum.

TABLE 9-2
SUMMARY WASTE ACCEPTANCE CRITERIA MIXED WASTE

The following criteria apply to RE acceptance of radioactive mixed waste for dispoal at Hanford:

- Waste treatment techniques shall use the Best Demonstrated Available Technology (BDAT) to reduce volume and provide a more stable waste form as required to 40 CFR 268. The concentations of the constituents shall not exceed those allowed by regulation.
- Forms of RMW that are classified for security reasons should be treated to remove or destroy the classified characteristic(s).
- Treatment standards as defined in 40 CFR 286, Subpart D, as applicable for the waste matrix, shall be adhered to.
- RMW that is also classified as Category 3 or Greater Than Category 3 waste may not be disposed until further performance assessment analyses indicate that such disposal is acceptable.
- Reactive wastes must be treated and rendered non-reactive before packaging.
- All RMW shall be segrated and packaged separately from LLW or TRU waste, but contains no hazardous or dangerous constituents.
- The total volume of RMW generated shall be minimized to be extent possible by segregation, compaction and consolidation.
- The RMW should be treated to remove the hazardous constituents.
- Corrosive material should be neutralized if allowed by regulation to remove its corrosive character or packaged in a manner to ensure integrity of the containment barriers.

- Washington Energy Facility Site Evaluation Council General Regulations for Air Pollution Sources, Title 463, Chapter 39
- Washington Pollution Control Tax Credit Regulations, Title 173, Chapter 24
- Washington Department of Ecology General Regulations, Chapter 173, Chapters 173.03, 173.04, 173.06, 173.08 and 173.12
- Washington Water Pollution Control Laws, Title 90, Chapter 48
- Washington Safe Drinking Water Act, Title 70, Chapter 119A
- Washington Water Pollution Control Regulations, Title 173, Chapters 10, 216, 220, 221, 222, 225, and 227
- Washington Water Quality Standards, Title 173, Chapter 201
- Washington Solid Waste Management Law, Title 70, Chapter 70.95
- Washington Hazardous Waste Management Act, Title 70, Chapter 70.105
- Washington Model Toxics Control Act, Title 70, Chapter 70.105D
- Washington Hazardous Waste Fee Regulations, Title 173, Chapter 305
- Washington Hazardous Waste Cleanup Regulations, Title 173, Chapter 340
- Washington State Department of Ecology, Dangerous Waste Regulations, Title 173 Chapter 303
- WHC-EP-0063-2, Hanford Site Radioactive Solid Waste Acceptance Criteria, September 1990.

- WHC-CM-7-5, Environmental Compliance, Level II, August 1991.
- WHC-CM-4-29, Nuclear Criticality Safety Manual
- 40 CFR Parts 240, 241-247, 256-257, 260-265, 268 and 270, Resource Conservation and Recovery Act (RCRA) Regulations
- 40 CFR 302, Designation, Reportable Quantities and Notification
- 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants (NESHAP)
- 40 CFR Part 60, New Source Performance Standards (NSPS)
- 40 CFR 141, National Primary Drinking Water Standards
- 40 CFR 761, Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
- 40 CFR 402, CERCLA Reportable Quantities
- 40 CFR 355, Emergency Planning and Notification under CERCLA
- 10 CFR 1022, Compliance with Floodplains/Wetlands Environmental Review Requirements
- 40 CFR 1500, et seq., CEQ Regulations
- 42 USC 4321-4347, National Environmental Policy Act
- 42 USC 7401, et seq., Clean Air Act
- 42 USC 6901, et seq., Resource Conservation and Recovery Act
- 42 USC 201 et seq. Safe Drinking Water Act
- 15 USC 2601 et. seq. Toxic Substances Control Act
- Executive Order 12088, Federal Compliance with Pollution Control Standards
- 43 USC 431 et seq. Clean Water Restoration Act Sections 307, 318, 402 and 405
- Executive Orders 11988 & 11990, Floodplains/Wetlands Environmental Review
- Executive Order 11514 and 11991, Protection and Enhancement of Environmental Quality
- Executive Order 12316, Response to Environmental Damage
- OMB Circular No. A-106, Reporting Requirements in Connection with the Prevention, Control and Abatement of Environmental Pollution of Existing Federal Facilities of December 31, 1974 as revised.
- DOE Order 5400.1, General Environmental Protection Program
- DOE Order 5400.2 and 2A, Environmental Compliance Issue Coordination
- DOE Order 4700.1, Project Management System

- DOE Order 5820.2A, Radioactive Waste Management
- DOE Order 5440.1C, Implementation of the National Environmental Policy Act
- DOE Order 5400.1, General Environmental Protection Program
- DOE Notice 5400.4, Integration of Environmental Compliance Processes
- DOE Notice 5480.4, Preliminary Notification of Environment, Safety and Health Concerns
- DOE Order 5480.1B, Environment, Safety and Health Program for Department of Energy Operations
- DOE Order 5480.2, Hazardous and Mixed Waste Management
- DOE Order 5480.4, Environmental Protection, Safety and Health Protection Standards
- DOE (and DOE-RL) Order 5484.1 and 1A, Environmental Protection, Safety, and Health Protection Information Reporting Requirements
- DOE Order 5480.3, Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances and Hazardous Wastes
- 49 CFR 171-179, Department of Transportation Regulations for Hazardous Materials
- DOE Order 5400.3, Hazardous and Mixed Waste Program
- DOE Order 6430.1A, General Design Criteria
- Draft DOE Order 5400.xx, Environment, Safety and Health Directive
- Draft DOE Order 5400.xy, Radiological and Effluent Monitoring and Environmental Surveillance
- 52 FR 47662, Section D, DOE Guidelines for NEPA Compliance
- 29 CFR 1910.1000 (Subpart Z - Toxic and Hazardous Substances)
- 29 CFR 1910.101-.120 (Subpart H - Hazardous Materials)
- 53 FR 34079, September 2, 1988, Use of Sumps for Secondary Containment
- ANSI N13.1, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities
- ANSI N42.18-1980, Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents
- UCRL - 15910 (draft), Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomenon Hazards
- SW-846, Test Methods for Evaluating Solid Waste, U.S. Environmental Protection Agency, 1986.
- Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment, Revision 1, U.S. Nuclear Regulatory Commission, Office of Standards Development, Washington, D.C. 1979

9.9 Regulatory Permits

1. The construction and operation of the WRAP Module 2A facility is subject to several sets of regulations concerning the management of solid wastes. The primary state and federal regulations include the following:

- Dangerous waste regulations
- Air emission regulations
- Other environmental regulations

2. Section 9.9.1 describes the state and federal dangerous waste regulations, section 9.9.2 describes the permitting requirements for a Treatment, Storage and Disposal Facility (TSDF), section 9.9.3 describes the air emission regulations and section 9.9.4 lists other environmental regulations applicable to the WRAP Module 2A facility.

9.9.1 State and Federal Dangerous Waste Regulations

1. The WRAP Module 2A facility provides the capability to receive containers of contact handled (CH) solid low-level mixed waste (MW) and treat these wastes as necessary to allow certification and permanent disposal in accordance with all applicable DOE orders and other laws, codes and regulations including: WAC 173-303, RCRA and Hanford site radioactive solid waste acceptance criteria, WHC-EP-0063.

2. The WRAP Module 2A facility will be treating and storing dangerous waste, therefore, the facility will be subject to the state and federal dangerous waste regulations contained in the Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations and related federal requirements included in Title 40 of the Code of Federal Regulations (40 CFR). The state of Washington, Department of Ecology has been granted the authority to enforce both the state and federal regulations for solid waste management.

3. Both 40 CFR part 261 and WAC 173-303 contain list of chemical compounds or common industrial waste solutions that if present in a solid waste make that solid waste a dangerous waste. The characteristics of dangerous waste include:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity

4. Many of the compounds present in the WRAP Module 2A feedstream exhibit one or more of the dangerous waste characteristics. The disposal of the dangerous waste is strictly regulated.

9.9.2 TSD Facility Permitting

1. WRAP Module 2A facility is a new TSD facility which will be treating dangerous waste, as such it must receive an interim status permit before any physical construction can start and a final status operating permit before beginning any treatment, storage or disposal activities. The process for both applying for these permits and for the state of Washington approval is described in WAC 173-303-806. Once granted, DOE owned facilities must operate in accordance with all final status requirements in particular the following:

WAC 173-303-600	Final Facility Standards
WAC 173-303-610	Closure and Post Closure Care
WAC 173-303-630	Use and Management of Containers
WAC 173-303-640	Tank Systems
WAC 173-303-645	Releases from Solid Waste Management Units

2. The WRAP Facility Part B Dangerous Waste permit application is contained in DOE-RL-91-16. This document mainly describes the WRAP Module 1 facility at the present time. This permit application will be modified in accordance with the requirements identified in WAC-173-303-830 as WRAP Module 2A facility design information becomes available. The data required for the permit modification will be prepared by the operating contractor in conjunction with the design contractor.

3. The WRAP Facility Part B permit application consists of 15 chapters:

- Introduction (Chapter 1.0)
- Facility Description and General Provisions (Chapter 2.0)
- Waste Characteristics (Chapter 3.0)
- Process Information (Chapter 4.0)
- Groundwater Monitoring (Chapter 5.0)
- Procedures to Prevent Hazards (Chapter 6.0)
- Contingency Plan (Chapter 7.0)
- Personnel Training (Chapter 8.0)
- Exposure Information Report (Chapter 9.0)
- Waste Minimization Plan (Chapter 10.0)
- Closure and Postclosure Requirements (Chapter 11.0)
- Reporting and Recordkeeping (Chapter 12.0)
- Other Relevant Laws (Chapter 13.0)
- Certification (Chapter 14.0)
- References (Chapter 15.0)

4. A brief description of each chapter of the Part B permit application is provided below:

a. Facility Description and General Provisions (Chapter 2.0) This chapter provides a general description of the WRAP facility. A brief description of the Hanford Site and the Hanford Facility also are provided.

b. Waste Characteristics (Chapter 3.0) This chapter describes the physical, chemical, and biological characteristics of the dangerous waste to be treated or stored at the WRAP facility. A waste analysis plan is included that provides the methodology for determining waste types. Although radionuclide components are not within the scope of the Dangerous Waste Regulations, the information is provided for general knowledge where appropriate.

c. Process Information (Chapter 4.0) This chapter provides a detailed discussion of the processes and equipment of the WRAP facility.

d. Groundwater Monitoring (Chapter 5.0) This chapter explains that the WRAP Facility will not be operated as a dangerous waste surface impoundment, waste pile, land treatment unit, or landfill. Therefore, groundwater monitoring is not required.

e. Procedures to Prevent Hazards (Chapter 6.0) This chapter discusses hazard prevention and emergency preparedness equipment, structures, and procedures.

f. Contingency Plan (Chapter 7.0) This chapter provides information on contingency planning to ensure that the WRAP facility employees whose primary duties will be identified as being associated with dangerous waste management.

g. Exposure Information Report (Chapter 9.0) This chapter explains that the WRAP facility will not store, treat, or dispose of dangerous waste in a surface impoundment or a landfill. Therefore, exposure information is not required.

h. Waste Minimization Plan (Chapter 10.0) This chapter discusses the program to minimize the volume or quantity and toxicity of waste generated at the WRAP facility. The regulatory basis for, and objectives of, the waste minimization program are discussed. Waste generation is described and specific procedures for minimizing waste are discussed.

i. Closure and Postclosure Requirements (Chapter 11.0) This chapter describes the planned activities for closing the WRAP facility. The WRAP facility is to be clean closed; therefore, no postclosure plan is included.

j. Reporting and Recordkeeping (Chapter 12.0) This chapter summarizes commitments for reporting and recordkeeping that will be applicable to the WRAP facility.

k. Other Relevant Laws (Chapter 13.0) This chapter discusses federal and state laws that will govern the operation of the WRAP facility, other than the RCRA, as amended, and the State of Washington Hazardous Waste Management Act of 1976, as amended.

l. Certification (Chapter 14.0) This chapter contains the required certification signed by officials of the U.S. Department of Energy (DOE) Field Office, Richland (RL) and Westinghouse Hanford Company indicating that the information provided is true, accurate, and complete.

m. References (Chapter 15.0) References used throughout the Part B permit application are listed in this chapter. All references which generally are not available from other sources, will be made available for review, upon request, to any regulatory agency or public commentor. References can be obtained by contacting the following:

Administrative Records Specialist
Public Access Room H4-22
Westinghouse Hanford Company
PO Box 1970
Richland, WA 99352

9.9.3 Air Emission Regulations

1. Emissions from the WRAP Module 2A facility will be subject to state and federal regulations governing radioactive and non-radioactive air emissions from processing facilities. Air emissions will also be subject to DOE Orders and WHC policy, which reflect the appropriate local, state and federal regulations.

a. General Regulations

1) Federal air emission regulations have been implemented in Washington through Chapters 173-400, 173-403, 173-480, and 402-80 WAC. In general, new or significantly modified sources of air emissions at Hanford must file notices of construction (NOCs) with the Department of Social and Health Services (DSHS), Ecology, and the Tri-County Air Pollution Control Authority (TCAPCA) before constructing a new or modified source of air emissions.

2) The NOCs will be reviewed to ensure that the proposed facility complies with any applicable New Source Performance Standards (NSPS) contained in 40 CFR Part 60, with applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs) found in 40 CFR Part 61, and that Best Available Control Technology (BACT), Best Available Radionuclide Control Technology (BARCT), and Best Available Control Technology for Toxics (T-BACT) have been applied for emissions control. Within 30 days, the appropriate authorities will make a preliminary determination on the acceptability of the proposed new source, and after an appropriate public comment period, authorize

construction to proceed. Major stationary sources may emit regulated air pollutants including particulates, nitrogen oxides, volatile organic compounds, sulfur dioxide, or reduced sulfur compounds including H_2S in excess of threshold levels so the major stationary sources must receive a Prevention of Significant Deterioration (PSD) permit from Ecology.

3) A NOC will be required for construction of the WRAP 2A facility, as it will lead to increased air emissions. A PSD permit may be required if sulfide or sulfur dioxide emissions exceed threshold levels.

b. National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities

1) Radionuclide emissions from DOE facilities are subject to the NESHAP contained in 40 CFR Part 61 Subpart H, which limits emissions from all sources at a DOE site to an effective offsite dose equivalent of 10 millirem per year (mR/yr). Subpart H also requires that specific monitoring and sampling systems be used for compliance monitoring. This requirement is also reflected in DOE Order 5400.5, Radiation Protection of the Public and Environment.

2) The WRAP Module 2A facility process will be designed and operated to ensure that, as a whole, emissions from the Hanford site do not exceed the 10 mR/yr limit. Emission monitoring systems must meet the standards specified in 40 CFR Part 61 Subpart H.

c. Washington State Toxic Air Pollutant Regulations

1) Chapter 173-460 WAC contains limits on emissions of toxic air pollutants (TAPs) from new sources; permission to operate a new source of toxic air pollutants is granted by review of an NOC as described in Section 2.2.1. Proposed sources of toxic air pollutants must show, through system mass balances and/or dispersion modeling, that emissions will not violate ambient source impact levels (ASILs) specified in Chapter 173-460.

2) The feed to the WRAP Module 2A facility contains many inorganic compounds, which are TAPs regulated under Chapter 173-460 WAC. Chemical additives used in the WRAP Module 2A treatment systems are also TAPs.

d. Federal Air Emissions Standards for RCRA TSDFs

1) Federal regulations for hazardous waste TSDFs found in 40 CFR 264 include air emission standards for facilities treating, storing, or disposing of volatile organic compounds (VOCs).

2) 40 CFR 264 Subpart AA regulates air emissions from process vents in facilities which treat solutions containing greater than 10 ppmw VOCs by the following processes: distillation, thin-film evaporation, fractionation, solvent extraction, air stripping, or steam stripping. A process vent is defined as "any open-ended pipe or stack that is vented to the atmosphere either directly, through a vacuum-producing device, or through a tank (e.g., distillate receiver, condenser, bottoms receiver, surge control tank, separator tank, or hot well)..." Volatile organic emissions from all process vents must be reduced to less than 1.4 kg/hr and 2.8 Mg/yr, or by 95 weight percent through installation of a closed vent system and/or control device. If a closed vent system and control device are installed, the device must meet the performance requirements stipulated in 40 CFR 264.1033. All facilities subject to the process vent regulations must meet the monitoring, recordkeeping, and reporting requirements found in 40 CFR 264.1034 through 40 CFR 264.1036.

3) 40 CFR 264 Subpart BB regulates air emissions from equipment leaks in facilities which manage hazardous wastes containing greater than 10 ppmw VOCs. Standard design features, routine maintenance, inspection, and recordkeeping requirements are incorporated into Subpart BB for such items as pumps, compressors, pressure relief devices, sampling stations, and valves. Subpart BB also establishes maximum allowable timeframes for repairs to leaking equipment after such leaks are detected.

4) Regulations proposed by EPA in July 1991 (Federal Register, Volume 56, Number 140, July 22, 1991) may eventually limit VOC emissions from tanks, surface impoundments, and containers at RCRA TSDFs. Under these proposed regulations, any TSDF which handles hazardous wastes which contain more than 500 ppmw of VOCs must use covered tanks, containers, or surface impoundments, and must route all emissions from these sources to a control devices which produces non-detectable VOC content of the waste is to be evaluated at the point of generation, or the point where the waste may first come into contact with the air.

9.9.4 Other Environmental Regulations

1. The WRAP Module 2A facility will also be required to comply with the following other federal environmental laws:

- Atomic Energy Act of 1954
- Clean Air Act of 1977
- Clean Water Act of 1977
- Endangered Species Act of 1973
- Fish and Wildlife Coordination Act of 1934
- National Historic Preservation Act of 1966
- Toxic Substances Control Act of 1976
- Wild and Scenic Rivers Act of 1968

9.10 Preliminary Safety Evaluation

1. This CDR provides a general functional description of operating scenarios, system descriptions, etc. that were utilized in preparation of the Hazard Classification and Preliminary Safety Evaluation (PSE).

2. The PSE provides early guidance on where to concentrate future design and analytical efforts to ensure that all safety requirements and concerns are addressed during the ACDR.

3. In assessing the hazard classification no credit is taken for engineered or administrative features. It is basically the "inherent" risk in the facility and its operations without any credit for mitigation. The accident deemed to result in the greatest radiological or hazardous material consequences is an earthquake of a magnitude such that the basic integrity of the WRAP Module 2A facility is lost and the major structural members of the facility impact containers, causing the release of radioactive and hazardous materials. Based upon the consequences, the WRAP Module 2A facility is categorized as a low-hazard non-reactor nuclear facility in accordance with the criteria of WHC-CM-4-46 shown below:

Facility Hazard Classification Criteria

Radiological Consequences	Hazard Classification		
	Low	Moderate	High
On-site	$\leq$ 5 rem	$>$ 5 rem to $\leq$ 25 rem	$>$ 25 rem
Off-site	$\leq$ 0.5 rem	$>$ .5 rem to $\leq$ 5 rem	$>$ 5 rem

4. The accident safety analysis included analysis of impacts due to natural phenomena hazards and operational accidents.

5. The analysis of natural phenomena hazards includes consideration of:

   - Earthquakes
   - High winds

6. The operational accident scenarios analyzed included the following:

   - Fires
   - Explosions
   - Spills
   - Criticality
   - Loss of Power
   - Industrial Safety

7. A preliminary qualitative assessment of the major systems that constitute the WRAP Module 2A Facility was conducted using the available data and facility design information from this CDR. The basic criteria used in the PSE analysis was that only single failures or multiple failures caused by a single initiating event (e.g., a major earthquake) which could produce unacceptable consequences would be considered.

8. Using the Hanford site standard dosimetry computer code (GEN II) and the source terms for the radionuclide and hazardous materials releases for a range of accidents (see item 6 above) as input, calculations were performed in the PSE to assess the radiological and hazardous chemical dose consequences to identify the maximum offsite and onsite individual doses. The nearest onsite individual was determined to be 800 meters south in building 272 - WA, while the offsite individual was determined to be 12.6 Km WNW of the WRAP Module 2A Facility site.

9. The results of the PSE evaluation indicates the WRAP Module 2A Facility can be classified as a safety Class 3 facility. A safety Class 3 facility contains items pertaining to occupational safety, the failure of safety Class 3 items could exceed acceptable radiological or toxological material consequences or pose industrial safety hazards to workers. Hence the design criteria for safety Class 3 items are formulated to maintain both capacity to function and occupant safety.

10. The PSE is included in **Appendix J.** Additional analysis to quantify offsite and onsite consequence of all risk significant events will be performed for the preliminary safety analysis report when more definitive design information and operating data are available.

9.11 WRAP 2A Shielding Assessment

1. Introduction

   a. Shielding calculations have been performed during this CDR phase of WRAP 2A to initially assess shielding requirements, and to perform dose rate point evaluations, in order to assess facility zone occupancy, per CM-4-9. An initial source term is presented, which has been used for this work.

   b. Dose to WRAP Module 2A personnel from ionizing radiation shall be estimated in later phases of the design by performing radiation shielding calculations using the agreed source term. Total effective dose equivalent shall be estimated in accordance with the methodologies provided in DOE Order 5480.11, Radiation Protection For Occupational Workers. Annual effective dose shall be calculated for the maximally exposed individual and total effective dose for all personnel employed at the WRAP Module 2A facility.

c. The following design criteria references and standards have been utilized within this shielding assessment:

- WHC-CM-4-9, Radiological Design
- DOE Order 6430.1A, General Design Criteria
- WHC-CM-4-10, Radiation Protection
- WHC-CM-4-11, ALARA Program
- WHC-CM-4-46, Nonreactor Facility Safety Analysis
- WHC-CM-7-5, Environmental Compliance
- DOE Order 5480.11, Radiation Protection for Occupational Workers
- DOE Order 5500.2, Emergency Planning, Preparedness, and Response for Operations
- DOE-RL Order 5480.11A, Requirements for Radiation Protection
- DOE-RL Order 6430.1A, General Design Criteria
- DOE/EV/1830-T5, A Guide to Reducing Radiation Exposures to As Low As Reasonably Achievable (ALARA), April 1980

2. Source Term

a. A comparison between the WRAP 1 source term, and data presented by WHC for a typical WRAP 2A waste steam showed no significant differences in dose drop off curves for a 55-gallon drum. Therefore, the following source term information which was generated for WRAP 1 LLW shielding assessment work has been used in shielding calculations relative to the design of WRAP Module 2A:

Gamma Energy Group

	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7
Energy $E\gamma$, Mev	0.25	0.66	1.12	1.50	2.00	2.40	2.60
Strength, Mev/sec	1.79 + 6	3.66 + 7	1.91 + 5	6.80 + 5	1.03 + 6	7.15 + 3	2.82 + 4
Dose Factor	2.52 - 3	2.22 - 3	1.98 - 3	1.70 - 3	1.60 - 3	1.50 - 3	1.45 - 3

Bulk and Elemental Densities

Drum Component	Bulk (g/cc)	H (g/cc)	O (g/cc)	Si (g/cc)	Fe (g/cc)
Shell	7.87				7.87
Radwaste	0.377	0.0107	0.102	0.014	0.250
Concrete	2.24	N/A	N/A	N/A	N/A

Nominal 10 mR/hr drum surface dose rates were assumed.

3. WRAP 2A Gamma Dose Rate Assessments for Conceptual Design

a. The purpose of a gamma dose rate assessment in the conceptual design of a new nuclear facility (i.e., WRAP 2A) is to determine the overall adequacy of shielding, distances of sources to personnel and operator occupancy times to meet the design requirements and objectives. Specific limiting design dose rates, as summarized below, are taken from WHC-CM-4-9, Section 8, Table 1, Shield Design Criteria.

Zone Category	Access Time Allowed	Initial Design Level	Maximum
		(mrem per hour)	
Uncontrolled Area	Full time	0.05	0.1
Controlled Area			
1	Full time	0.2	0.5
2	Less than 1 hour per day	2	5
3	Less than 1 hour per week	10	20
4	Less than 10 hours per year	50	100
5	No normal access permitted	>100	

b. In addition, the facility shall be designed to limit each operating person's total annual integrated dose to less than 1 rem.

c. Design dose rate calculations and assessments generally proceed from conservative rough order of magnitude values in the conceptual design phase to more accurate (less conservative) and refined values in the title design phases. Multiple dose point calculations from multiple sources require extensive efforts, therefore, perturbations due to shielding and source placement changes should be minimized where feasible.

d. The methodology follows that used in the WRAP 1 dose point assessments, and in summary, consists of judiciously selecting a few target dose points and manually estimating the dose rate at each dose point (utilizing the QAD computer code--generated dose drop-off curves) due to each significant source. Thus if there are *n* dose points and *m* significant sources, there are *n x m* calculations. The manual method uses a dose rate/shielding calculation matrix for multiple source contributions to each dose point.

e. The following list summarizes the significant design drawing bases for source material locations and operating locations for dose point dose rate assessments.

Cadfile	Drawn Date	Title*
SK-2-GP1	04/15/92	Overall Equipment General Arrangement
SK-2-GP9	04/24/92	Vessel & Process Off-Gas General Arrangement
SK-2-MH1	05/05/92	Material Handling Equipment General Arrangement (Overall γ-source locations)
SK-2-MH2	04/24/92	Automated Storage Retrieval Equipment General Arrangement (Plan & secs of drum storage arrays)
SK-2-RC1	04/03/92	Receiving & Shipping Equipment General Arrangement - Plan
SK-2-RC5	04/22/92	Non-Destructive Examination Equipment General Arrangement
SK-2-SC1	04/06/92	Secondary Waste Collection Equipment General Arrangement - Plan
SK-2-SC2	04/07/92	Secondary Waste Collection Equipment General Arrangement - Section
SK-2-SP1	04/06/92	Special Waste Equipment General Arrangement - (Plan)
SK-2-SP2	04/10/92	Special Waste Equipment Sections
SK-2-SR1	04/14/92	Size Reduction & Repack Equipment General Arrangement - Plan
SK-2-SR2	04/30/92	Size Red & Repack Equipment General Arrangement - Sections
SK-2-ST13	04/07/92	Polymer Encapsulation Equipment General Arrangement - Plan
SK-2-ST19	04/23/92	Grout Stabilization Enclosure Equipment General Arrangement - Plan
WR2ASEC1 (A301)	04/23/92	Building Sections
WR2AH6	04/30/92	HVAC Zone Plan Lower & Ground Levels
WR2AH7	04/30/92	HVAC Zone Plan Upper Level

*Note: All drawing nos. H-2-89xxx, Rev. A, Cadcode: 2C:IBM:ACD2:11:NN

4. WRAP 2A Areas for Dose & Shielding Assessment

a. Combining the WRAP 1 dose/shielding methodology guidelines with a review of the WRAP 2A conceptual drawing package, the following general areas are identified for gamma dose and shielding preliminary assessment.

1) Shipping, Receiving and Truck Dock Area (sources in Transfer Conveyor, Drummed-Pallet Storage and in truck)

2) Sample Management Area (sources inside sample management room and sampled drum)

3) Special Waste Treatment Area (Process Gloveboxes) Size Reduction Sort and Repackaging (sources inside and outside of gloveboxes)

4) Box Breakdown Area (1-SWB only at a time)

5) Process Off-Gas and Confinement Zones HVAC rooms (contaminated ducting and HEPA filter sources)

6) Drum Storage Area (182 drums in 2 parallel row arrays + 6 drums)

7) Grout Stabilization Area (29 drums in various stages of grouting)

8) Polymer Encapsulation Area (4 drums undergoing polymerization)

9) Non-Destructive Assay Area (4 single drums undergoing assay)

10) Secondary Waste Collection

11) Control Room*

12) Other Miscellaneous Areas*

*May not have γ-source materials present.

WRAP 2A Radwaste Gamma Source Configurations, Number of Drum Equivalents and Geometric Model Types for QAD			
Gamma(1) Source Area ID	Sources Configuration(2)	Number(3) of DB Drums	QAD-Code(4) Geometric Model Types
1	11-drum row, 6 drummed pallets, 1 single drum, 3-drum row	39	Single Drum 9-drum row + 2 drums 24-drum temp storage 4- drum row - 1 drum
2	1 single drum (in airlock) unknown sample size/config.	1	Single drum
3	5-drum row, 3-dumped drums, 7-single drums	15	Single drum GB pancakes 4-drum row + 1 drum
4	1-SWB (box)	15	Std. box
5	Ducting (contaminated interior surfaces) & loaded HEPA filters (3 banks of 4X2 ea)	<1	Ducting model (new) HEPA model (new)
6	2-91 drum rows 7 high 13 long 6-single drums	188	Single drum 13x7 drum rectang. (new)
7	9-drum row, 11-drum row, 9 single drums	29	Single drum 9-drum row and 9-drum row + 2 drums
8	4 single drums	4	Single drum
9	4 single drums	4	Single drum
10	15,000 & 3,000 gal tanks carbon & bag filters (may not have potential for γ-source)	~0	Tank models (new) Filter models
11 & 12	None	0	None
	Total Drums	296	or equivalents

(1) ID corresponds to area number in above page title "WRAP 2A Areas for Dose & Shielding Assessment".
(2) Observed from conceptual drawing sheets
(3) Drum count (i.e. DB-design basis) or number of DB drum-equivalent volumes
(4) (new) refers to models to be developed not used for WRAP 1

5. <u>WRAP 2A Radwaste Source Configurations Summary for QAD Dose/Shielding Computer Code</u>

   a. Single 55 Gallon Drum

   b. Standard Waste Box (SWB)

   c. 4-Drum Row

   d. 5-Drum Row (4-drum row + 1 drum)

e. 11-Drum Row (9-drum row + 2 drums)

f. 24-Drum 6-Pallets

g. 91-Drum Row (New: 7 high, 1 wide, 13 long)

h. Dumped-Drum 'Pancakes' (in gloveboxes)

i. Duct Model (new contaminated interior)

j. HEPA Filter Model (new contaminated interior)

k. 9-Drum Row

l. 3-Drum Row (4 drums - 1 drum)

m. Secondary Liquid Waste Collection Tanks (new)
- 15K gal & 3K gal

n. Carbon Filter Model (new)

o. Bag Filter Model (new)

p. Facility design requires containment of all forms of radioactive and mixed waste. Most of the waste material will be contained in 55 gallon steel drums, standard waste boxes or in gloveboxes or other specifically designed enclosures.

6. Summary of WRAP 2A Gamma Dose Rate and Shielding Assessments

a. Preliminary γ-dose rates were calculated based on the WRAP 1 dose rate reduction curves for each source type vs. distance and shielding wall assumptions. The dose rate reduction curves for the two drum storage arrays were developed as an additional 'tool' required for the dose rate calculations.

b. Twelve WRAP 2A areas were considered for dose rate and shielding calculations as shown in the table below. Seven of the 12 areas contained multiple dose points; a total of 23 dose point calculations were completed. These dose points are shown on **Figure 9-1**. Some engineering judgement has been used to eliminate calculations from many of the radwaste source drums due to their estimated negligible contribution to a given dose point (i.e., they are either far from the dose point or are shielded by interior walls, or both).

c. All source-to-dose point dose rate calculations were performed in two spacial dimensions and assumed source - midplace maximum dose rates. This assumption should be conservative in most cases, such as for dose rates at approximately 5 feet from floor level due to the 30 foot high drum storage. Refined, three dimensional calculations may be required for advanced conceptual or for title design. The savings in time and calculation effort of the 2-D approach for preliminary work is justifiable at this stage of design.

d. All interior walls are specified as 8 inch thick hollow concrete block except for 12 inch thick poured standard concrete reinforced shielding walls in Shipping and Receiving area, Size Reduction area, around the Box Breakdown area, around Drum Storage arrays, and partial walls separating NDA area from other parts of the facility. One NDA interior shielding wall attached to the west exterior wall is initially assessed as 30 inches thick. The size reduction glovebox is initially assessed as having 1/2 inch thick lead equivalent exterior shield. No shielding is assumed around forklift operators.

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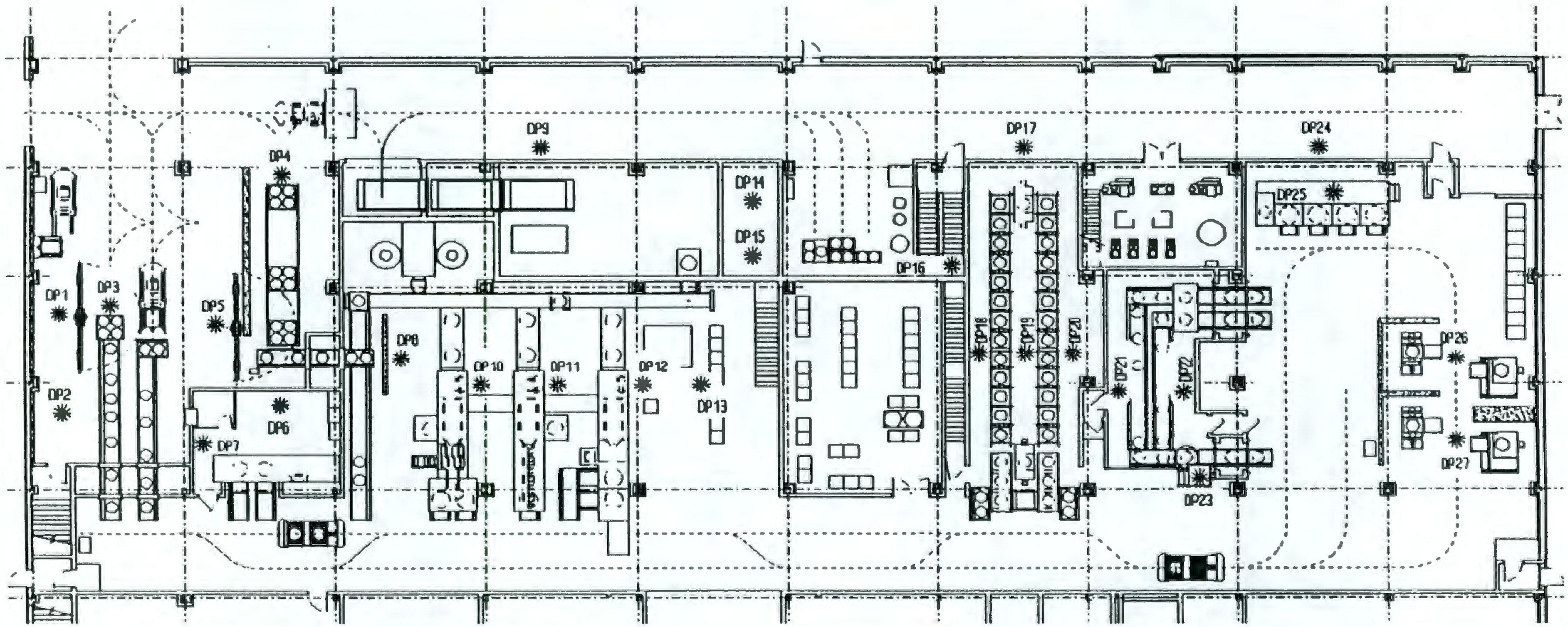
FIGURE 9-1
WRAP 2A DOSE RATE DOSE POINT LOCATIONS



e. No dose point calculations have been assessed near the Special Waste Treatment gloveboxe. Dose rates can be conservatively assumed the same as for the Size Reduction glovebox pending design refinements.

SUMMARY OF WRAP 2A PRELIMINARY DOSE RATE CALCULATIONS

Facility Area	Dose Point ID	γ-Dose Rate* (mrem/hr)	Major Contributing Sources
Shipping & Receiving Area			
Jib Crane Op, Transfer Conveyor	DP1	1.95	S1 - Transfer Conveyor Drums
Walkway East Transfer Conveyor	DP2	1.94	S1 - Transfer Conveyor Drums
Forklift Operator Transfer Conveyor	DP3	1.12	S1 - Transfer Conveyor Drums
Fork Op - Pallet Storage	DP4	4.97	S4 - 24 Drum Pallet Storage
Jib Crane Op - Pallet Storage	DP5	1.34	S5 - Sample Conveyor Drums
Sample Management Area			
South Wall (inside ~ 1')	DP6	0.47	S5 - Sample Conveyor Drums
East Wall (inside ~ 1')	DP7	0.08	S5 - Sample Conveyor Drums
Size Reduction Sort Area			
1' W of Concrete Shield Wall	DP8	0.25	S8 - Glovebox Pancake Source
1' W of Glovebox (Shred)	DP10	0.40	S8 & S9 - Glovebox Pancakes
Transfer Corridor W112 Area			
1' from N - Wall	DP9	0.03	S4 & S17 - 24 Drums & SWB
1' from Storage Wall	DP17	0.05	S22 & S23 - Drum Storage
1' from Polymer Encapsulation Wall	DP24	0.03	S37 - S40 - Polymer Encapsulation Drums
Other Gloveboxes			
Sludge Glovebox	DP11	N/C	Not Determined
Special Waste	DP12	N/C	
Reactive Metals	DP13	N/C	
Suit Change Area			
Center of Room	DP14	0.03	S16 - React Metal Glovebox Structure
Control Room			
Center of Room	DP15	(0.03)	Assumed same as Suit Change Area; 3-D Calculation required
Stairway to AMU	DP16	0.025	S22 & S23 - Drum Storage
Drum Storage Area			
Between E - Wall & E - Array	DP18	9.31	S22 & S23 - Drum Storage
Between Arrays	DP19	17.9	S22 & S23 - Drum Storage
Between W - Wall & W - Array	DP20	9.18	S22 & S23 - Drum Storage
Grout Stabilization Area			
Between Storage Wall & Drums	DP21	4.86	S25 & S27 - Curing Drums
W - Side of Curing Drums	DP22	5.69	S25 & S27 - Curing Drums
N - Platform	DP23	1.94	S27 & S28 - Curing Drums
Polymer Encapsulation Area			
Platform Between S - Wall & Drums	DP25	1.05	S37 - S40 Polymer Encapsulation Drums
NDA Area			
S - Center Track AGV	DP26	0.37	S41 & S42 Drums
N - Center Track AGV	DP27	0.38	S43 & S44 Drums

*Note: Values listed are average instantaneous dose rates for the average drum.

f. The results of the dose rate calculation indicate the following with reference to CM-4-9:

- That the Shipping and Receiving area and the Polymer Encapsulation area, as currently configured, can be considered suitable for part-time occupancy. These will, therefore, need to be further evaluated from the point of view of addition of shielding, and from an integrated exposure assessment during later design.

- That the Sample Management Area, and the operating areas of the Size Reduction and Repack area are generally within the dose rate range for full-time occupancy, although some further consideration will need to be given to additional reduction measures, to bring these rates down closer to the initial design target level of 0.2 mrem/hr. The NDA area is also within the same range, although this will be normally unoccupied.

- That the radiation levels in the Lag Store and the Grouting Cell are within the overall range for controlled area Zones 2 and 3, which is consistent with these areas being remotely operated, and therefore accessed only for maintenance.

- That the Transfer Corridor, the Control Room, the AMU stairway and the suit change area, as currently configured, meet the uncontrolled area dose rate criteria.

g. This dose rate data will next need to be combined with the operating time requirements which will be incorporated in the next design phase via the Time and Motion Study results to fully assess shielding adequacy and to consider optimization. Also, refined dose rate/shielding design calculations will be required for those operating areas requiring controlled full-time occupancy with marginal dose rates as noted above.

h. Shielding wall materials (i.e., hollow concrete block and reinforced poured concrete) and thickness appear adequate for conceptual design purposes. The next design iteration will require more extensive wall thickness and other shielding verification. Also, additional dose point dose rates will be calculated for dose assessment adequacy.

TABLE OF CONTENTS

OUTLINE SPECIFICATIONS INDEX

WRAP 2A

OUTLINE SPECIFICATIONS

TABLE OF CONTENTS

VOLUME III
WRAP 2A OUTLINE SPECIFICATIONS

1.0 INTRODUCTION

1. Outline Specifications for the CDR have been developed utilizing the Construction Specification Institute (CSI) Masterformat©.

   a. Masterformat is a system of numbers and titles for organizing construction information into a regular, standard order or sequence. By establishing a master list of titles and numbers Masterformat promotes standardization and thereby facilitates the retrieval of information and improves construction communication.

   b. Since its introduction in 1963, the 16 division format has been widely accepted as an industry standard in the United States and Canada.

   c. Masterformat is the basis for numbering and titling Federal Construction Guide Specifications and is also used at state and municipal levels in the U.S.

WRAP 2A

OUTLINE SPECIFICATIONS

WRAP 2A

OUTLINE SPECIFICATIONS

2.0 SCOPE

1. Outline Specification Sections have been developed to envelope all major components and activities.

2. Divisions:

a. The specification titles and numbers are organized into 16 basic groupings of related construction information called "divisions". Each division is identified by a fixed number and title. The divisions are the basic framework and they indicate the location of the subordinate elements of the system. The numbers and titles of the divisions are:

- Division 1 - General Requirements
- Division 2 - Site Work
- Division 3 - Concrete
- Division 4 - Masonry
- Division 5 - Metals
- Division 6 - Wood and Plastics
- Division 7 - Thermal and Moisture Protection
- Division 8 - Doors and Windows
- Division 9 - Finishes
- Division 10 - Specialties
- Division 11 - Equipment
- Division 12 - Furnishings
- Division 13 - Special Construction
- Division 14 - Conveying Systems
- Division 15 - Mechanical
- Division 16 - Electrical

3. Sections

a. Within each division, specifications are written in numbered "sections" each of which covers one portion of the total work or requirements. The first two digits of the section number are the same as the division number. Using this method successive levels of scope can be captured within a specification section; i.e. broad, medium, and detailed. The broadscope section titles are shown with five digit numbers, and recommended mediumscope sections are shown with hyphenated three digit numbers. Unnumbered, indented titles, which in most cases follow a mediumscope title, are narrowscope section titles. These, when taken together with the mediumscope titles under a broadscope heading, describe the coverage of that broadscope section. For example:

02100	SITE PREPARATION
-110	Site Clearing
	Clearing and Grubbing
	Large Tract Tree Clearing
-115	Selective Clearing
	Sod Stripping
	Tree and Shrub Removal
	Tree Pruning
-120	Structure Moving

b. The following outline Specification Sections have been developed for this CDR. Only applicable broadscope section titles have been utilized. It should be noted that the grouping by component or system is very subjective. This outline specification format is very adaptable to follow on title work which may address construction contracts by area, building or system in consideration of yet to be developed cost and schedule criteria.

DIVISION 2	**SITEWORK**
02210	GRADING
02221	EXCAVATING, BACKFILLING AND COMPACTING FOR STRUCTURES
02225	EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES
02430	CULVERTS
02511	AGGREGATE BASE COURSE
02513	ASPHALT CONCRETE PAVING
02528	CONCRETE CURBS AND WALKS
02665	WATER SYSTEMS
02730	SANITARY SEWAGE SYSTEMS
02740	SEPTIC SYSTEMS
02935	LANDSCAPING
DIVISION 3	**CONCRETE**
03100	CONCRETE FORMWORK
03200	CONCRETE REINFORCMENT
03300	CAST-IN-PLACE CONCRETE
03600	GROUT
DIVISION 4	**MASONRY**
04000	MASONRY
DIVISION 5	**METALS**
05060	WELDING
05100	STRUCTURAL STEEL
05101	STAINLESS STEEL AND FASTENERS
DIVISION 6	**WOOD AND PLASTICS**
06000	WOOD AND PLASTICS
DIVISION 7	**THERMAL AND MOISTURE PROTECTION**
07000	THERMAL AND MOISTURE PROTECTION
DIVISION 8	**DOORS AND WINDOWS**
08000	DOORS & WINDOWS
DIVISION 9	**FINISHES**
09000	FINISHES
DIVISION 10	**SPECIALTIES**
10000	SPECIALTIES
DIVISION 11	**EQUIPMENT**
11000	EQUIPMENT
11172	HEPA FILTER COMPACTOR
11177	SHREDDING EQUIPMENT
11501	SAWING EQUIPMENT
11502	DRUM LID REMOVER
11503	MANIPULATORS
11504	LIFTING DEVICES
11505	DECONTAMINATION EQUIPMENT
11506	INLINE PROCESS EQUIPMENT
11507	JAR MILL
DIVISION 12	**FURNISHINGS**
12000	FURNISHING

DIVISION 13	SPECIAL CONSTRUCTION
13000	SPECIAL CONSTRUCTION
13070	AIRLOCK
13110	ENCLOSURES
13220	LIQUID WASTE FILTERS
13250	SIMPLE DOUBLE LID SYSTEM
13251	PURGED PORT
13401	CONTROL AND INSTRUMENTATION SPECIFICATION
13402	CONTROL AND INSTRUMENTATION FOR MECHANICAL EQUIPMENT
13406	BAR CODE IDENTIFICATION
13407	ANNUNCIATORS
13451	HEALTH PHYSICS INSTRUMENTATION
13452	ISOKINETIC STACK EFFLUENT MONITORING SYSTEMS
13461	PLANT MANAGEMENT SYSTEM HARDWARE
13462	PLANT MANAGEMENT SYSTEM SOFTWARE
13531	DRUM NON-DESTRUCTIVE ASSAY EQUIPMENT
DIVISION 14	**CONVEYING SYSTEMS**
14053	DRUM HANDLING/TIPPING
14054	SORTING & TIPPING TABLES
14450	FORK LIFT TRUCK
14470	SCISSOR LIFT TABLE
14510	AUTOMATIC GUIDED VEHICLE
14550	CONVEYING SYSTEMS (CONTAINER & BULK)
14551	GROUTING STABILIZATION CONVEYING SYSTEM
14590	GROUTING AGENTS BULK STORAGE AND HANDLING
14592	DRUM PUSHER
14593	PUG MILL
14594	WASTE TRANSFER DEVICES
14595	CONTAINER TRANSFER CARRIAGE
14596	TRANSFER BASKET
14600	HOIST AND CRANE
14620	AUTOMATIC STORAGE/RETRIEVAL
DIVISION 15	**MECHANICAL**
15000	GENERAL MECHANICAL (HVAC)
15050	BASIC MECHANICAL, MATERIALS & METHODS
15060	PIPING MATERIAL AND VALVES
15140	SUPPORTS AND ANCHORS (HVAC)
15160	PUMPS
15175	TANKS
15200	AGITATORS/MIXERS
15250	MECHANICAL INSULATION (HVAC)
15330	FIRE PROTECTION SPRINKLER SYSTEMS
15375	STANDPIPE & HOSE SYSTEMS
15400	PLUMBING SYSTEMS
15450	PLUMBING FIXTURES AND EQUIPMENT
15481	COMPRESSED AIR SYSTEMS

15575	STACKS (HVAC)
15682	WATER COOLED CHILLERS (HVAC)
15700	COOLING TOWER (HVAC)
15760	LIQUID HEAT TRANSFER (HVAC)
15800	AIR DISTRIBUTION (HVAC)
15855	AIR HANDLING UNITS (HVAC)
15860	RETURN & EXHAUST FANS
15883	HEPA FILTER HOUSING (HVAC)
15900	CONTROLS & INSTRUMENTATION (HVAC)
15990	TESTING & BALANCING OF SYSTEMS (HVAC)
DIVISION 16	**ELECTRICAL**
16050	BASIC ELECTRICAL MATERIALS AND METHODS
16110	RACEWAYS
16120	WIRE AND CABLES
16123	15 KV CONDUCTORS
16141	SWITCHES, RECEPTACLES & ACCESSORIES
16152	ELEC SPECIFICATIONS FOR PACKAGED MECHANICAL EQUIPMENT
16252	MANUAL TRANSFER SWITCHES
16310	AERIAL POWER DISTRIBUTION
16315	POWER TRANSFORMERS
16316	LOW VOLTAGE FEEDER BUSWAY
16317	LOW VOLTAGE SWITCHGEAR
16450	GROUNDING
16462	TRANSFORMER - DRY TYPE
16470	PANELBOARDS
16480	MOTOR CONTROL CENTERS
16501	LAMPS
16510	LIGHTING FIXTURES
16610	UNITERRUPTABLE POWER SUPPLY SYSTEM
16640	CATHODIC PROTECTION
16670	LIGHTNING PROTECTION SYSTEM
16700	EMERGENCY AUDIBLE ALARM-SIGNALS
16710	FIRE ALARM AND SMOKE DETECTION SYSTEMS
16740	VOICE AND DATA SYSTEMS
16750	PUBLIC ADDRESS SYSTEM
16780	CLOSED CIRCUIT TELEVISION SYSTEM

3.0 APPROACH

1. The Specifications are very limited outlines and are only intended to provide a conceptual envelope of products, components, services and applicable materials, codes and standards. They may be easily reconfigured to suit contract prerogatives.

2. The Mechanical Discipline Specification Sections, for example, list potential applicable commercial codes and standards and provide preliminary data sheets for equipment. Other disciplines sections detail services or materials as required. In all cases the paragraphs are numbered to comply with the CSI format and may be inserted as required in the more detailed specification developed during follow-on title work.

3. A full table of contents has been printed for each section, for information only. The Specification, as currently formatted is an outline suitable for the Conceptual Design Stage. As the project evolves, other sections (as noted in the TOC) will be prepared/added as they become relevant to the required state or contracting (i.e, equipment procurement, construction contract bidding etc).

WRAP MODULE 2A

DIVISION 2 - SITE WORK

TABLE OF CONTENTS

SECTION 02210

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
2210 GRADING

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02210

GRADING

PART 1 GENERAL

1.01 SECTION SCOPE

A. Stripping, excavation, filling, embankment construction and subgrade preparation for road, parking and landscaping in the building site area.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT-M41-10 - 1991 Standard Specifications for Road, Bridge, and Municipal Construction

1.04 SYSTEM DESCRIPTION

A. Grading work includes stripping ,excavating, filling, embankment and subgrade preparation for all areas of the WRAP 2A project site.

B. A minimum of 6 inches of stripping will be required from all construction areas. Stripped material suitable for reuse will be stockpiled. Unsuitable material will be wasted.

C. Excavated material will be used for compacted fill.

D. Embankments will be placed on prepared surfaces scarified and compacted to 90% of maximum density.

E. Subgrade will be constructed to a tolerance of +0 to -0.05 feet in 10 feet.

F. Top soil will be graded to a tolerance of $\pm$0.1 feet in 10 feet.

G. Dust and erosion due to drainage will be controlled by use of appropriate dust control fences and construction methods.

END OF SECTION

SECTION 02221

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02221 EXCAVATING, BACKFILLING AND COMPACTING FOR STRUCTURES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02221
EXCAVATING, BACKFILLING AND COMPACTING FOR STRUCTURES

PART 1 GENERAL

1.01 SECTION SCOPE

A. Excavating, backfilling and compacting for the Module 2A building foundation and equipment foundations inside and*outside of the building including but not limited to storage tanks, bins, transformer and cooling tower foundations.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT-M41-10 - 1991 Standard Specifications for Roads, Bridge and Municipal Construction

B. OSHA - Occupational Safety and Health Administration Standards

1.04 SYSTEM DESCRIPTION

A. Excavation, backfilling and compacting will be required for the WRAP 2A Facility Building, for the bulk material storage area and exterior equipment foundations.

B. Excavations will be cut to the tolerance of ± 0.1 foot from the elevation shown on the design drawings and will be sufficiently wide to allow for the installation of concrete formwork.

C. Backfilling will be done with suitable material from the excavations or from offsite borrow areas.

D. Compaction for structural fills will be to 95% of maximum density.

END OF SECTION

SECTION 02225

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02225 EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02225

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 SECTION SCOPE

A. Excavation, backfilling and compacting for the installation of buried pipe liens and electrical duct banks including but not limited to sanitary sewer and leach field distribution piping, fire water and potable water piping and buried electrical duct bank to the transformers.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT-M41-10 - 1991 Standard Specifications for Road, Bridge, and Municipal Construction

B. OSHA - Occupational Safety and Health Administration Standards

1.04 SYSTEM DESCRIPTION

A. Trenches for pipe, electrical duct banks, etc. will be cut to the angle of repose of the soils except that the trench below the top of pipe will have vertical sides. Trenches will not exceed the pipe diameter by more than 21 inches.

B. Trenches will be backfilled to the top of pipe with pipe bedding material and from the top of pipe to grade with suitable material from the trench excavation or from offsite borrow.

C. Backfill will be thoroughly tamped under and around the full length of pipe.

END OF SECTION

SECTION 02430

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02430 CULVERTS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02430

CULVERTS

PART 1 GENERAL

1.01 SECTION SCOPE

A. Culverts for storm drainage under the parking lot access roads.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. AASHTO M190 - Bituminous coated corrugated metal culvert pipe and pipe arches

B. AASHTO M36 - Zinc coated (galvanized) corrugated iron or steel culverts and underdrains

1.04 SYSTEM DESCRIPTION

A. Culverts will be corrugated, galvanized steel pipe with Helical corrugations with manufacturer's recommended joints and flared end sections.

B. Culverts will be fully coated with a bituminous coating.

C. Culverts will be used to direct surface drainage under driveways.

END OF SECTION

SECTION 02511

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02511 AGGREGATE BASE COURSE

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02511

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SECTION SCOPE

A. Aggregate base course for roads, parking lot and vehicle maneuvering areas and gravel for landscaping.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT- M41-10 - 1991 Standard Specification for Road, Bridge, and Municipal Construction

1.04 SYSTEM DESCRIPTION

A. Aggregate base course for roads and parking areas will be in accordance with WSDOT standards.

B. Aggregate use as landscaping gravel will be compacted with light vibratory compactors and be in accordance with WSDOT-M41-10, Section 9-03.12(4).

END OF SECTION

SECTION 02513

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02513 ASPHALTIC CONCRETE PAVING

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02513

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION SCOPE

A. Exterior paving for roads, parking lot and vehicle maneuvering areas.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT-M41-10 - 1991 Standard Specifications for Road, Bridge, and Municipal Construction

1.04 SYSTEM DESCRIPTION

A. Asphaltic concrete paving will be installed on all roads, drives and parking areas used for vehicular traffic.

B. Asphalt paving will be designed in accordance with WSDOT-M41-10.

C. Asphaltic concrete wearing course will be placed over the leveling course with a tack coat between them.

D. The base course will have a prime coat applied prior to placing the paving.

END OF SECTION

SECTION 02528

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02528 CONCRETE CURBS AND WALKS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02528

CONCRETE CURBS AND WALKS

PART 1 GENERAL

1.01 SECTION SCOPE

A. Exterior sidewalks, stoops and curbs.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. N/A

1.04 SYSTEM DESCRIPTION

A. Concrete used for sidewalks, curbs and walks will have a 4,000 psi 28-day compressive strength.

B. Concrete will be air entrained to provide a durable concrete suitable for exterior use.

C. Sidewalks will have control joints and expansion joints to control cracking. Joints will be 4 to 6 feet center-to-center.

D. There will be wheel chair ramps at curbs on the south side of the parking lot.

E. Sidewalks will be generally 4 inches thick without concrete reinforcement except sidewalks subjected to vehicular traffic which will be 6 inches thick and will have reinforcement.

END OF SECTION

SECTION 02665

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02665 WATER SYSTEMS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02665

WATER SYSTEMS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation and acceptance of fire water and potable water line extensions from existing water mains and the irrigation sprinkler system.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Socity for Testing and Materials (ASTM)

ASTM D2241	Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)

B. American Water Works Association (AWWA)
AWWA C900
AWWA C151
AWWA C509
AWWA C502
AWWA B301
AWWA B300
AWWA C104
AWWA C651

C. American National Standards Institute (ANSI)
ANSI A21.51

D. Washington State Department of Transportation (WSDOT)

WSDOT-M41-10-1991	Standard Specifications for Road, Bridge and Municipal Construction

E. National Fire Protection Association

NFPA-24	Installation of Private Fire Service Mains and Their Appurtenances

1.04 SYSTEM DESCRIPTION

A. Water systems for the WRAP 2A Facility will be provided by tapping into the existing water main serving the area near the WRAP Module 1 site.

B. Polyvinyl chloride pipe will be used for the potable water and irrigation sprinkler system.

C. Ductile Iron Pipe (DIP) of thickness class 50 with mechanical or push-on joints will be used for the fire protection piping. DIP will be cement lined and seal coated inside with bituminous dip or paint and shall also have a bituminous coating on the exterior.

D. Gate valves will be UL-FM iron body, double disc, bronze mounted, parallel seat type with nonrising stem having "o" ring packing.

E. Fire hydrants will have one 5.25 valve opening and have one 4.5 inch nozzle and two 2.5 inch nozzles. Hydrants shall be dry barrel traffic type.

F. Water lines will be installed with concrete thrust blocks.

END OF SECTION

SECTION 02730

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02730 SANITARY SEWAGE SYSTEMS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02730

SANITARY SEWAGE SYSTEMS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication and acceptance testing of sanitary sewer pipe outside of building to septic tank for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Society for Steel Testing and Materials

ASTM D3034	Type PSM Poly(vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.04 SYSTEM DESCRIPTION

A. Sanitary sewage system will consist of PVC pipe with push-on joints and rubber gaskets and be in accordance with ASTM D3034.

B. Joints will be in accordance with the manufacturer's recommendations.

C. Cleanouts will be provided as required.

END OF SECTION

SECTION 02740

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
SEPTIC SYSTEM

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02740

SEPTIC SYSTEM

PART 1 GENERAL

1.01 SECTION SCOPE

A. WRAP Module 2A Septic System.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. ASTM D3034 — Type PSM Poly(vinyl Chloride) (PVC) Sewer Pipe and Fittings

B. ASTM D2729 - Poly(vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.04 SYSTEM DESCRIPTION

A. The septic system consists of the septic tank, leaching field and interconnecting piping.

B. The septic tank will be constructed of 4,000 psi concrete using type V cement.

C. The septic tank will have a bituminous coating to a depth of 4 inches below the water level and on all surfaces above the water level.

D. A precast concrete distribution box 5 feet in diameter with cast iron frame and cover will be furnished for the leaching field distribution piping.

E. Perforated PVC piping layed in clean graded crushed gravel with perforation down will be used for the leach field distribution piping.

END OF SECTION

SECTION 02935

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
02935 LANDSCAPING

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 02935

LANDSCAPING

PART 1 GENERAL

1.01 SECTION SCOPE

A. Work includes sodding and planting for the WRAP Module 2A Facility site.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. WSDOT-M41-10-1991 — Standard Specifications for Road, Bridge and Municipal Construction

1.04 SYSTEM DESCRIPTION

A. Areas near the building to have grass will be sodded.

B. Other disturbed areas will be seeded with a field mixture of native grasses suitable for growth in the Hanford area without irrigation (35 pounds of live seed per acre).

C. Seeded areas are to receive hay, straw or wood cellulose mulch applied at a rate of 2 tons per acre.

D. Hydraulically applied seed will be permitted.

E. Erosion control netting will be used to control erosion and shall be polypropylene knit interwoven with biodegradable paper furnished in 5 foot minimum width rolls.

F. Trees shall be wrapped, staked and guyed to encourage straight growth and to prevent wind damage.

END OF SECTION

WRAP MODULE 2A

DIVISION 3 - CONCRETE

TABLE OF CONTENTS

SECTION 03100

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
03100 CONCRETE FORMWORK

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SECTION SCOPE

A. All concrete formwork.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. ACI 347 - Recommended Practice for Concrete Formwork

B. ACI 301 - Specifications for Structural Concrete for buildings

C. ACI 318 - Building Code Requirements for Reinforced Concrete

D. CRSI - Manual of Standard Practice

1.04 SYSTEM DESCRIPTION

A. Forms for concrete will be of plywood, metal or other acceptable panel material which will provide a smooth, straight surface.

B. Form release oil will be applied to all form surfaces in contact with concrete.

C. Form oils shall be nonstaining and compatible with the type of finish to be given to the concrete.

D. Form ties shall be commercially manufactured snap-off type which will not leave any metal nearer than 1 inch to the surface of the concrete nor a hole larger than 1 inch in the surface of the concrete.

END OF SECTION

SECTION 03200

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
03200 CONCRETE REINFORCEMENT

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SECTION SCOPE

A. All steel reinforcing bars for concrete.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	ACI - 318	Building Code Requirements for Reinforced Concrete
B.	ASTM A185	Welded Steel Wire Fabric for Concrete Reinforcement
C.	ASTM A370	Methods and Definitions for Mechanical Testing of Steel Products
D.	ASTM A497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement
E.	ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
F.	CRSI	Manual of Standard Practice

1.04 SYSTEM DESCRIPTION

A. Concrete Reinforcing will be primarily deformed bars of ASTM A615, Gd 60 Steel.

B. Welded wire fabric will be used for thin slabs requiring shrinkage and crack control reinforcing (e.g., elevated slabs supported on metal decking).

C. Reinforcing bars will have lap splices and will be wire tied at all crossing points.

END OF SECTION

SECTION 03300

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
03300 CAST-IN-PLACE CONCRETE

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION SCOPE

A. Concrete for walls, footings, column piers, slabs-on-grade and elevated slabs.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
B.	ACI 301	Specifications for Structural Concrete for Buildings
C.	ACI 304	Measuring, Mixing, Transporting and Placing Concrete
D.	ACI 305	Hot Weather Concreting
E.	ACI 306	Cold Weather Concreting
F.	ACI 318	building Code Requirements for Reinforced Concrete
G.	ASTM C94	Ready-Mixed Concrete
H.	ASTM C260	Air-Entraining Admixtures for Concrete
I.	ASTM C33	Concrete Aggregates
J.	ASTM C150	Portland Cement
K.	ASTM C309	Liquid Membrane-Forming Compounds for Curing Concrete
L.	ASTM C494	Chemical Admixtures for Concrete

M. ASTM D1751 — Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types)

1.04 SYSTEM DESCRIPTION

A. Cast-in-place concrete will be utilized for all building and equipment foundations, floor slabs-on-grade, elevated slabs and for walls where radiation shielding is required.

B. Concrete, including shielding concrete, will be normal weight concrete composed of Portland cement, coarse and fine aggregate, and suitable admixtures to produce workable and durable concrete.

C. Air entraining admixtures will be added to all concrete to produce air entrainment of 6% ± 1%.

D. Concrete for floor slabs and exterior sidewalks, curbs, etc. shall have a 28-day compressive strength of 4,000 psi.

E. Concrete for building and equipment foundations shall have a 28-day compressive strength of 3,000 psi except concrete for electrical duct banks shall have a 28-day compressive strength of 2,000 psi.

END OF SECTION

SECTION 03600

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
03600 GROUT

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 03600

GROUT

PART 1 GENERAL

1.01 SECTION SCOPE

A. Grout for column base plates, equipment base plates, anchoring anchor bolts and steel dowels to concrete and for bonding fresh concrete to hardened concrete.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	ASTM C827	Test Method for Early Volume Change of Cementious Mixtures
B.	ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete
C.	ASTM C109	Test Method for Compressive Strength of Hydraulic Cement Mortars
D.	ASTM C191	Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

1.04 SYSTEM DESCRIPTION

A. Nonshrink, nonmetallic cementious grout shall be used to provide full bearing under base plates of building columns and equipment.

B. Grout shall be installed after all alignment and leveling operations have been completed.

C. Epoxy grouts shall be used for anchoring bolts, reinforcing dowels, etc. into holes drilled into hardened concrete.

D. Epoxy grout shall be 100% solids moisture insensitive epoxy resin adhesive.

END OF SECTION

WRAP MODULE 2A

DIVISION 4 - MASONRY

TABLE OF CONTENTS

SECTION 04000

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
04000 MASONRY

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 04000

MASONRY

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design and installation of reinforced concrete unit masonry work for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Society for Testing and Materials

ASTM C 90 - Concrete Masonry Units
ASTM C 270 - Mortar
ASTM C 476 - Grout
ASTM A 615 - Reinforcing Bars
ASTM A 307 - Anchor Bolts

B. Uniform Building Code
Chp. 24 Engineered Masonry

1.04 SYSTEM DESCRIPTION

A. Reinforced Concrete Unit Masonry Interior Partitions

Full height to roof structure unless otherwise indicated on drawings.

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances, and applicable standards.

B. Concrete masonry units (CMU), hollow stone aggregate type of standard 8 x 8 x 16 inch size conforming to applicable provisions of ASTM C 90.

C. Concrete masonry units for rated fire separation walls shall comply with appropriate UL requirements.

D. Mortar is type S per ASTM C 270.

E. Coarse grout used at vertical reinforcing, bond beams and lintels conforms to ASTM C 476.

F. Horizontal reinforcement shall be galvanized steel ladder type.

G. Verticle reinforcing and horizontal reinforcing for bond beams and lintels shall be deformed steel reinforcing bars conforming to ASTM A 615, Grade 60.

H. Anchor bolts set into masonry shall conform to ASTM A 307.

I. Masonry Accessories: Wall ties, anchors, and formed control joints as applicable.

PART 3 EXECUTION

3.02 ERECTION, INSTALLATION AND APPLICATION

A. Concrete masonry units shall be laid in a running bond pattern with tooled concave mortar joints.

B. Masonry walls shall be anchored to structural steel building frame for horizontal support.

C. Bond beams are continuous for the entire length of all walls and are located at the top of walls and elsewhere to meet seismic design requirements.

D. Reinforced masonry lintels shall be located over all openings.

E. Grouted cells with vertical reinforcing shall be located at sides of openings and elsewhere to meet seismic design requirements.

F. Bullnose concrete masonry units shall be used at exposed interior corners.

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WRAP MODULE 2A

DIVISION 5 - METALS

TABLE OF CONTENTS

SECTION 05060

WRAP MODULE 2A

SPECIFICATION SECTION FOR 05060 WELDING

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 05060

WELDING

PART 1 GENERAL

1.01 SECTION SCOPE

A. Shop and field welding for structural steel and vessel and piping systems.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	AWS D1.1	Structural Welding Code
B.	ANSI B31.3	Chemical Plant and Petroleum Refinery Piping
C.	ASME	Boiler and Pressure Vessel Code

1.04 SYSTEM DESCRIPTION

A. All structural and piping welding whether done in the shop or field shall be done in accordance with this section.

B. 100 percent of structural welds shall be visually inspected.

C. Piping welds shall have liquid penetrant, magnetic particle or radiographic examination in accordance with the applicable codes.

D. Both carbon steel and stainless steels are included.

E. Welding electrodes will be E70XX for carbon steel and E308, E308L, E316 and E309Cb for stainless steels.

END OF SECTION

SECTION 05100

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
05100 STRUCTURAL STEEL

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 05100

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION SCOPE

A. Structural steel for elevated floors, pipe supports, bus duct supports, access platforms and miscellaneous fabrications.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	ASTM A36	Structural Steel
B.	ASTM A325	High-Strength Bolts for Structural Steel Joints
C.	ASTM A563	Carbon and Alloy Steel Nuts
D.	ASTM A307	Carbon Steel Externally Threaded Standard Fasteners
E.	ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
F.	ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
G.	ASTM A611	Cold-Rolled Sheet, Carbon, Structural
H.	ASTM A108	Steel Bars, Carbon, Cold-Finished, Standard Quality

I. ASTM F959 — Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

J. SSPC — Steel Structures Painting Council

1.04 SYSTEM DESCRIPTION

A. Structural steel for equipment supports, elevated floor framing and miscellaneous access platforms and stairs and ladders shall be fabricated from ASTM A36 steel.

B. Connections shall be welded in the shop and bolted in the field to the greatest extent possible.

C. Primary bolted connections shall be made with high strength bolts and secondary connections may be made using common bolts.

D. Structural steel will have a surface preparation in accordance with SSPC-SP-2 (Hand Tool Cleaning) and will have one coat of an ALKYD modified acrylic latex primer.

E. Anchor bolts for anchoring structural steel to foundations shall be in accordance with ASTM A307.

F. Expansion bolts used to anchor equipment and secondary structures to concrete shall be in accordance with FS FF-S-325, Group II, Type 4, Class 1.

G. Metal Floor Decking shall be 18 ga, 1 1/2 inch steel decking.

END OF SECTION

SECTION 05101

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
05101 STAINLESS STEEL AND FASTENERS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 05101

STAINLESS STEEL AND FASTENERS

PART 1 GENERAL

1.01 SECTION SCOPE

A. Structural supports and fabrications of stainless steel.

1.02 RELATED SECTIONS

1.03 REFERENCES

A.	ASTM A240	Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
B.	ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
C.	ASTM A193	Alloy Steel Bolting Material for High-Temperature Service
D.	ASTM A194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service

1.04 SYSTEM DESCRIPTION

A. Stainless steel shall be 304L or 316L in accordance with ASTM A240 for plates and ASTM A276 for shapes and bars.

B. Stainless steel shall be used in areas where corrosion from decontamination agents is to be prevented.

END OF SECTION

WRAP MODULE 2A

DIVISION 6 - WOOD AND PLASTICS

TABLE OF CONTENTS

SECTION 06000

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
06000 WOOD AND PLASTICS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 06000

WOOD AND PLASTICS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication and installation of rough and finished carpentry work for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. Western Wood Products Association
WWPA Lumber Standards

B. American Plywood Association
APA Plywood Standards

C. Architectural Woodwork Institute
AWI Millwork Standards

D. American Wood Preservers' Association
AWPA Fire Retardant Treatment

1.04 SYSTEM DESCRIPTION

A. Miscellaneous Wood Blocking and Backing

B. Interior Architectural Woodwork

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished instrict accordance with all of the governing codes, ordinances, and applicable standards.

B. Miscellaneous wood blocking and backing any species, WWPA No. 3 or better, or plywood, grade PS1, APA C-C.

C. Pressure treated with chloride salts for fire retardancy where required. AWPA C20 for lumber and AWPA C27 for plywood - noncorrosive type.

D. Finish carpentry work shall be AWAI "custom" grade with high pressure plastic laminate finish. To include:

- Toilet Vanity Counters
- Closet Shelves
- Reception Counter

END OF SECTION

SECTION 07000

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
07000 THERMAL AND MOISTURE PROTECTION

TABLE OF CONTENTS

SECTION 07000

THERMAL AND MOISTURE PROTECTION

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for installation of waterproofing, dampproofing, insulation and sealants for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

ASTM D 412	Sheet Waterproofing
	Liquid Water Repellant
ASTM C 665	Acoustical Insulation
ASTM C 665	Fire Safing Insulation
ASTM C 920	Sealants

B. Federal Specification (FS)

FS HH-I-425	Rigid Insulation

C. Uniform Building Code (UBC)

UBC Chp. 34	Sloped Glazing and Skylights

1.04 SYSTEM DESCRIPTION

A. Membrane waterproofing for lower level floor slab and walls of liquid waste tank room

B. Water repellant treatment for exterior concrete walls

C. Rigid insulation at perimeter of building foundation

D. Acoustic insulation for toilet rooms and conference room partition walls

E. Safing insulation utilized in fire rated, area separation partitions

F. Sealants utilized in wall and ceiling joints through out facility

G. Skylights

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

B. Butyl Sheet Waterproofing: Synthetic Butyl rubber sheets, 60 mils thick, tensile strength 1200 psi, ASTM D 412

C. Water repellant at all above grade exterior concrete foundation wall surfaces is clear acrylic copolymer sealer.

D. Vapor barrier beneath on grade floor slabs shall be single polyethylene film, 6 mil thick.

E. Building perimeter subsurface insulation shall be 2 inch thick polystyrene foam board, FS HH-I-425, Type II.

F. Acoustical insulation shall be 3.5 inch thick, unfaced, 2 PCF density fiberglass batts.

G. Mineral wool fire safing at top and ends of masonry area separation walls complies with NFPA 101, Chapter 6.

Fire barrier sealant is per applicable provisions of UL.

H. Roof curbs and flashing boots for mechanical equipment and vents shall be prefabricated type specifically designed for use with the pre-engineered building roof system.

I. Floor and walkway control and expansion joints in areas not subject to contamination are sealed with one part self-leveling urethane.

J. Vertical surface joints in masonry or concrete in areas not subject to contamination are sealed with one part polysulfide sealant, nonstaining primer and closed-cell polyethylene foam backer rod.

K. Joints between metal surfaces or glass surfaces where the sealant does not come in contact with neoprene or asphalt materials are sealed with one component, medium modulus silicone sealant.

L. Skylights shall be tinted double dome plastic type.

END OF SECTION

SECTION 08000

WRAP MODULE 2A

DIVISION 8 - DOORS AND WINDOWS

TABLE OF CONTENTS

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
08000 DOORS AND WINDOWS

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 08000

DOORS AND WINDOWS

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design and installation of doors and windows for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American National Standards Institute

ANSI A 115	Door and Frame Preparation
ANSI A 156	Hardware
ANSI A 216.1	Doors and Frames
ANSI A 134	Aluminum Window Wall and Entries

B. Underwriters Laboratory

UL	Fire Shutters

C. National Association of Architectural Metal Manufacturers

NAAMM, Entrance Manual	Aluminum Window Wall and Entries

D. Door and Hardware Institute

D.H.I. Handbook	Finish Hardware
Glazing Manual	Glass and Glazing

E. Steel Door Institute
1.100

F. American Society for Testing and Materials
ASTM C 1036

G. National Fire Protection Association

NFPA 101	Life Safety

1.04 SYSTEM DESCRIPTION

A. Exterior and interior hollow metal doors and frames.

B. Exterior and interior metal overhead doors.

C. Fire Shutters.

D. Aluminum window wall framing and entry doors.

E. Finish Hardware.

F. Window Glazing.

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances, and applicable standards.

B. Hollow Metal Doors and Frames

1. Hollow metal frames shall be welded 16 gauge construction. Frame section is approximately 2 inches by 6 inches size.

2. Hollow metal doors shall be flush panel type with 18 gauge face sheets, internal reinforcing and sound deadening material.

3. Fire resistive door and frame assemblies have appropriate UL label and comply with NFPA 80 requirements.

4. All doors, except for office, storage, toilet and closet doors, have vision panels. New door vision panels have screw applied metal glazing stops.

5. Door frames are prepared by fabricator to receive hardware scheduled for this project.

6. Interior window frames are 16 gauge steel and match door frame section profile, with applied glazing stops.

7. All hollow metal doors and frame shall have shop applied primer in accordance with this Specification.

C. Metal Overhead Doors

1. Sectional overhead doors shall be insulated, 16 gauge flush steel construction with vision panels, power operated with auxiliary chain operation, and weatherstripping.

2. Single leaf overhead doors are insulated 16 gauge flush steel construction with vision panels, power operated with auxiliary chain operation, and weatherstripping.

D. Fire Shutters

1. Storefront framing elements are nominal 2 x 4 inch tubular aluminum with clear anodized finish, and constructed with thermal break configuration.

2. Aluminum frame entry doors are 1.75 inch thick clear anodized medium stile frames.

F. Finish Hardware

1. Finish hardware complies with the ANSI A 156 series. Finish is US10 (Brushed Chrome).

2. Hardware for doors in area separation walls (fire walls) shall comply with UL and NFPA requirements.

3. Toilet room doors have push and pull plates. All other doors shall have locksets.

4. Required exit doors shall have panic hardware complying with NFPA 101.

5. All doors, except for closet doors and storage room doors, shall have closers.

   Doors with closers, except for UL labeled doors, shall have hold opens.

6. All butts are heavy duty (ball bearing) type.

7. Exterior doors and doors at process areas have weather stripping.

G. Window Glazing

1. Glazing for storefront is 1 inch insulated type with grey; tinted and tempered, where required by UBC.

2. Glazing for door vision panels shall be 0.25 inch diamond patterned clear wired glass.

3. Glazing for control room windows is 1 inch laminated glass.

4. Mirror glass is 0.25 inch float glass complying with ASTM C 1036.

H. Sliding Metal Fire Doors

1. Doors to be composite type with inorganic mineral core.

2. Doors shall be two hour fire-resistive rating.

3. Doors shall be automatic closing with motorized operator.

END OF SECTION

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SECTION 09000

WRAP MODULE 2A

DIVISION 9 - FINISHES

TABLE OF CONTENTS

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
09000 FINISHES

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 09000

FINISHES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for finishes.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

ASTM C 635	Specification for Metal Suspension for Acoustical Tile and Lay-in Panel Ceilings
ASTM C 636	Practice for Installing of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
ASTM C 840	Spec. for Application and Finishing of Gypsum Board
ASTM E 580	For Acoustical Tile and Lay-in Panels
ASTM C 926	Spec. for Application of Portland Cement Based Plaster in Areas Requiring Seismic Restraint
ASTM C 36-85	Spec. for Gypsum Wall Board
ASTM E 1264	Acoustical Ceiling Products
ASTM F 693	Products by Use of Liquid Seam Sealers
ASTM E 84	Test Method for Surface Burning Characteristics of Building Materials
ASTM E 648	Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
ASTM D 4082	Test Method for Effects of Radiation on Coatings Used in Light-Water Nuclear Power Plants
ASTM D 4256	Test Method for Determination of the Decontamibility of Coatings Used in Light-Water Nuclear Power Plants

B. American National Standards Institute (ANSI)

ANSI A 137.1	Ceramic Tile
ANSI N 512	Nuclear Facilities

C. Carpet Specifiers Handbook

D. Carpet and Rug Institute

E. Federal Standards

Doc. FF 1-70	Carpet

F. Gypsum Association (GA)
GA 216-85

G. Federal Specifications (FS)

FS SS-T-312B	Resilient Flooring

H. International Conference of Building Officials (ICBO)
Report 4071

I. National Fire Protection Association (NFPA)

NFPA-101	Life Safety Code

J. Uniform Building Code (UBC)

UBC Chap. 23	Wood
UBC Std. No. 47-18	Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings

K. University of California Research Laboratory (UCRL)

UCRL 15714	Suspended Ceiling System Survey and Seismic Bracing Recommendations

1.04 SYSTEM DESCRIPTION

A. Suspended Ceiling System

B. Lath and Plaster Ceiling System

C. Gypsum Board System

D. Suspended Acoustical Tile System

E. Resilient Floor Coverings

F. Carpet

G. Special Coatings

H. Paint

I. Ceramic Tile

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

B. Suspended Ceiling

1. Support system shall be 16 gauge roll formed by 6 inch deep galvanized steel joist members.

   a. Wall framing members for areas having suspended ceiling support system (locker area) are 20 gauge x 3.625 inch galvanized steel studs and runners.

   b. Wall framing members for other areas (offices and reception) are 25 gauge x 3.625 inch galvanized steel studs and runners.

2. Suspended ceilings grid shall be light gauge steel type with interlocking main runner "T"s and cross "T"s.

   a. Factory finish is white vinyl paint.

   b. Acoustic tiles are lay-in type mineral fiber board panels finished with white latex paint.

   c. System light shall be reflectance is greater than 75 percent, STC class is 35-39 and noise reduction coefficient is .50 to .60.

C. Lath and Plaster System

Shower room ceilings have a standard three coat (scratch, brown and finish) portland cement plaster on suspended metal lath system.

D. Gypsum Board System

1. Wallboard is .625 inch fire rated type (x) gypsum panels.

2. Wallboard at wet areas is water resistant type gypsum panels.

3. Wallboard backing for ceramic tile walls or wainscots is .50 inch portland cement panels.

E. Ceramic Tile

1. Wall tile is 2 x 2 x .25 inch dry set mortar set, latex-portland cement grouted mosaic ceramic tile.

2. Price group 2

3. Install per TCA W243 recommendations.

4. Floor tile is 2 x 2 x .25 inch latex-portland cement set, latex-portland cement grouted with non-slip abrasive grain finish ceramic tile.

5. Price group 2

6. Install per TCA F113 recommendations.

F. Resilient Floor Covering

1. Sheet flooring shall be .125 inch thick vinyl sheet with sealed seams.

2. Resilient floor tile shall be 12 x 12 x .125 inch vinyl.

3. Rubber floor tile shall be 18 x 18 x .105 inch with disc pattern.

4. Resilient base is 4 inch topset cove type.

5. Comply with SFCI, "Recommended Work Procedures for Resilient Floor Covering".

G. Carpet Material

1. Class A, glued down, tufted, level loop Atron III nylon fiber, minimum yarn weight 28 ounces per yard, minimum total weight 62 ounces per yard.

2. Comply with CRI carpet Specifiers Handbook and CRI Standard for Installation of Textile Floor Covering Materials.

H. Special Protective Coating

1. Decon coatings used at process areas subject to contamination shall be 100 percent epoxy, radiation resistant as determined by ASTM D 4082 and decontaminable to at least 95 percent of total activity removed as determined by ASTM D 4256 or ANSI N512-74 and suitable for Nuclear Coating Service Level II.

2. Comply with ANSI N512, "Protective Coatings (Paint) for the Nuclear Industry".

I. Hardener and sealer for concrete floors shall be applied initially to assist curing and hardening followed by a subsequent application for sealing.

1. Sealer shall be a clear chlorinated rubber suspended in a mineral carrier.

2. Concrete floor traffic and safety markings are painted with two coats of alkyd and chlorinated rubber.

J. Paint Schedule

1. Interior and exterior steel surfaces including:

   - Electrical conduit
   - Exposed ductwork
   - Galvanized piping recommended solvent shall be cleaned and painted with one coat cement/alkyd resin primer and two coats of alkyd-resin semi-gloss enamel.

2. Exterior galvanized steel surfaces including gratings and handrails are not painted.

3. Gypsum board walls and ceilings are painted with latex sealer undercoat and 2 coat semi-gloss acrylic latex.

4. Plaster ceiling is painted with alkali resistant primer and a finish coat of fine textured latex.

5. Concrete block walls in areas not subject to contamination are painted with high build latex masonry block filler and a finish coat of acrylic latex.

6. Background colored red with white diagonal stripes number designation upper right hand border.

7. Fire extinguishers shall be labeled per WHC-CM-4-3, Guide FP-2 Sec. 2.8.

8. Exposed piping and electrical conduit are painted.

END OF SECTION

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SECTION 10000

WRAP MODULE 2A

DIVISION 10 - SPECIALTIES

TABLE OF CONTENTS

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
10000 SPECIALTIES

TABLE OF CONTENTS

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WRAP MODULE 2A

SECTION 10000

SPECIALTIES

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design and installation of specialties for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Society for Testing and Materials

ASTM A 591	Metal Toilet Compartments with Baked Enamel Finish

B. National Fire Protection Association

NFPA 10	Standard for Portable Fire Extinguishers

1.04 SYSTEM DESCRIPTION

A. Tackboards

B. Bulletin Boards

C. "Chalk" Boards

D. Projection Screen

E. Toilet Compartments

F. Access Flooring System

G. Identifying Devices

H. Metal Lockers

I. Portable Fire Extinguishers

J. Folding Partitions

K. Metal Shelving

L. Toilet and Bath Accessories

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

B. Tack boards are 42 x 36 inch composition cork field with aluminum frame.

C. Bulletin boards are 48 x 36 inch with glass cover and locking aluminum frame.

D. "Chalk" boards are 42 x 36 inch white porcelain enamel writing surface with aluminum frame and tray.

Markers included.

E. Projection screen is 8 x 8 foot glass bead surface, motorized with concealed ceiling installation.

F. Compartments are ceiling hung type with 1 inch thick steel factory enamel finished panels.

1. Toilet partitions (ceiling hung); Urinal screens (wall mounted); and combination dressing/shower compartments with precast receptor are included.

2. Color to be selected from manufacturer's standard chart.

G. Access floor system shall comply with UBC seismic requirements.

1. System shall be braced as required.

2. Systems load criteria shall be 300 psf uniform distributed and 1250 lb concentrated point load.

3. System is bolted stringer type with 24 x 24 inch steel pan panels and 18 inch high pedestals.

4. Surface finish is static control high pressure plastic laminate (HPL).

5. System fire rating shall be UL class A.

H. Identifying devices shall be 10 x 12 inches engraved plastic laminate displaying room number and title.

One sign shall be wall mounted adjacent to each interior door.

I. Metal lockers are single-tiered, 15 x 18 x 72 inch factory finished steel with sloped stops and factory supplied fillers, closures and finished ends.

1. Color to be selected from manufacturer's standard chart.

2. Locker benches are hardwood with factory finished steel legs.

J. Portable fire extinguishers shall comply with NFPA 10.

Provide breathing stations per safety analysis.

K. Operable partition shall be accordion folding type having vinyl-clad cold rolled steel panels connected with full length steel hinges.

STC class 44 minimum and UL Class A flame spread rating.

L. Metal shelving shall consist of prefinished modular units, open, braced frame, with six solid adjustable shelves, 36 x 12 x 85 inches.

M. Toilet and bath accessories shall be stainless steel, brushed chrome or matte finish, semi-recessed where appropriate or surface mounted.

Paper towel dispensers, waste receptacles, toilet paper holders (double roll type), mirrors with shelves, soap dispensers, sanitary napkin dispensers, sanitary napkin receptacles, grab bars, coat hooks, janitor shelf and mop hooks are included items.

END OF SECTION

SECTION 11000

WRAP MODULE 2A

DIVISION 11 - EQUIPMENT

TABLE OF CONTENTS

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
11000 EQUIPMENT

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 11000

EQUIPMENT

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design and installation of Equipment for WRAP Module 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

1.04 SYSTEM DESCRIPTION

A. Loading dock Equipment

B. Kitchen Units

PART 2 PRODUCTS

2.02 MATERIALS

A. All materials and manufactured items shall be new and of first quality and shall be designed and furnished in strict accordance with all of the governing codes, ordinances and applicable standards.

B. Loading Dock Equipment

1. Dock bumpers shall be laminated fabric reinforced rubber type.

2. Dock ramps shall be front mounted, spring counter-balanced type with integral bumpers.

3. Electrically operated vehicle restraint with integrally connected signal lights.

C. Premanufactured kitchen unit shall include, microwave oven, cooking top, exhaust hood, sink (no disposer), refrigerator, drawer and upper cabinets.

END OF SECTION

SECTION 11172

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WRAP MODULE 2A

SPECIFICATION SECTION
FOR
11172 HEPA FILTER COMPACTOR

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 11172

HEPA FILTER COMPACTOR

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of filter press within WRAP 2A.

1.02 RELATED SECTIONS

A. Section
B. Section

1.03 REFERENCES

A. Material Specs.

B. American National Standards Institute (ANSI)

C. American Society for Testing and Materials (ASTM)

D. National Electric Code (NEC)

E. AWS D1.1 "Structural Welding Code"

F. NEMA MG-1 Motors and Generators

1.04 SYSTEM DESCRIPTION

A. The filter press provides the function of compacting filters to a size such that they can be loaded into a drum.

B. GENERAL DESCRIPTION

The filter compactor consists of a housing within which full size filter can be contained, and a compacting piston which crushes the filter to the required size. The compactor is fitted with local ventilation equipment to ensure particulate which is released from the filter during compaction does not contaminate the area local to the filter compactor.

The filter compactor will be powered by a hydraulic power unit.

C. CONSTRUCTION

The filter compactor is constructed of painted carbon steel.

D. CONTROL AND INSTRUMENTATION

The filter compactor will be interfaced with control and safety interlocks.

The safety interlocks will prevent operation of the filter press if the environmental conditions are not satisfactory.

The filter compactor will be operated locally.

E. DATA SHEETS

Equipment Tag Nos. WBS Area Location Numbers and equipment data sheets for this description are provided in **Appendix A.**

END OF SECTION

WRAP MODULE 2A

APPENDIX A

EQUIPMENT/INSTRUMENT DATA SHEETS

WBS LOCATION	**EQUIPMENT TAG**	**SERVICE**
1105	CM-05-561	Filter Compactor - Box Breakdown Cell

APRIL 1992

UE&C PROJECT NO. 6237.006

FILE NO. 11172

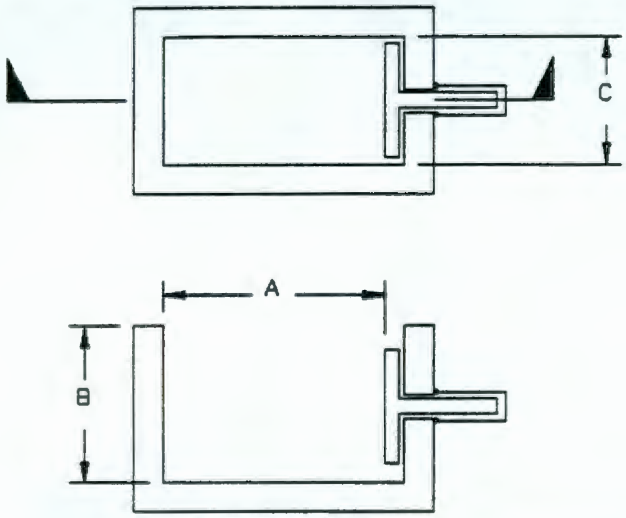
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER CM-05-561	PAGE 1 OF 1

CUSTOMER & LOCATION DOE-RL/WHC HANFORD, WA	PROJECT WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006	DATE: 05/14/92
		ACCOUNT NO.	BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE HEPA FILTER COMPACTOR	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

COMPACTOR



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: CRUSH HEPA FILTERS		A: 2'	F:
UNIT LOAD DESCRIPTION: HEPA FILTER		B: 2'	G:
UNIT LOAD SIZE: 2' X 2' X 1'	DUTY: 8 HOURS/DAY	C: 1'	H:
UNIT LOAD WEIGHT: 15 LBS	OPEN/CLOSING SPEED:	D:	I:
LOCATION: BOX BREAKDOWN CELL	OPEN/CLOSING TIME:	E:	J:
OPERATOR: HYDRAULIC			
VENTING: LOCAL, CONTROLLER			
CONSTRUCTION			
MATERIAL: STAINLESS STEEL			
WEIGHT: 500 LBS			

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SECTION 11177

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
11177 SHREDDING EQUIPMENT

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 11177

SHREDDING EQUIPMENT

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of Shredding Equipment used for shredding solid waste in WRAP Module 2A Facility.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. Anti-Friction Bearing Manufacturer's Association
AFBMA All applicable sections.

B. American National Standards Institute
ANSI All applicable sections.

C. American Society for Testing and Materials
ASTM All applicable sections.

D. American Welding Society
AWS D1.1 "Structural Welding Code"

E. Occupational Safety and Health Administration
OSHA 29 CFR Part 1910

F. National Electric Code
NEC All applicable sections.

G. National Electric Manufacturers Association
NEMA MG-1 Motors and Generators

H. American Gear Manufacturers Association
AGMA All applicable sections.

I. Mechanical Power Transmission Association
MPTA ND 301 All applicable sections.

1.04 SYSTEM DESCRIPTION

A. Shredding equipment provides the function of size reducing large items of waste to an acceptable size to allow further processing.

B. **General Description**

Shredding equipment consists of a rectangular vertical hopper within which two shafts, fitted with circular cutting tools, rotate simultaneously to size reduce items of waste using a shearing action. Waste is fed through the shredders by gravity.

The shredders will be located inside process enclosures.

The shredders will be powered by hydraulic power units.

C. **Construction**

The shredder hoppers will be constructed of painted carbon steel.

The shredder cutting tools will be of a suitably hardened steel.

Motor drives for the shredders will be mounted outside of enclosures with through wall drives to the shredders.

D. **Control and Instrumentation**

The shredders will be interfaced with control and safety interlocks.

The safety interlocks will prevent operation of the shredders if the environmental conditions are not satisfactory.

The shredders will be controlled from the main control room.

E. **Data Sheets**

Equipment Tag Nos. WBS Area Location Numbers and equipment Data Sheets for this description are provided in Appendix A.

END OF SECTION

WRAP MODULE 2A

APPENDIX A

EQUIPMENT/INSTRUMENT DATA SHEETS

WBS LOCATION	**EQUIPMENT TAG**	**SERVICE**
1105	SH-05-521	Coarse Shredder Shredder and Repack Enclosure
1105	SH-05-522	Fine Shredder Shredder and Repack Enclosure
1106	SH-06-101	Shredder Special Waste Enclosure

APRIL 1992

UE&C PROJECT NO. 6237.006

FILE NO. 11177 - A1

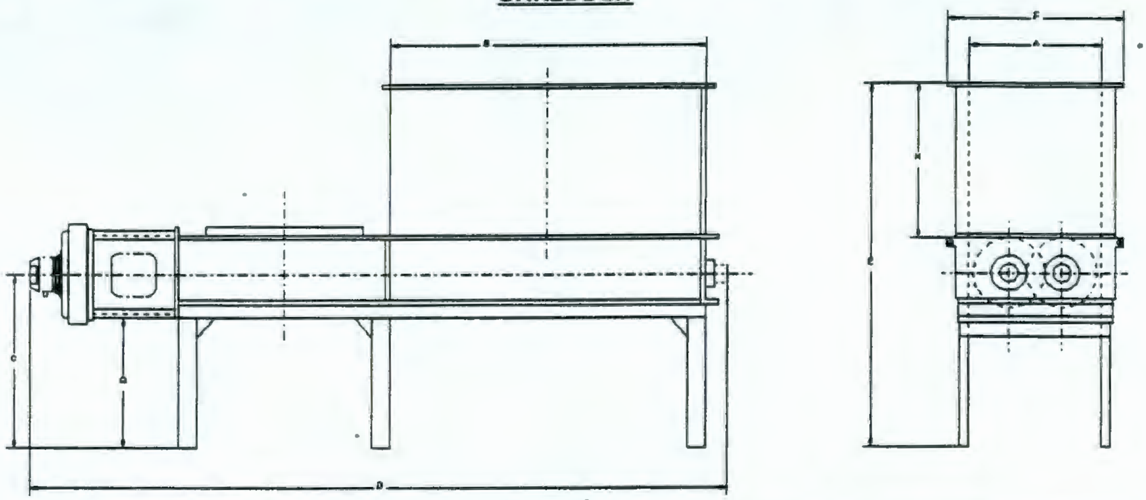
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	**EQUIPMENT DATA SHEET** ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER SH-05-521	PAGE 1 OF 1

CUSTOMER & LOCATION DOE-RL/WHC HANFORD, WA	PROJECT WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006	DATE: 04/13/92
		ACCOUNT NO.	BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE SHREDDER	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

SHREDDER



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: TO SIZE REDUCE LLRMW AND EMPTY DRUM SHELLS		A: 48"	F: 58"
UNIT LOAD DESCRIPTION: 55 AND 85 GALLON DRUMS CONTAINING LLRMW		B: 74"	G: 36"
UNIT LOAD SIZE: 26" DIA X 39" HIGH	DUTY: 8 HOURS/DAY	C: 51"	H: 48"
UNIT LOAD WEIGHT: 3,000 LBS	NEL AREA CLASS: UNCLASSIFIED	D: 210"	I:
LOCATION: SHREDDER AND REPACK PROCESS ENCL.		E: 114"	J:
CAPACITY: 25 CU FT/HR			
SOLIDS DENSITY: 30-450 LBS/CU FT			
CONSTRUCTION			
MOTOR HP: 300			
CONSTRUCTION: CARBON STEEL			
WEIGHT: 43,000 LBS			

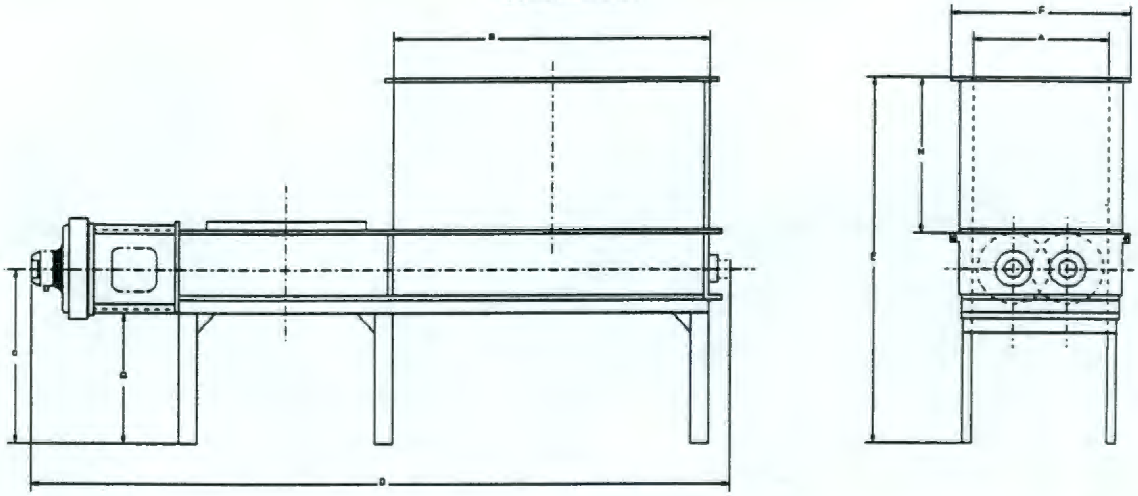
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER SH-05-522	PAGE 1 OF 1

CUSTOMER & LOCATION	PROJECT	UE&C JOB NO. 6237.006	DATE: 04/13/92
DOE-RL/WHC HANFORD, WA	WRAP FACILITY MODULE 2A	ACCOUNT NO.	BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE SHREDDER	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

SHREDDER



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: TO SHRED LLRMW		A: 34"	F: 42.5"
UNIT LOAD DESCRIPTION: TO SHRED COARSELY SHREDDED LLRMW		B: 56"	G: 36"
UNIT LOAD SIZE:	DUTY: 8 HOURS/DAY	C: 51"	H: 36"
UNIT LOAD WEIGHT:	NEL AREA CLASS: UNCLASSIFIED	D: 159"	I:
LOCATION: SHREDDER & REPACK PROCESS ENCL		E: 96"	J:
CAPACITY: 25 CU FT/HR			
SOLID DENSITY: 30-450 LBS/CU FT			
SOLID SIZE DISCHARGE: 2" X 2" X 2" MAX			
CONSTRUCTION			
MOTOR HP: 150			
CONSTRUCTION: CARBON STEEL			
WEIGHT: 21,000 LBS			

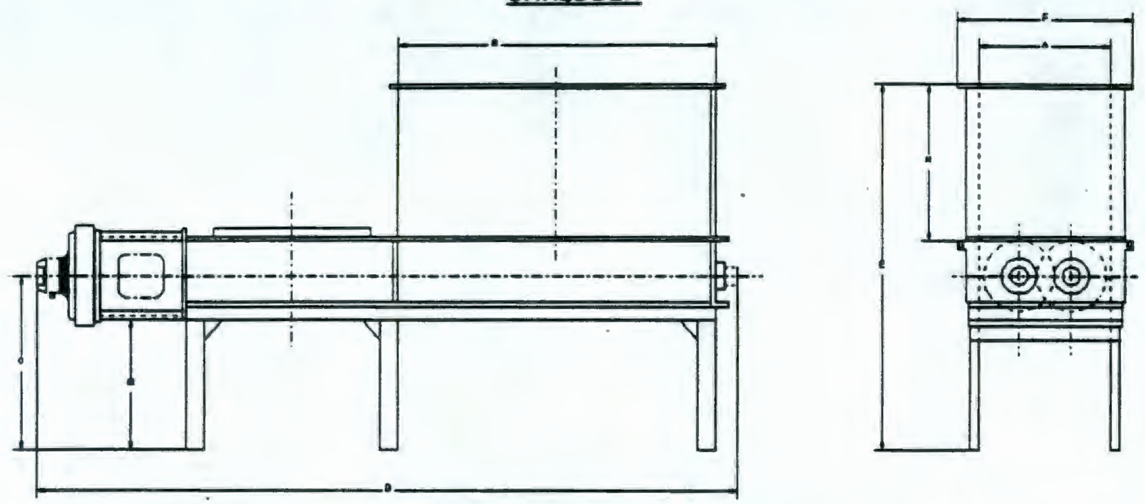
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER SH-06-101	PAGE 1 OF 1

CUSTOMER & LOCATION DOE-RL/WHC HANFORD, WA	PROJECT WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006	DATE: 04/21/92
		ACCOUNT NO.	BY: RLH

REVISIONS (DATE & BY)								
	A	04/24/92 RLH	B		C		D	
	E		F		G		H	

SERVICE	MANUFACTURER	NO. REQ'D.	SOURCE OF QUOTE
SHREDDER		1	

SHREDDER



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: SHRED MERCURY AND LEAD CONTAMINATED BULK SOLIDS		A: 34"	F: 42.5"
UNIT LOAD DESCRIPTION:		B: 56"	G: 36"
UNIT LOAD SIZE:	DUTY: 2 HOURS/DAY	C: 51"	H:
LOCATION: INSIDE SPECIAL WASTE ENCLOSURE	NEL AREA CLASS:	D: 159"	I:
RATED CAPACITY: 300 LBS/HR MAX		E: 96"	J:
SOLIDS DENSITY: 700 LBS/FT^3 MAX			
22 LBS/FT^3 MIN			
SOLIDS SIZE OF DISCHARGE: 2" X 2" STRIPS			
CONSTRUCTION			
MOTOR HP: 150			
CONSTRUCTION: CARBON STEEL			
WEIGHT: 21,000 LBS			
MOTOR RATING: 150 HP			
AVAILABLE3 POWER V/PH/HZ: 460/3/60			

SECTION 11501

WRAP MODULE 2A

SPECIFICATION SECTION
FOR
11501 SAWING EQUIPMENT

TABLE OF CONTENTS

WRAP MODULE 2A

SECTION 11501

SAWING EQUIPMENT

PART 1 GENERAL

1.01 SECTION SCOPE

A. This specification establishes the requirements for detailed design, fabrication, installation, start-up, and acceptance testing of equipment to carry out mechanical sawing operations within WRAP 2A.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. American Iron and Steel Institute (AISI)

B. American National Standards Institute (ANSI)

C. American Society for Testing and Materials (ASTM)

D. National Electric Code (NEC)

E. AWS D1.1 "Structural Welding Code"

F. NEMA MG-1 Motors and Generators

1.04 SYSTEM DESCRIPTION

A. The sawing equipment provides the following functions:

- Cut through the clamp band restraining the drum lid. This is carried out within the process enclosure.
- Size reduce large waste items in the loose breakdown cell.

B. General Description

1. The bank saw consists of a single reciprocating electrically powered saw blade which cuts the carbon steel clamp band of a drum. The saw blade is offered to the drum clamp band using a pneumatically driven deployment arm. The drum is held by a separate grabber during the cutting operation.

2. Base Breakdown Saw: The base breakdown saw consists of a combined saw and workpiece holding table. Large items of waste are held on the workpeice table using mechanical clamping equipment. The base breakdown saw provides the capability to size reduce large items of waste which enter the base breakdown cell. This waste typically includes carbon steel sheet, carbon and stainless steel sections and converted drums of waste.

C. CONSTRUCTION

1. Band Saw: The band saw blade is constructed of Tungsten carbide. The pneumatic cylinder is constructed of aluminum and operates at 80 psi. The band saw deployment arm is constructed of painted carbon steel.

2. Base Breakdown Saw: The base breakdown workpiece holder will be constructed of painted carbon steel. The saw blade will be constructed of Tungsten carbide or similar material.

D. Control and Instrumentation

The saw drives will be interfaced with control and safety interlocks. The safety interlocks will present operation of the saws if the environmental conditions are not satisfactory.

E. Data Sheets

Equipment Tag Nos. WBS Area Location Numbers and equipment data sheets for this description are provided in **Appendix A.**

END OF SECTION

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WRAP MODULE 2A

APPENDIX A

EQUIPMENT/INSTRUMENT DATA SHEETS

WBS LOCATION	EQUIPMENT TAG	SERVICE
1105	RT-05-521	Band Saw - Shredder/Repack Enclosure
1105	RT-05-541	Band Saw - Puz Mill Enclosure
1105	RT-05-561	Mechanical Saw - Box Breakdown
1100	RT-06-102	Band Saw - Special Waste Enclosure
1105	RT-05-611	Band Saw - Sampling Enclosure
1105	RT-05-612	Drill Press

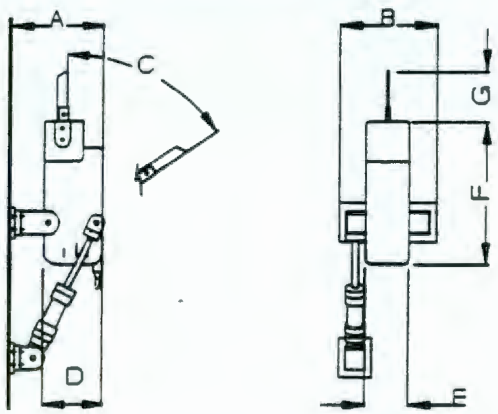
REMOTE TOOL

UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-05-521	PAGE 1 OF 1
CUSTOMER & LOCATION: DOE-RL/WHC HANFORD, WA	PROJECT: WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006 / ACCOUNT NO.	DATE: 04/13/92 / BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE	MANUFACTURER	NO. REQ'D.	SOURCE OF QUOTE
BAND SAW		1	

BAND SAW



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: CUT DRUM CLAMP BAND		A:	F:
UNIT LOAD DESCRIPTION: CLAMP BAND		B:	G:
UNIT LOAD SIZE: 27" DIA X 1.5" DEEP	DUTY: 8 HOURS/DAY	C:	H:
UNIT LOAD WEIGHT: 2 LBS		D:	I:
LOCATION: SHREDDER AND REPACK ENCLOSURE		E:	J:
CONSTRUCTION			
TYPE OF EQUIPMENT: SAW	BLADE: 6" HEAVY DUTY		
TYPE OF CONTROL: ELECTRIC			
MATERIAL: ALLOY PAINTED	SUPPORT BRACKET:		
POWER REQUIREMENT:	MATERIAL: STAINLESS STEEL CLEVIS BKT		
CODE:	ACTUTION; CYLINDER 2" DIA X 6" STROKE		
WEIGHT: 7 LBS			
STROKE: 0.75"			
BRAKE:			

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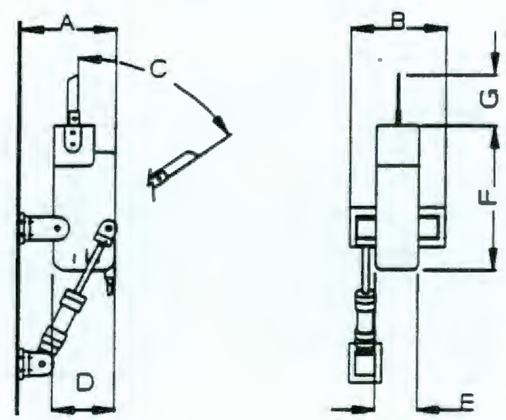
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-05-541	PAGE 1 OF 1
CUSTOMER & LOCATION DOE-RL/WHC HANFORD, WA	PROJECT WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006	DATE: 04/13/92
		ACCOUNT NO.	BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE BAND SAW	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

BAND SAW



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CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: CUT DRUM CLAMP BAND		A:	F:
UNIT LOAD DESCRIPTION: CLAMP BAND		B:	G:
UNIT LOAD SIZE: 27" DIA X 1.5" DEEP	DUTY: 8 HOURS/DAY	C:	H:
UNIT LOAD WEIGHT: 2 LBS		D:	I:
LOCATION: PUG MILL ENCLOSURE		E:	J:
CONSTRUCTION			
TYPE OF EQUIPMENT: SAW	BLADE: 6" HEAVY DUTY		
TYPE OF CONTROL: ELECTRIC			
MATERIAL: ALLOY PAINTED	SUPPORT BRACKET:		
POWER REQUIREMENT:	MATERIAL: STAINLESS STEEL CLEVIS BKT		
CODE:	ACTUTION; CYLINDER 2" DIA X 6" STROKE		
WEIGHT: 7 LBS			
STROKE: 0.75"			

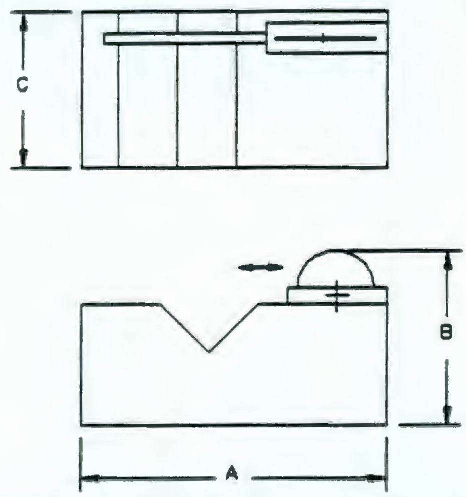
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-05-561	PAGE 1 OF 1

CUSTOMER & LOCATION	PROJECT	UE&C JOB NO. 6237.006	DATE: 05/14/92
DOE-RL/WHC HANFORD, WA	WRAP FACILITY MODULE 2A	ACCOUNT NO.	BY: SAS

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE	MANUFACTURER	NO. REQ'D.	SOURCE OF QUOTE
MECHANICAL SAW		1	

MECHANICAL SAW



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: SIZE REDUCE REJECT GROUTER OR POLYMER PROCESSED DRUMS		A:	F:
UNIT LOAD DESCRIPTION: 55 GALLON DRUMS CONTAINING GROUTED OR POLYMER PROCESSED LLRMW		B:	G:
UNIT LOAD SIZE: 22.5" DIA X 34.5" HIGH		C:	H:
UNIT LOAD WEIGHT: 1,000 LBS		D:	I:
LOCATION: BOX BREAKDOWN CELL		E:	J:
CONSTRUCTION			
MATERIAL: STAINLESS STEEL			
WEIGHT: 1,000 LBS			

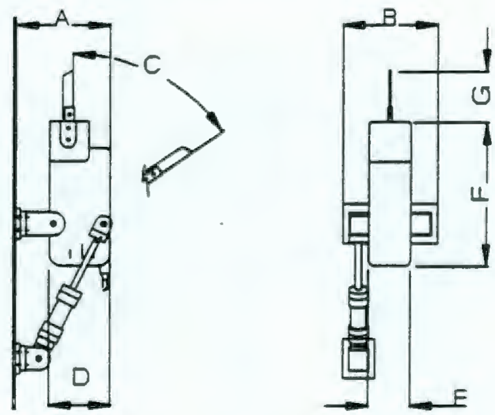
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-06-102	PAGE 1 OF 1

CUSTOMER & LOCATION DOE-RL/WHC HANFORD, WA	PROJECT WRAP FACILITY MODULE 2A	UE&C JOB NO. 6237.006	DATE: 05/13/92
		ACCOUNT NO.	BY: GBD

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE BAND SAW	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

BAND SAW



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: CUT DRUM CLAMP BAND		A: 7.75"	F: 11.94"
UNIT LOAD DESCRIPTION: CLAMP BAND		B: 7.94"	G: 4.19"
UNIT LOAD SIZE: 27" DIA X 1.5" DEEP	DUTY: 8 HOURS/DAY	C: 55°	H:
UNIT LOAD WEIGHT: 2 LBS		D: 5"	I:
LOCATION: MERCURY/LEAD DRUM INLET ENCL		E: 3.5"	J:
CONSTRUCTION			
TYPE OF EQUIPMENT: SAW	BLADE: 6" HEAVY DUTY		
TYPE OF CONTROL: ELECTRIC			
MATERIAL: ALLOY PAINTED	SUPPORT BRACKET:		
POWER REQUIREMENT:	MATERIAL: STAINLESS STEEL CLEVIS BKT		
CODE:	ACTUTION; CYLINDER 2" DIA X 6" STROKE		
WEIGHT: 7 LBS			
STROKE: 0.75"			

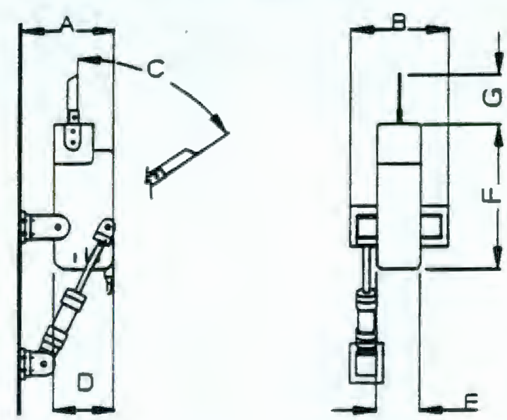
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-05-611	PAGE 1 OF 1

CUSTOMER & LOCATION	PROJECT	UE&C JOB NO. 6237.006	DATE: 06/21/92
DOE-RL/WHC HANFORD, WA	WRAP FACILITY MODULE 2A	ACCOUNT NO.	BY: VAW

REVISIONS (DATE & BY)	A		B		C		D	
	E		F		G		H	

SERVICE BAND SAW	MANUFACTURER	NO. REQ'D. 1	SOURCE OF QUOTE

BAND SAW



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: CUT DRUM CLAMP BAND		A:	F:
UNIT LOAD DESCRIPTION: CLAMP BAND		B:	G:
UNIT LOAD SIZE: 27" DIA X 1.5" DEEP	DUTY: 8 HOURS/DAY	C:	H:
UNIT LOAD WEIGHT: 2 LBS		D:	I:
LOCATION: SAMPLE MAINAGEMENT AREA		E:	J:
CONSTRUCTION			
TYPE OF EQUIPMENT: SAW	BLADE: 6" HEAVY DUTY		
TYPE OF CONTROL: ELECTRIC			
MATERIAL: ALLOY PAINTED	SUPPORT BRACKET:		
POWER REQUIREMENT:	MATERIAL: STAINLESS STEEL CLEVIS BKT		
CODE:	ACTUTION; CYLINDER 2" DIA X 6" STROKE		
WEIGHT: 7 LBS			
STROKE: 0.75"			

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REMOTE TOOL

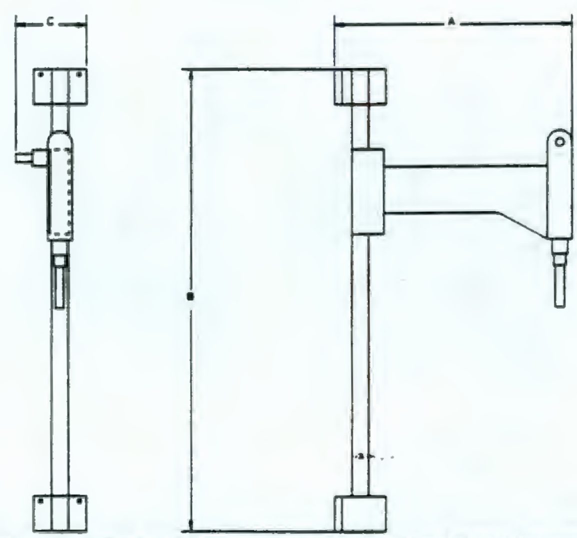
UNITED ENGINEERS & CONSTRUCTORS A Raytheon Company Western Operations	EQUIPMENT DATA SHEET ☒ CDR ☐ TITLE I ☐ TITLE II ☐ TITLE III	ITEM NUMBER RT-05-612	PAGE 1 OF 1

CUSTOMER & LOCATION	PROJECT	UE&C JOB NO.	DATE:
DOE-RL/WHC HANFORD, WA	WRAP FACILITY MODULE 2A	6237.006	06/03/92
		ACCOUNT NO.	BY: VAW

REVISIONS (DATE & BY)				
	A	B	C	D
	E	F	G	H

SERVICE	MANUFACTURER	NO. REQ'D.	SOURCE OF QUOTE
CORE SAMPLER		1	

DRILL PRESS



CONDITIONS OF SERVICE		DIMENSIONS	
APPLICATION: REMOVE A CORE SAMPLE FROM IMMOBILIZED DRUMS		A: 23"	F:
UNIT LOAD DESCRIPTION: CORE SAMPLE REMOVED FROM IMMOBOLIZED WASTE FORM DURING DRILLING PROCESS		B: 40"	G:
CORE SIZE: 1 LITER	DUTY: 8 HOURS/DAY	C: 13.5"	H:
SPEED: 4 SPEEDS - 250/500/800/1400	NEC AREA CLASS: UNCLASSIFIED	D:	I:
LOCATION: INSIDE SAMPLE ENCLOSURE		E:	J:

CONSTRUCTION	
POWER REQUIREMENTS (VOLTS/PHASE/HZ): 115/1/60	SHIPPING WEIGHT: 300 LBS
DRILL HEAD MOTOR POWER: 2 HP	DRILL HEAD DIMENSIONS: 7.5"L X 4.0"W X 21"H
DRILL COLUME MOTOR POWER: 4 HP	DRILL COLUMN DIMENSIONS: 15"L X 7"W X 40"H
CHUCK TYPE: COLLET	MOTOR TYPE: BRUSHED
DRILL BIT TYPE: CARBIDE	BEARINGS: SEALED BALL BEARINGS
	LUBRICATION: GREASE

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REMOTE TOOL

SECTION 11502

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