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RCRA PART B PERMIT APPLICATION SECTION D: PROCESS INFORMATION VOLUME 3 OF 11 SEPTEMBER 22, 1990

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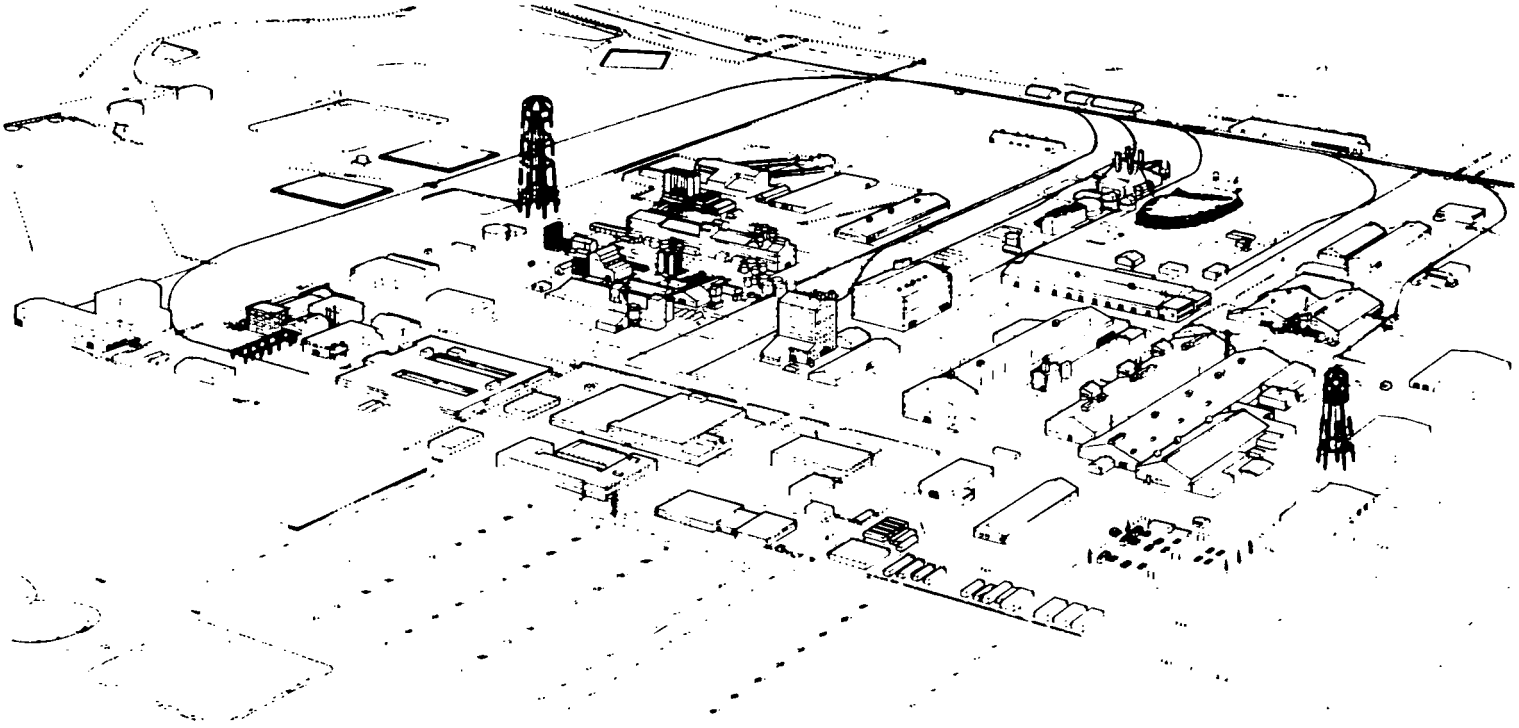

SEPTEMBER 22, 1989

SECTION D: PROCESS INFORMATION

(Volume 3 of 11)

FEED MATERIALS PRODUCTION CENTER
U.S. DEPARTMENT OF ENERGY
CINCINNATI, OHIO 45239-8705

U.S. EPA IDENTIFICATION NO. 0H6890008976
OHIO EPA PERMIT NO. 05-31-0681

RCRA PART B
PERMIT APPLICATION

SECTION D - PROCESS INFORMATION

SEPTEMBER 22, 1989

FEED MATERIALS PRODUCTION CENTER
U.S. DEPARTMENT OF ENERGY
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Part B Permit Application
Feed Materials Production Center
Fernald, Ohio

The information provided in this section is submitted in accordance with the requirements of the Ohio Administrative Code 3745-50-44 (C), and as otherwise provided in rules 3745-55-70 through 78. This information is also in accordance with 40 CFR 270.15 through 270.21. Other Federal hazardous waste regulations addressed in this section include 40 CFR 264.171 through 264.175.

This section discusses the specific process information for drum storage of RCRA hazardous and radioactive mixed waste in the Hazardous Waste Storage Units, for which a RCRA permit is being sought.

D-1 CONTAINERS

D-1a Containers with Free Liquids

The majority of containers in the Hazardous Waste Storage Units are used for storing liquid wastes; therefore the more stringent requirements for containers with free liquids will be addressed in the following paragraphs.

D-1a(1) Description of Containers

The Hazardous Waste Storage Units primary containment devices are 55-gallon drums. Removable-head, single-trip steel containers (DOT-17H) are used for solids and some liquids, and permanent-head, single-trip steel containers (DOT-17E) are also used for liquids. Other containers used at the FMPC are shown in Table D-1 with the container specifications. All the

containers used in the Hazardous Waste Storage Units are new, or reconditioned. All containers are inspected for corrosion and other defects at the time they are first used and on a weekly basis after they are filled and placed in a Storage Unit. Figure D-1 shows the RCRA Container Storage Inspection Form used for inspection. The completed inspection forms are kept in the Waste Operations first- line supervisors office.

The drum markings and label placement are shown in Figure D-2. A Hazardous Waste Mark (Figure D-3) is applied to the middle of the drum to the right of the seam at the accumulation start date. This label contains the facility name (U.S. DOE-FMPC) and address, plus the EPA ID No., EPA Waste No., and Accumulation Start Date. The FMPC lot number, inventory number, drum number, and the gross, net, and tare weight are attached as a bar coded label (Figure D-4) to the middle third of the drum centered to the left of the seam. A color coded patch is applied to the left of the seam in the top third of the drum representing the Storage Compatibility Color Code. A self-adhesive envelope is affixed to the middle third of the drum and just to the right of the seam. This envelope contains a 65-card, a 68-card, and a 69-card (these records are shown in Figure D-5). These records are used to transfer, receive, and identify the materials to be moved. The 65-card is the birth certificate and is issued each time hazardous waste is generated. The 68-card is an internal transfer record and is completed and signed by the sender of the material. The 69-card is a receipt record and is completed and signed by the receiver of the material. For the purposes of this application, only the hazardous waste components of these wastes and the applicable parts of these records relating to these waste are addressed.

D-1a(2) Container Management Practices

Any container (SAC-Satellite Accumulation Area Container and drum) used to accumulate waste is thoroughly checked for damage and must be clean and free of debris prior to being used in an Accumulation Area. If a container does not meet the criteria it will be returned to reconditioning or not used for RCRA waste. A SAC is a moveable secondary containment vessel, used to surround drums which store liquids in a Satellite Accumulation Area. Solid waste is accumulated in drums without SACs. A hazardous waste stream is accumulated in a storage container until it is full. Only one waste stream is permitted in each accumulation drum. The lid of a waste accumulation drum is secured with a bolt-type ring or bung head lid at all times, except when adding more waste. When the drum is full (within three inches from the lid and not to exceed 55 gallons or 1,200 pounds) it is closed and sealed as above. The full drum is to be transported within 72 hours to a Hazardous Waste Storage Unit. The 65-card, and the 68-card (Figure D-7) are completed by the Generator.

The drum and/or SAC (Satellite Accumulation Area Container) which are transported by truck or trailer are carefully placed on a trailer by fork-lift. An MVO (Motor Vehicle Operator) checks the condition of the shipping container and verifies that the lid is fitted securely, and if the load appears stable on the trailer. The MVO also checks for proper transfer documents (i.e., 65-card, 68-card, and 69-card). If any of the above disposition criteria are not satisfactory, the responsible supervisor is asked to correct them. Once the conditions for movement are verified, the drum and/or SAC are carefully moved to the designated storage unit.

Drums delivered to the Storage Units by Transportation are inspected by Waste Operations and Materials Control and Accountability according to a Hazardous Waste Container Pre-storage Checklist (Figure D-6). If acceptable, the drum is logged into the Hazardous Waste Log which is maintained in the foreman's office. This log records the drum number, drum contents, compatibility color code stencilled on the container and location within the storage unit that corresponds to this color. A typical log sheet is shown in Figure D-6a. Containers are carefully placed on pallets with the container markings and labels facing toward an aisle. This is done for ease of weekly inspections, and identification in the event of a spill. If the drum is not acceptable, remedial actions will be taken to render the container acceptable for storage.

A hazardous waste compatibility color code patch is stencilled on the drum when it is first used. A stick-on color patch is also applied to the envelope containing the transfer records, which will match the compatibility color code on the drum. This color code will determine, where the waste will be stored and with what other compatible waste it can be stored. All storage units are arranged with specific color coded areas (i.e., orange/white or orange/blue). No other waste colors are allowed within these containment areas. Further discussion of compatible groups is presented in Section F Paragraph F-5a.

Waste types are grouped together and stored according to compatibility. This arrangement provides for ease of identification in case of a spill. This arrangement also allows for easier identification for inventory and inspection. When shipped out of the Waste Storage Unit the individual drums are brought on pallets to the shipping dock and logged out of the Hazardous Waste Log. Because all containers are sealed prior to storage, accidental mixing of the wastes is prevented.

All drums housed in the storage units are on pallets. A 36-inch wide aisle is maintained between rows of pallets, and between the pallets and the storage unit's walls.

The storage capacities in the following paragraphs are based on 55-gallon drums. The drums are stored on pallets, with four drums on each pallet.

In the Plant 6 Warehouse, there is a total storage capacity of 3,648 drums.In bay 1 the maximum storage is 1,152 drums or 63,360 gallons. In bay 2 the maximum storage is 1,332 drums or 73,260 gallons. In bay 3 the maximum storage is 1,164 drums or 64,020 gallons. These storage capacities are based on three-high stacking of skids.

In the KC-2 Warehouse, there is a total storage capacity of 1,160 drums. Bay 5 has a maximum storage of 456 drums or 25,080 gallons. Bay 6 has a maximum storage of 464 drums or 25,520 gallons. Bay 7 has a maximum storage of 240 drums of 13,200 gallons. These storage capacities are based on two-high stacking.

In the Pilot Plant Warehouse, there is a total storage capacity of 180 drums or 9,900 gallons. These storage capacities are based on three- high stacking.

In the Plant 8 Warehouse, there is a total storage capacity of 1,992 drums. The maximum storage volume is 109,560 gallons. The maximum storage capacity and volume are based on a stacking height of three-high.

The maximum number of drums to be stored in the Plant 9 Warehouse is 1,704. The maximum storage volume is to be

93,720 gallons. The maximum number and volume are calculated using a stacking height of three high.

The maximum number of drums to be stored in the Proposed RCRA Warehouse is 2,640. The maximum storage volume is to be 145,200 gallons. The maximum number and volume are calculated using a stacking height of three high.

The Proposed Building 83-X Storage Warehouse will have three separate areas. One area contains 40,000 sq. ft., there is a 2,000 sq. ft. materials handling/identification area, and an 8,000 sq. ft. area. The storage capacity is estimated to be approximately 16,300 drums stacked one high.

D-1a(3) Secondary Containment System Design and Operation

A plan view of the Plant 6 Warehouse is provided in Figure D-9. Detailed design parameters, dimensions and materials of construction are provided in Figure D-10. The Plant 6 Warehouse is a pre- engineered warehouse completely under roof. The building measures 100'x 170' and serves as a storage area for radioactive mixed waste.

A plan view of the KC-2 Warehouse (Bays 5,6, and 7) is provided in Figure D-11, D-12, and D-13. Detailed design parameters, dimensions and materials of construction are provided in Figure D-14, and D-15. The KC-2 Warehouse was built back in the 1950's, with concrete block walls and steel joist placed two feet on center. Bays 5, and 6 measure 70'x 36', and Bay 7 measures 70'x 20'.

All waste stored within this Unit are stored in a compatible manner. Incompatible waste are separated by dikes and/or walls. Bay 5 has an inner diked area, and a surrounding diked

area for storing orange color coded hazardous waste. Bays 6, and 7 are used for storing ignitables. In compliance with OAC 3745-55-76, these two Bays are at least 50 feet from the nearest property boundary (approximately 1,700 feet).

A plan view of the Pilot Plant Warehouse is provided in Figure D-16. Details of the dike and spacing of the warehouse are provided in Figure D-17. Detailed design parameters, dimensions and materials of construction are provided in Figure D-18. This pre-engineered structure is completely under roof.

A plan view of the Plant 8 Warehouse is provided in Figure D-19. This warehouse is a pre-engineered structure completely under roof, measuring 60'x 170'.

A plan view of the Plant 9 Warehouse is provided in Figure D-20. This warehouse is a pre-engineered structure completely under roof, measuring 80'x 100'.

A plan view of the Proposed RCRA Warehouse is provided in Figure D-21. Details of the dike and spacing are also shown in Figure-21. Design parameters, and dimensions are also shown. Materials of construction for the base are described as follows. The floor is to be constructed of reinforced concrete and be able to withstand the load of a 20,500 pound forklift.

A plan view of the Proposed Building 83-X Storage Warehouse is provided in Figure D-22. There are three pre-engineered structures completely under roof. The complex will have three separate storage areas measuring approximately 80'x 500', 45'x 45', and 50'x 160'.

All wastes stored within these Units are stored in a compatible manner. Incompatible wastes are separated by dikes and or walls.

A concrete curb extends around the perimeter of each containment area within a Storage Unit. In all Storage Units the curbing is 6 inches wide by 6 inches high.

D-1a(3)(a) Requirement for the Base to Contain Liquids

In the Plant 6 Warehouse, the floors and curbs are free of cracks or gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation, until the material is detected and removed. The detailed design parameters provided in Figure D-10, show the floor to be 8" thick, and reinforced with rebar and steel mesh. A detail of the curb is also given. The wastes stored in this unit are compatible with the base.

In the KC-2 Warehouse, the floors has been repaired with a durable epoxy polymer coating to seal the minor cracks. The detailed design parameters for the building are provided in Figure D-14, and D-15. The floors and curbs, when repaired will be free of cracks or gaps and be sufficiently impervious to contain leaks, spills, and any accumulated precipitation, until the material is detected and removed. The waste stored in the KC-2 Warehouse will be compatible with the epoxy polymer coating.

In the Pilot Plant Warehouse, the floors are free of cracks, but the dike requires repair, before liquids

can be stored. The detailed design parameters are shown in Figures D-17, and D-18. The floor is constructed of 8" of concrete reinforced with steel mesh. When repaired, the floors, and dike will be sufficiently impervious to contain leaks, spills, and any accumulated precipitation, until the material is detected and removed. This storage unit will not be used for storing liquid waste until the curb is repaired.

The Plant 8 Warehouse is constructed with 8" concrete reinforced with rebar and steel mesh to withstand 4,000 P.S.I. pressure. The detailed design parameters for the building are given in Figure D-19. There is no containment design at the present time. No liquid wastes will be stored at this unit until secondary containment is provided, in accordance with applicable OAC codes.

The Proposed Plant 9 Warehouse is constructed with 6" concrete reinforced with rebar and steel mesh to withstand 4,000 P.S.I. pressure. The detailed design parameters for the building are given in Figure D-20.

The Proposed Plant 9 Warehouse has no containment design at the present time. Prior to storage of RCRA wastes at this unit, it will be upgraded to meet all applicable OAC Codes.

The floors and curbs in all storage units, which use 55-gallon containers are checked for cracks or gaps weekly as part of the routine RCRA building inspections, shown in Figure D-23.

A plan view of the Proposed RCRA Warehouse is provided in Figure D-21. Details of the dike and spacing are also shown in Figure D-21. Design parameters, and dimensions are also shown. Materials of construction for the base are described as follows. The floor is to be constructed of reinforced concrete and be able to withstand the load of a 20,500 pound forklift. The Proposed RCRA Warehouse has been designed with the intent of containing liquid hazardous waste. The floors will be free of cracks or gaps and be sufficiently impervious to contain leaks, spills or accumulated precipitation until the material is detected and removed. The four containment areas will be sloped toward the middle, which contains a trench for accumulating a spill, or leak.

D-1a(3)(b) Containment System Drainage

The drums in all the present Storage Units are stored on pallets to elevate them from contact with any standing liquids (spills or accumulated precipitation). All of the containment areas currently in use for RCRA waste storage at the FMPC are surrounded by 6" high by 6" wide curbs. The bases of the current waste storage units are not sloped. None of the present waste storage units have sumps or drainage systems.

The base of the Proposed RCRA Warehouse will be sloped toward trenches in the middle of each containment area as shown in Figure D-21. The trenches will be slightly pitched for drainage into a collection area.

The Proposed Building 83-X Storage Warehouse will be designed with 6" curbs that will surround the floor. The floor should be sloped to a collection sump that should run through the center of the floor.

D-1a(3)(c) Containment System Capacity

The containment capacities are calculated from the area of the containment and the height of the curbs. Adjustments have been made for the volume displacement of the pallets in all containment areas. Calculations are shown in Figure D-24. Figure D-25 shows the calculations for the conversion of containment capacities from gallons to cubic feet. Adjustments are also made for the displacement of the solid ramps. Calculations for the ramps are shown in Figure D-26.

The maximum number of drums which can be stored in Plant 6 Warehouse is 3648.

a. The maximum storage capacity in the Bay 1 area is 1,152 drums. This storage capacity will yield 63,360 gallons of liquid storage. The containment capacity of this area is 1,730 cu. ft. (12,941 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for the Bay 1 area. Calculations are provided in Figure D-27.

b. The maximum storage capacity in the Bay 2 area is 1,332 drums. This storage capacity will yield 73,260 gallons of liquid storage. The containment capacity of this area is 2,048 cu. ft. (15,320 gallons). This containment capacity is greater

than 10 percent of the maximum storage capacity for the Bay 2 area. Calculations are provided in Figure D-28.

c. The maximum storage capacity in the Bay 3 area is 1,164 drums. This storage capacity will yield 64,020 gallons of liquid storage. The containment capacity of this area is 1,824 cu. ft. (13,644 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for the Bay 3 area. Calculations are provided in Figure D-29.

The maximum number of drums which can be stored in the KC-2 Warehouse is 1,160 drums.

a. The maximum storage capacity of Bay 5 is 456 drums. Bay 5 contains two diked areas. An inner diked storage area and a surrounding diked area.

1. The storage capacity of the inner dike is 80 drums. This storage capacity will yield 4,400 gallons of liquid wastes. The containment capacity of the inner diked area is 71 cu. ft. (531 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for the inner dike. Calculations are provided in Figure D-30. This secondary containment area does not have ramps.
2. The storage capacity of the surrounding diked area is 376 drums. This storage capacity will yield 20,680 gallons of

liquid wastes. The containment capacity of the surrounding diked area is 919 cu. ft. (6,874 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity of the surrounding diked area. Calculations are provided in Figure D-31.

b. The maximum storage capacity of Bay 6 is 464 drums. This storage capacity will yield 25,520 gallons of liquid storage. The containment capacity of this area is 1,017 cu. ft. (7,607 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for Bay 6. Calculations are provided in Figure D-32.

c. The maximum storage capacity of Bay 7 is 240 drums. This storage capacity will yield 13,200 gallons of liquid storage. The containment capacity of this area is 620 cu. ft. (4,637 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for Bay 7. Calculations are provided in Figure D-33.

The maximum storage capacity of the Pilot Plant Warehouse is 180 drums. This capacity will yield 9,900 gallons of liquid storage. The containment capacity of this area is 172 sq. ft. (1,286 gallons). This containment capacity is greater than 10 percent of the maximum storage capacity for the Pilot Plant Warehouse. Calculations are provided in Figure D-34. There are currently no ramps used with this

containment area. This area is not currently being used to store liquid wastes. This area will not be used to store liquid wastes until repairs are made to the dike.

The maximum storage capacity for the Plant 8 Warehouse is 1,992 fifty-five gallon drums. This capacity will yield 109,560 gallons of liquid storage. This storage unit will require at minimum 10,956 gallons of containment capacity. This is equal to 1465 cu. ft. of containment capacity. With our typical 6" curbs, this will require 2,930 sq. ft. of floor space. Since the building has 10,200 sq. ft. under roof, this should be easily accomplished. Until the curbing is constructed, no liquid waste will be stored. Once construction is complete, an inspection of the containment curbing will be required before the placement of liquid waste can begin. The calculations for minimum containment capacity are provided in Figure D-39.

The maximum storage capacity for the Plant 9 Warehouse is 1,704 fifty-five gallon drums. This capacity will yield 93,720 gallons of liquid storage. This storage unit will require at minimum 9,372 gallons of containment capacity. This is equal to 1,253 cu. ft. of containment capacity.

With typical 6" curbs, this will require 2,506 sq. ft. of floor space. Since the building has 10,200 sq. ft. under roof, this should be easily accomplished. Until the curbing is constructed, no liquid waste will be stored. Once construction is complete, an inspection

of the containment curbing will be required before the placement of liquid waste can begin. The calculations for minimum containment capacity are provided in Figure D-38.

The maximum storage capacity of the Proposed RCRA Warehouse will be 2,640 drums. This capacity will yield 145,200 gallons of liquid storage. The RCRA Warehouse will have four containment areas.

Two of the diked areas are approximately 2,700 sq. ft. each. The containment capacity of these areas is 1,086 cu. ft. (8,123 gallons). These areas will store 720 drums or 39,600 gallons of liquid waste, each. The containment capacity of these two areas will easily be greater than 10 percent of the maximum storage capacity. Calculations are provided in Figure D-36. Ramp calculations are provided in Figure D-35.

The other two diked areas will be approximately 2,100 sq. ft. each. The containment capacity of these areas is 872 cu. ft. (6,523 gallons). These areas will store 600 drums or 33,000 gallons of liquid waste, each. The containment capacity of these two areas will easily be greater than 10 percent of the maximum storage capacity. Calculations are provided in Figure D-37. Ramp calculations are provided in Figure D-35.

The containment capacities for the Proposed Building 83-X Storage Warehouse cannot be calculated, since no containment areas are defined at this time.

D-1a(3)(d) Control of Run-On

The Plant 6 Warehouse is totally under roof and completely curbed, there will be no run-on. Since no rainfall event will affect this Storage Unit, storm intensity and frequency are not relevant factors. To further prevent run-on concrete slabs and landscape around the warehouse slope away from the building.

The KC-2 Warehouse concrete block walls on the east and west sides and are completely under roof. The fence is completely covered by a plastic reinforced tarp at the north end of the building, and is completely covered except for the three bay doors at the south end. The curbing inside the north and south ends of the building are 5 ft. from the security chain-link fence. The ramps are sloped away from the inside and outside of the dike and do not allow for run-on. Since the building is completely under roof, and the fence is covered with tarps, storm intensity and frequency are not relevant. In the event any rain water does enter the containment area, the containers are elevated on pallets to avoid contact with the water.

The Pilot Plant Warehouse is totally under roof and contains a diked area of 62′ by 7′ wide within the building. Rainwater is prevented from entering warehouse by concrete slabs and landscape which slope away from the building.

The Plant 8 Warehouse contains liquid-free waste only. The pre-engineered building is completely under roof. In front of each door is a grated trench connected to a sewer drain to prevent run-on from entering the building and

coming into contact with the drums. To further prevent rainwater from entering the building, concrete slabs and landscape around the building are sloped away from the building. The Plant 8 Warehouse is in the process of being activated and modified to handle all types of RCRA waste and not just liquid-free waste. Six-inch curbs will encircle the RCRA storage containers to further prevent run-on from reaching the material stored within.

The Proposed Plant 9 Warehouse is a pre-engineered building completely under roof. This warehouse will be modified to store RCRA waste in four curbed areas. The curbs will help prevent run-on from reaching the drums in the storage area. To further prevent run-on, the concrete slabs and landscape around the warehouse are sloped away from the building.

The Proposed RCRA Warehouse is a pre-engineered structure completely under roof. The building will be supplied with ramps that slope away from the entrance to prevent run-on. There will be electrically operated roll-up steel doors. The landscape will be sloped away from the building to prevent run-on.

The Proposed Building 83-X Storage Warehouse is totally under roof and will be completely curbed. This will prevent any run-on. Since no rainfall event will affect this storage unit, storm intensity and frequency are not relevant factors. To further prevent run-on, concrete slabs and landscape around the warehouse slope away from the building.

D-1a(3)(e) Removal of Liquids from Containment System

If a spill or leak occurs, the personnel involved in the incident or its discovery shall follow the RCRA Contingency Plan (included in Section G of this permit application). This includes reporting the incident to the Assistant Emergency Duty Officer (AEDO), who initiates the actions to be taken for cleanup. Spill response equipment is included in all Waste Storage Units. At Minimum, this equipment includes the following:

85 gallon recovery drum	3
absorbent pads minimum 6 pads	1 box
hazardous mat PIG minimum 6 pads	1 box
granular absorbent	1 bag
leather-palm gloves	6 pair min.
rubber gloves	6 pair min.
shovel and broom	1 each
disposable coveralls	1 set

All leaking, damaged or rusting drums shall be replaced with new or reconditioned drums. This shall be accomplished by overpacking (placing one drum inside another drum) or redrumming. Any residues from a spill will be drummed and labelled as hazardous waste.

D-1b Containers Without Free Liquids

D-1b(1) Tests for Free liquids

The absence of free liquids is confirmed based on visual inspection of the waste and both current and historical knowledge of the physical and chemical composition of plant waste streams as generated and stored. Should visual

inspection or known composition fail to clearly define the physical state of any particular waste stream to be stored, U.S. EPA Publication SW-846, TEST METHODS FOR EVALUATING SOLID WASTE, PHYSICAL/CHEMICAL METHODS, Third Edition, November 1986, Method 9095, "Paint Filter Liquids Test"(PFLT), will be employed to ensure the absence of free liquids. The sampling methods used to properly sample a waste stream for the PFLT test are presented in Section C, Paragraph C-2c "Sampling Methods."

D-1b(2) Description of Containers

This topic has been thoroughly discussed in section D-1a(1).

D-1b(3) Container Management Practices

This topic has been thoroughly discussed in section D-1a(2).

D-1b(4) Container Storage Area Drainage

The drums in all the present Storage Units are stored on pallets to elevate them from contact with any standing liquids (spills or accumulated precipitation). All of the containment areas currently in use for RCRA waste storage at the FMPC are surrounded by 6" high by 6" wide curbs. The bases of the current waste storage units are not sloped. None of the present waste storage units have sumps or drainage systems.

The base of the Proposed RCRA Warehouse will be sloped toward trenches in the middle of each containment area as shown in Figure D-21. The trenches will be slightly pitched for drainage into a collection area.

The Proposed Building 83-X Storage Warehouse will be designed with 6" curbs that will surround the floor. The floor should be sloped to a collection sump that should run through the center of the floor.

D-2 TANKS

Until July, 1989, two 10,000 gallon stainless steel storage tanks, T-5 and T-6, had been used at the FMPC to store RCRA hazardous waste. The total volume of waste which had been stored in these tanks was 12,831 gallons. The primary component in the tanks was 1,1,1- trichloroethane, with some mineral spirits and water contaminants in Tank T-5. The material in both tanks was in a liquid state. The material in Tank T-5, 7,954 gallons, was ignitable, but the material in Tank 6, 4,877 gallons, was not ignitable.

In July 1989, the two tanks were drained into 55-gallon drums due to the age and condition of the tanks. Closure of this storage unit will begin pending approval of the Closure Plan by the Ohio Environmental Protection Agency.

As these were the only tanks containing hazardous waste, there are currently no tanks at the FMPC which contain RCRA hazardous waste.

D-3 WASTE PILES

There are no active or planned hazardous waste Surface Impoundments at the FMPC; therefore, process information on surface impoundments is not included.

D-4 SURFACE IMPOUNDMENTS

There are no active or planned hazardous waste Surface Impoundments at the FMPC; therefore, process information on surface impoundments is not included.

D-5 INCINERATORS

There are no active or planned hazardous waste incinerators at the FMPC; therefore, process information on incinerators is not included.

D-6 LANDFILLS

The FMPC has one existing hazardous waste landfill located on-site, Waste Pit 4. Waste Pit 4 was constructed in 1960. A minimum of 12 inches of compacted clay was used to line the inner slopes of the pit walls.

Waste Pit No. 4 has a depth of 24 feet and has a volume of approximately 53,000 cubic yards. Waste Pit 4 is no longer used for the disposal of any material. No hazardous materials have been placed in the landfill since April of 1983.

At the request of the Ohio Environmental Protection Agency, a cover has been placed over the surface of Waste Pit 4. The cover consists of fill material placed on the landfill to achieve an adequate slope or runoff, overlain two feet of clay compacted to $1x10^{-7}$ cm/s permeability, overlain with a 45 mil thickness of chlorosulphonated polyethylene (Hypalon). The construction of this cover was completed in June 1989. This cover has been termed "interim closure" for Waste Pit 4. Final closure will be determined by the Record of Decision.

D-6a List of Wastes

Waste Pit No. 4 was placed in operation in August of 1960. Since its opening the waste pit has received various FMPC process residues, waste graphite, non-burnable trash, construction rubble asbestos and a trichloride waste salt that is hazardous doe to the toxic concentrations of barium. This waste is designated as D005 hazardous waste.

Current waste volume contained in the landfill is now estimated at 53,000 cubic yards. The cover materials placed over the pit comprised a volume of approximately 13,000 cubic yards. During the period of May 1981 through April 1983 Waste Pit 4 received 23,499 pounds of the low-level radioactive waste containing barium chloride salt. The waste salts generated at the RMI facility are listed in the Part A application.

D-6b Liner System Exemption Requests

Waste Pit 4 was constructed and utilized prior to November 8, 1984. At the time of construction, no requirements for liners existed, and Waste Pit 4 has not been retrofitted since requirements for the liners were issued. Therefore, Waste Pit 4 is exempt from liner system requirements.

D-6c Liner System, General Items

Waste Pit 4 is exempt from liner system requirements.

D-6d Liner System, Foundation

Waste Pit 4 is exempt from liner system requirements.

D-6e Liner System, Liners

Waste Pit 4 is exempt from liner system requirements.

D-6f Liner System, Leachate Collection/Detection Systems

Waste Pit 4 is exempt from liner system requirements.

D-6g Liner System, Construction and Maintenance

Waste Pit 4 is exempt from liner system requirements.

D-6h Run-on and Run-off Control System

A run-on, run-off control system is in place for Waste Pit 4. This system was installed as part of the interim closure of the landfill completed in June of 1989. The systems consist of a perimeter drainage ditch and an earthen berm.

D-6h(1) Run-on Control System

There are no active portions to Waste Pit 4, it is an inactive hazardous waste landfill that has been covered under the specifications of an interim closure plan approved by U.S. EPA and Ohio EPA. The run-on control structures that do exist are earthen berms.

D-6h(1)(a) Design and Performance

Surrounding one-half of a landfill's perimeter drainage ditch is an earthen berm which prevents surface water from running onto the landfill. The top elevation of this earthen berm is above the elevation of surrounding areas. The other half of the perimeter drainage ditch is surrounded by a roadway which makes installation of an earthen berm impossible. However, only a small portion of surface water runoff is contributed by this roadway in relation to the amount of surface water runoff from the cover over the landfill. This system was installed as part of the interim closure of the landfill completed in June of 1989.

D-6h(1)(b) Calculation of Peak Flow

There will be no flow of stormwater onto the surface of Waste Pit 4 since the cover over the pit raised the surface of landfill above the surrounding topography. Therefore, no calculation of peak flow is provided.

D-6h(2) Run-off Control System

The run-off control system consists of a continuous drainage ditch surrounding the entire perimeter of the landfill which provides run-off capability for rainwater that falls on the surface of the landfill.

D-6h(2)(a) Design and Performance

The perimeter drainage ditch is sloped so that a high point exists on the north portion of the drainage ditch and surface water flows in opposite directions from this point around the landfill to a point on the south portion of the landfill. The surface water is then removed from the perimeter drainage ditch by flowing through a twenty-four inch diameter reinforced concrete pipe which passes beneath a road. The surface water flows to Paddy's Run Creek via a continuous drainage ditch that provides that runoff for the several areas in the FMPC Waste Storage Area. Portions of the perimeter drainage ditch and the drainage ditch that continues to Paddy's Run are lined with riprap to reduce erosion. Since a cover has been placed over the landfill, there is no runoff which comes in contact with the hazardous wastes.

D-6h(2)(b) Calculation of Peak Flow

The calculation of peak flow from the surface of the landfill is based on the size of the landfill, the type of surface that the rainfall contacts, the time for surface water runoff to travel the greatest distance in the water shed, the rainfall distribution for the geographical location within the United States, and the number of pond and sump areas located within the watershed. The Peak discharge from Waste Pit 4 has been calculated as 15 cubic feet per second for a 25 year, 24 hour storm event. The program used to calculate this discharge is titled "Urban Hydrology for Small Watersheds," this document is Technical Release 55 developed by the Engineering Division of the Soil Conservation Service and printed by the National Technical Information Service of the U.S. Department of Commerce. A copy of the calculation is provided in Figure D-40.

D-6h(3) Management of Collection and Holding Units

There is no collection or holding units for run-on or run-off of storm water that falls onto the surface of Waste Pit 4.

D-6h(4) Construction

To address the specifications used to construct the run-on and run-off control system, a copy of the specifications used to construct the entire cover is provided in Appendix D-1. The sections of the specification which relate to run-on and run-off control system construction are in Sections 02200, 02721, 02821, 03300, and 03450.

D-6h(5) Maintenance

The interim cover and run-on and run-off control system are inspected on a weekly basis. This includes the inspection of the run-on and run-off control berm and drainage ditch around the landfill. This system is inspected for erosion. When erosion is noted, FMPC maintenance is instructed to fill the erosion with additional soil and seed the area to promote vegetative growth and prevent further erosion.

D-6i Control of Wind Dispersal

Covering the landfill has eliminated any possibility of wind dispersal.

D-6j Liquids in Landfills

Waste Pit 4 does currently contain liquid. This liquid is rainfall that has collected in the landfill over the life of the landfill prior to covering.

D-6j(1) Bulk or Noncontainerized Free Liquids

Available records do not indicate that bulk or noncontainerized liquids were placed into the landfill. The landfill was operated for the disposal of bulk nonliquid waste. No process lines enter into pit which greatly reduces the possibility of pumping waste into the landfill. The only liquid that is known to have accumulated in the landfill is rainfall. Available records indicate that no stabilization of the rainfall that collected in the landfill was ever attempted. The only action that was taken was to pump the water from the landfill into the FMPC waste water treatment system.

D-6j(2) Containers Holding Free Liquids

Available records indicate that no containers holding free liquids were placed into the landfill.

D-6j(3) Restriction to Small Containers

The possibility of small containers of liquid waste being placed into the landfill does exist. No records have been located that indicate whether small containers have been placed into the landfill or the size of these containers if this disposal was performed.

D-6j(4) Nonstorage Containers

The possibility does exist that nonstorage containers with free liquids were placed into the landfill. No records have been located that indicate whether nonstorage containers with free liquids have been placed into the landfill. However, it is known that pieces of equipment used in FMPC operations that were no longer of use were placed into the landfill.

D-6j(5) Labpacks

Available records do not indicate that any type of labpacks were placed into the landfill.

D-6j(5)(a) Inside Containers

Available records do not indicate that any type of labpacks were placed into the landfill.

D-6j(5)(b) Overpack

Available records do not indicate that any type of labpacks were placed into the landfill.

D-6j(5)(c) Absorbent Material

Available records do not indicate that any type of absorbent material was used.

D-6j(5)(d) Incompatible Wastes

Available records do not indicate that any type of labpacks were placed into the landfill.

D-6j(5)(e) Reactive Wastes

Available records do not indicate that any type of labpacks were placed into the landfill.

D-6k Containerized Wastes

Containerized solid wastes were placed into the landfill. The only hazardous waste that was placed into the landfill, Barium Chloride Waste Salt, was in 55-gallon containers. It is not known if these containers were at least 90 percent full when placed into the landfill. It is known that these containers were not crushed, shredded or similarly reduced in volume prior to burial.

D-61 Special Waste Management Plan for Landfills Containing Wastes F020, F021, F022, F023, F026 and F027

This section is not applicable to Waste Pit 4. The landfill is not known to contain any of the wastes F020, F021, F022, F023, F026, and F027.

D-61(1) Waste Description

This section is not applicable to Waste Pit 4. The landfill is not known to contain any of the wastes F020, F021, F022, F023, F026, and F027.

D-61(2) Soil Description

This section is not applicable to Waste Pit 4. The landfill is not known to contain any of the wastes F020, F021, F022, F023, F026, and F027.

D-61(3) Mobilizing Properties

This section is not applicable to Waste Pit 4. The landfill is not known to contain any of the wastes F020, F021, F022, F023, F026, and F027.

D-61(4) Additional Management Techniques

This section is not applicable to Waste Pit 4. The landfill is not known to contain any of the wastes F020, F021, F022, F023, F026, and F027.

D-7 LAND TREATMENT

There are no hazardous Land Treatment facilities at the FMPC; therefore, section does not apply.

Table D-1

Drum Specifications

Container Type	Approximate Number	DOT Specifications	Volume	Waste Type
Single Trip, Bung Type	927	17E	55-gallon	Liquids
Single Trip, Open Head	3,709	17H 17H	55-gallon	Liquids and Solids
Sealed Head Metal Drums	8	5	5-gallon	Liquids
"	12	17C	10-gallon	Liquids
"	91	17C	30-gallon	Liquids and Solids
"	279	16 gauge or .060" thick	85-gallon	Liquids
"	-	16 gauge or .060" thick	110-gallon	Liquids

RCRA CONTAINER 1PC RAGE INSPECTION FORM

Inspector Name: _____ Inspector Badge No.: _____

Location: _____ Date: _____ Time: _____

	MC&A INVENTORY NUMBER	FMPC LOT NUMBER	CHEMICAL NAME	RCRA ID NUMBER	DOT ID NUMBER	MC&A COLOR CODE	ACCUM. DATE DD/MM/YR	REMEDIATION/DATE CORRECTED
CORROSION								
PAINT PITTING								
DENTED								
CLEAN DRUM								
DRUM CLOSED								
PALLET STRENGTH								
LABEL SECURE								
LABEL VISIBLE								
DRUM HAS COMPATIBLE ARRANGEMENT								
WASTE RELEASE TO ENV. *								
OTHER:								

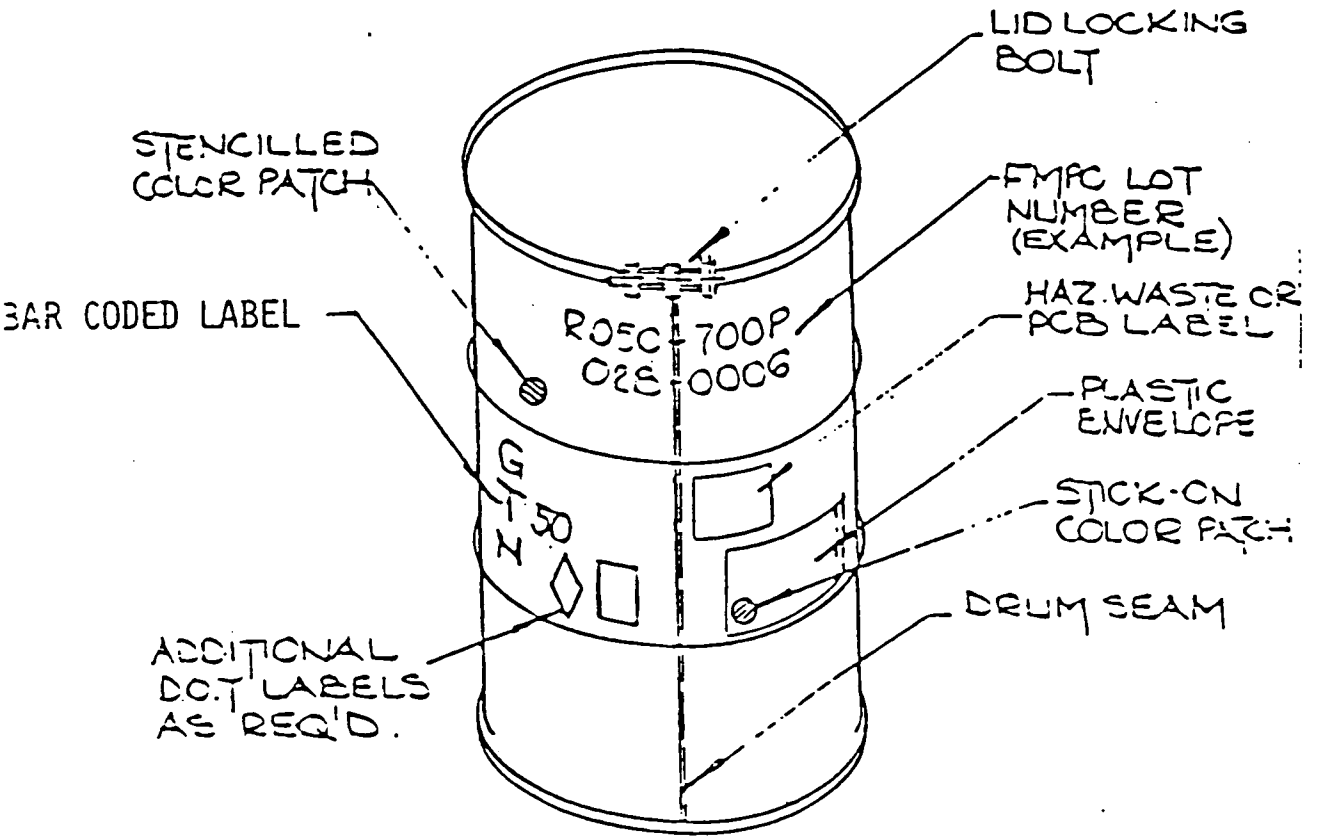
* Notify Supervisor immediately if the answer is yes.

Comments: _____

_____ INSPECTOR'S SIGNATURE _____ DATE

_____ SUPERVISOR'S SIGNATURE _____ DATE

FIGURE D-1



RCRA WASTE DRUM LABELING

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL.

IF FOUND CONTACT THE NEAREST POLICE
PUBLIC SAFETY AUTHORITY OR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY.

PROPER DOT
SHIPPING NAME _____ UN OR NA# _____

GENERATOR INFORMATION:

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

EPA
ID NO. _____ EPA
WASTE NO. _____

ACCUMULATION
START DATE _____ MANIFEST
DOCUMENT NO. _____

CAUTION:

THIS CONTAINER HOLDS HAZARDOUS OR TOXIC WASTE.

HANDLE WITH CARE!

© Copyright Science Related Materials Inc., Janesville, WI 53547

LOT NUMBER

R050-700-P028-0001

INVENTORY NUMBER

9999

GROSS WEIGHT

740

DRUM NUMBER

01

TARE WEIGHT

50

NET WEIGHT

690

BAR CODED LABEL

MATERIAL IDENTIFICATION RECORD

CARD PL.	CARD NO.
	XX

NOTE: Green card is for receiver information ONLY and may be retained in file. DO NOT FORWARD to Data Processing. DO NOT LEAVE with the material.

NEGATIVE	DATE RECEIVED MO.	DAY	YEAR	SHIFT	RECEIVED BY BADGE NO.

CARD SEQUENCE NO.:

P.O. NO.:	SOURCE:
MATERIAL CLASS:	MATERIAL TYPE:
LOT SEQUENCE NO.:	
MATERIAL DESCRIPTION:	
SHAPE CODE:	

MBA: (FROM)	PLANT:
MBA: (TO)	PLANT:
STORAGE LOCATION:	

NO. OF CONTAINERS OR ITEMS NUMBER	DESCRIPTION
GROSS WEIGHT:	
TARE WEIGHT:	

SIGNATURES: (SHIPPER) (TRANSPORTATION) (RECEIVER)

FMPC-AC-2221 (REV. 10/7/86)

NUCLEAR MATERIAL TRANSFER RECORD

CARD PL.	CARD NO.
	68

NEGATIVE	DATE TRANSFERRED MO.	DAY	YEAR	SHIFT	TRANS. BY BADGE NO.

NOTE: Green card is for receiver information ONLY and may be retained in file. DO NOT FORWARD to Data Processing. DO NOT LEAVE with the material.

CARD SEQUENCE NO.: 86500

P.O. NO.:	SOURCE:
MATERIAL CLASS:	MATERIAL TYPE:
LOT SEQUENCE NO.:	
MATERIAL DESCRIPTION:	
SHAPE CODE:	

MBA: (FROM)	PLANT:
MBA: (TO)	PLANT:
STORAGE LOCATION:	

NO. OF CONTAINERS OR ITEMS NUMBER	DESCRIPTION
GROSS WEIGHT:	
TARE WEIGHT:	

SIGNATURES: (SHIPPER) (TRANSPORTATION) (RECEIVER)

FMPC-AC-1990 (REV. 10/7/86)

NUCLEAR MATERIAL RECEIPT RECORD

CARD PL.	CARD NO.
	69

NOTE: Green card is for receiver information ONLY and may be retained in file. DO NOT FORWARD to Data Processing. DO NOT LEAVE with the material.

NEGATIVE	DATE RECEIVED MO.	DAY	YEAR	SHIFT	RECEIVED BY BADGE NO.

CARD SEQUENCE NO.: 86500

P.O. NO.:	SOURCE:
MATERIAL CLASS:	MATERIAL TYPE:
LOT SEQUENCE NO.:	
MATERIAL DESCRIPTION:	
SHAPE CODE:	

MBA: (FROM)	PLANT:
MBA: (TO)	PLANT:
STORAGE LOCATION:	

NO. OF CONTAINERS OR ITEMS NUMBER	DESCRIPTION
GROSS WEIGHT:	
TARE WEIGHT:	

SIGNATURES: (SHIPPER) (TRANSPORTATION) (RECEIVER)

FMPC-AC-2220 (REV. 10/7/86)

HAZARDOUS WASTE CONTAINER PRE-STORAGE CHECK LIST

Date: _____ Time: _____

Storage Area: _____

ITEM NUMBER	INSPECTION ITEM	STATUS: ACCEPTABLE	STATUS: UNACCEPTABLE	OBSERVATIONS & DATE CORRECTED
1	Verify information on "Item Production/Certification/Identification" Card XX			
2	Verify information on "NM Transfer Record/NM Receipt Record/Material Identification Record" 68/69 Card			
	VERIFY DRUM MARKINGS AND ACCURACY:			
3	FMPC Lot Marking Number			
4	FMPC Storage Compatibility Color Code			
5	Gross, Tare, and Net Weight			
	VERIFY DRUM LABELS:			
6	Hazardous Waste Label			
7	PCB Label			
8	Combustible Label			
9	Flammable Lable			
10	Additional Labels (List in "COMMENTS")			
11	EPA waste number on hazardous waste label			
12	Accumulation start date on hazardous waste label			
13	Drum labels and markings applied seam as center point			
14	Marking height between 1½" - 2"			
	CHECK CONDITION OF DRUM:			
15	Exterior free from dents, rust, or chipped paint			
16	No leaking			
17	Bolt centered on drum seam			
18	Lid locked and taped (liquids only)			
19	Drum lid and ring free from defects			

MC&A	SIGNATURE:	BADGE NO.:	WASTE OPERATIONS	SIGNATURE:	BADGE NO.:

COMMENTS:

FIGURE D-6

FIGURE D - 6A

M. C. & A
RCRA INVENTORY

DW NO.	MATERIAL DESCRIPTION	DOT CODE	UT NUMBER	DRUM NO.	GROSS WGT	TARE WGT	NET WGT	NBA	EPA ID NUMBER	UN/NA NO.	ACCUMULATION DATE	LOCATION	ROW	SLIKUST	PHYS	VOL (GAL)	SAMPLED (Y/N)	RADIO ACTIV (Y/N)	MAN. NUMBER IN	MANIFEST DATE IN	BAND CODE	DESTINATION	MAN. NO. OUT	MANIFEST DATE OUT	COLOR CODE	LAND CODE	LAND BAN
863	PAINT THINNER	FL	R050-748	P013-0315	0	0.0	0.0	0.0	0 F002D001	1263	03/08/1982	5	3	7 2		50	F	F	0		1	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
864	PAINT THINNER	FL	R050-748	P013-0290	0	0.0	0.0	0.0	0 F002D001	1263	02/17/1986	5	3	7 1		50	F	F	0		1	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
865	PAINT THINNER	FL	R050-748	P013-0315	0	0.0	0.0	0.0	0 F002D001	1263	03/08/1982	5	3	7 1		50	F	F	0		1	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
866	PAINT THINNER	FL	R050-748	P013-0290	0	0.0	0.0	0.0	0 F002D001	1263	02/17/1986	5	3	7 2		50	F	F	0		1	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
867	PAINT THINNER	FL	R050-748	P013-0304	5	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	1 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
868	PAINT THINNER	FL	R050-748	P013-0304	6	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	1 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
869	PAINT THINNER	FL	R050-748	P013-0304	11	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	1 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
870	PAINT THINNER	FL	R050-748	P013-0304	15	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	2 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
871	PAINT THINNER	FL	R050-748	P013-0304	14	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	2 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
872	PAINT THINNER	FL	R050-748	P013-0304	2	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	2 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																
873	PAINT THINNER	FL	R050-748	P013-0304	17	0.0	0.0	0.0	0 F002D001	1263	04/16/1987	7	2	3 2		85	OP	F	F	0		3	S01			RED		16 T
	DRUM CONTENT:																										
	PROPER SHIPPING NAME: RQ WASTE PAINT, THINNERS								OFFSITE SHIPDATE:																		
											ETA:																

CARD XX **ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION**

P. O. NO.	SOURCE	CLASS	MATERIAL TYPE	LOT SEQUENCE NO.	DATE MO	DATE DAY	DATE YEAR	SHIFT	BADGE NO.	PACKAGE NO.

SEAL NUMBER	SEAL DATE MONTH	SEAL DATE DAY	SEAL DATE YEAR

WASTE DESCRIPTION AND COMMENTS

PACKAGE TYPE	
PACKAGE SIZE	

PACKAGE PHYSICAL CERTIFICATION	YES	NO
EMPTY CONTAINER AT START		
RUST HOLES OR DENTS		
MATERIAL IS AS CODED		
PROHIBITED MATERIALS		
LIQUIDS IN CONTAINER		
MINIMUM OF VOID SPACE		
PACKAGE SECURED		
DRAIN PLUG SECURED		

PLANT	PROD. MBA
PLANT TO	MBA TO

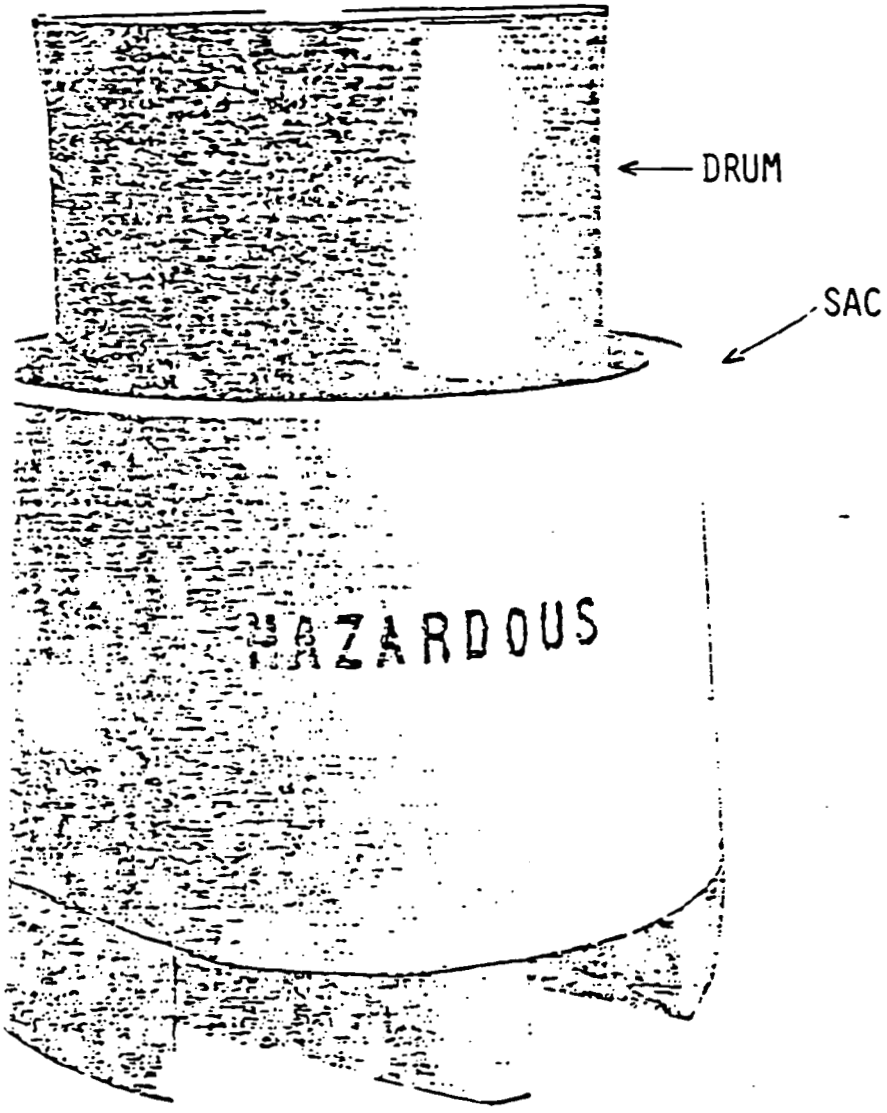
GROSS WEIGHT
TARE WEIGHT
NET WEIGHT

GENERATOR SIGNATURE

SUPERVISOR SIGNATURE DATE

FMPC-CONT-1945-XX (REV. 12/19/88)

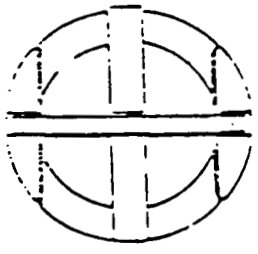
SAC - SATELLITE ACCUMULATION AREA CONTAINER



Part Number	Load Capacity	O.D. (Inches)	Shipping Wt. (Pounds)	Fork Clearance (Inches)
[illegible]	900 LB	30¼ × 26	19½	8¼"W × 5¼"H

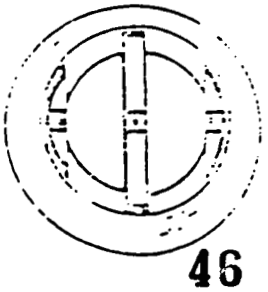
All Weights and Dimensions Nominal

Bottom View



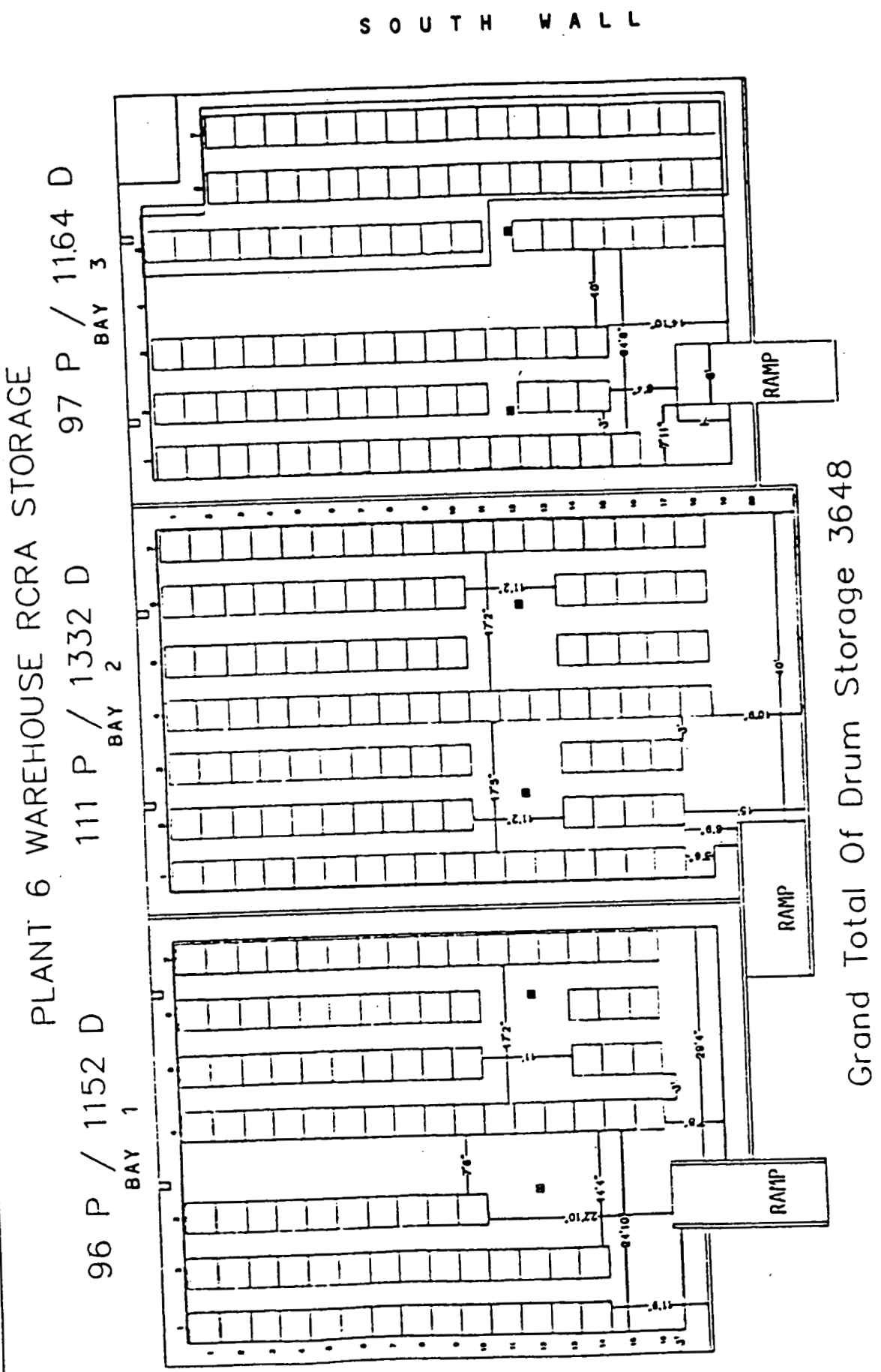
Fork Lift Base
with Steel Retainer
to Prevent Spillcontainer from Tipping Over

Inside View



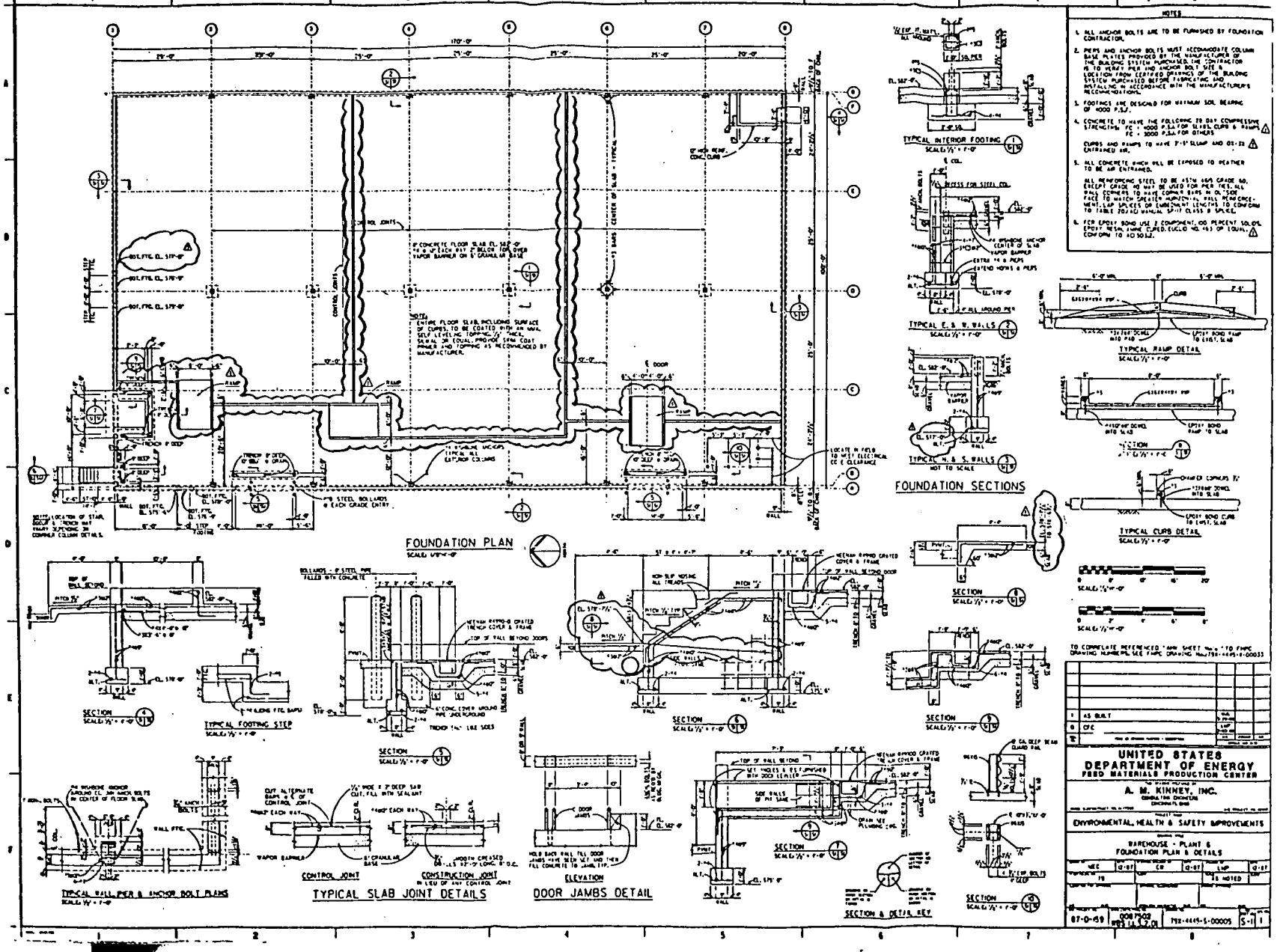
Molded-in Retainer Ring
for 55 Gallon Steel Drum

FIGURE D-9



P.C. Morales Jr.,8-18-89,M-12,W1-plda

FIGURE 0-10



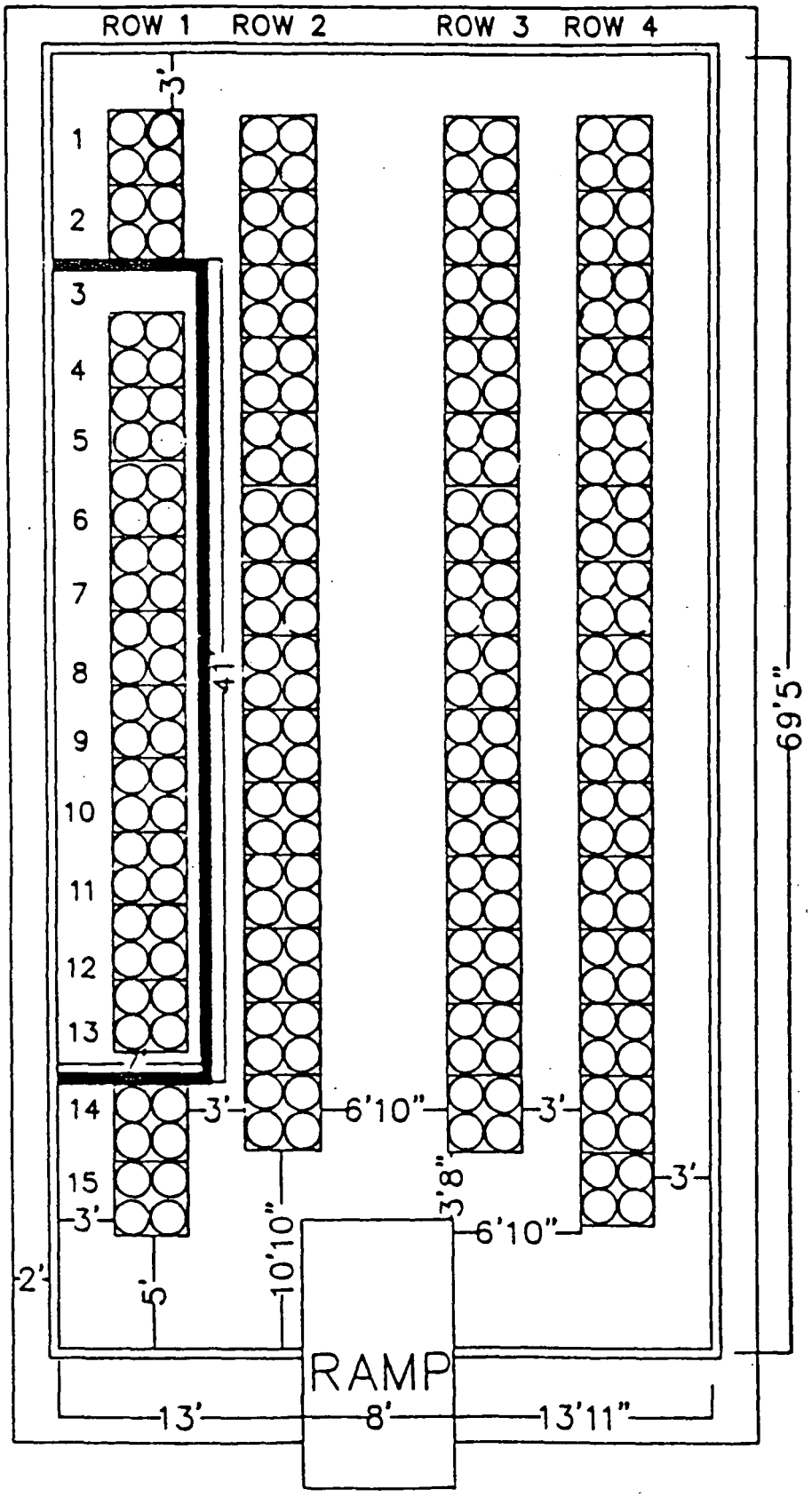
48

257

Proposed Layout
Orange Color / PCB

KC 2 BAY 5

Pallets - 57 Drums,- 228
Total Drum Capacity 456



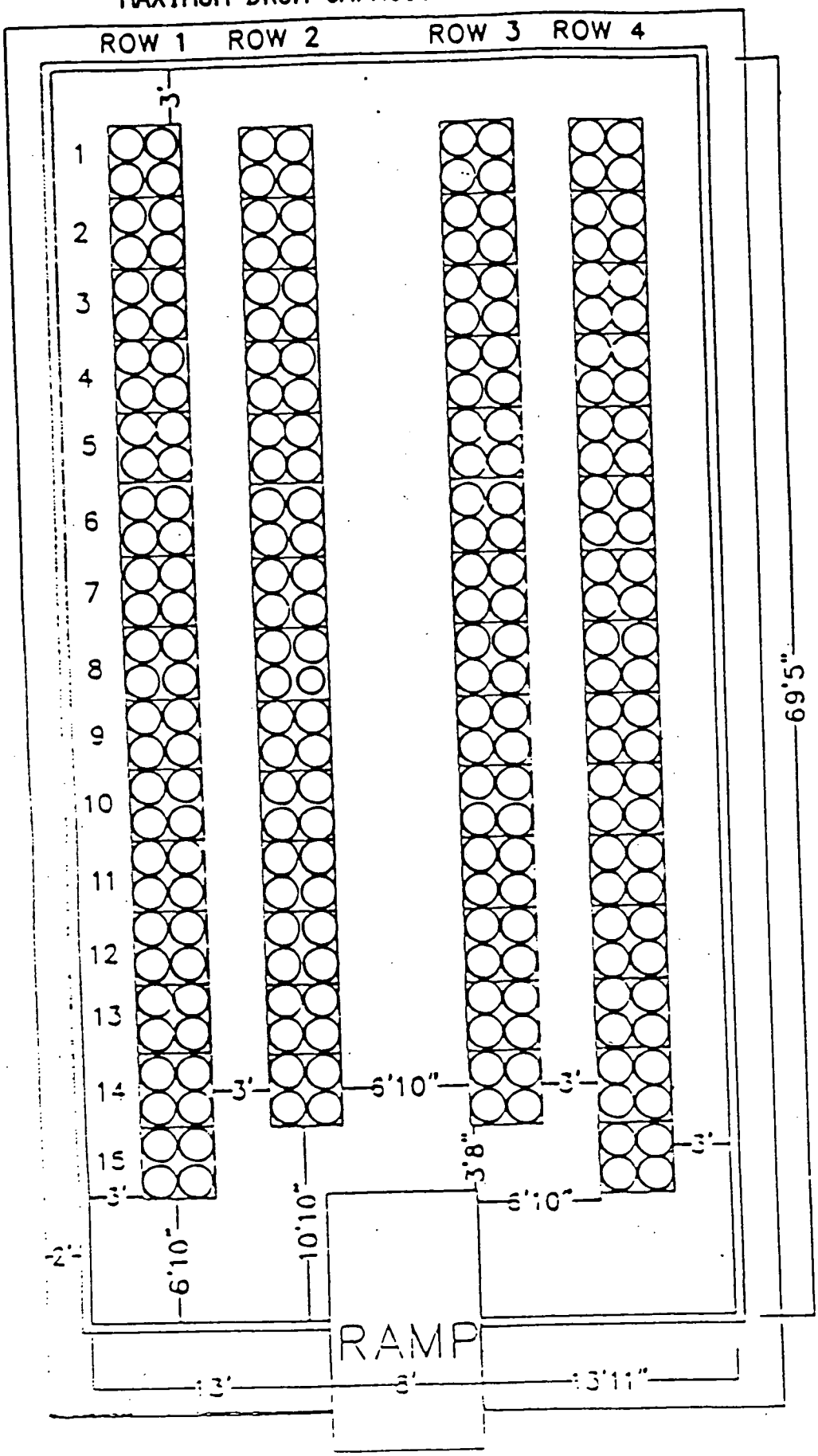
Red Color

FIGURE D-12

KC 2, BAY 6

Pallets - 58 Drums - 232

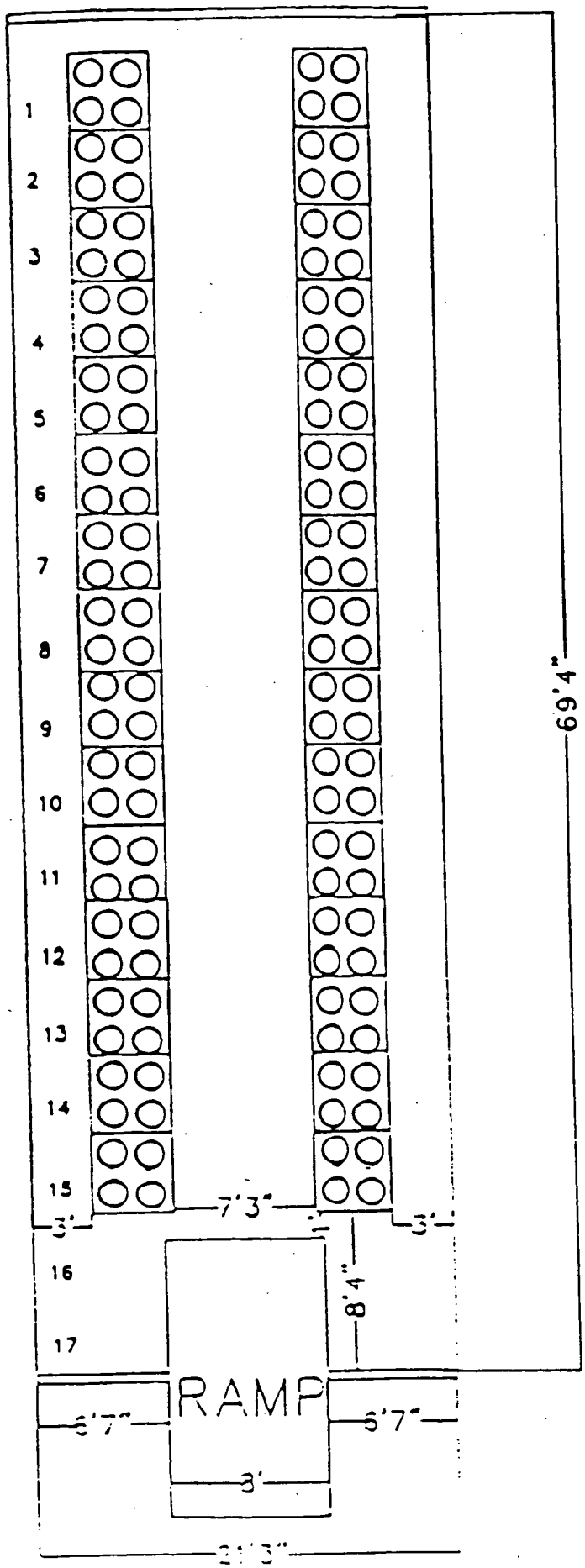
MAXIMUM DRUM CAPACITY - 464

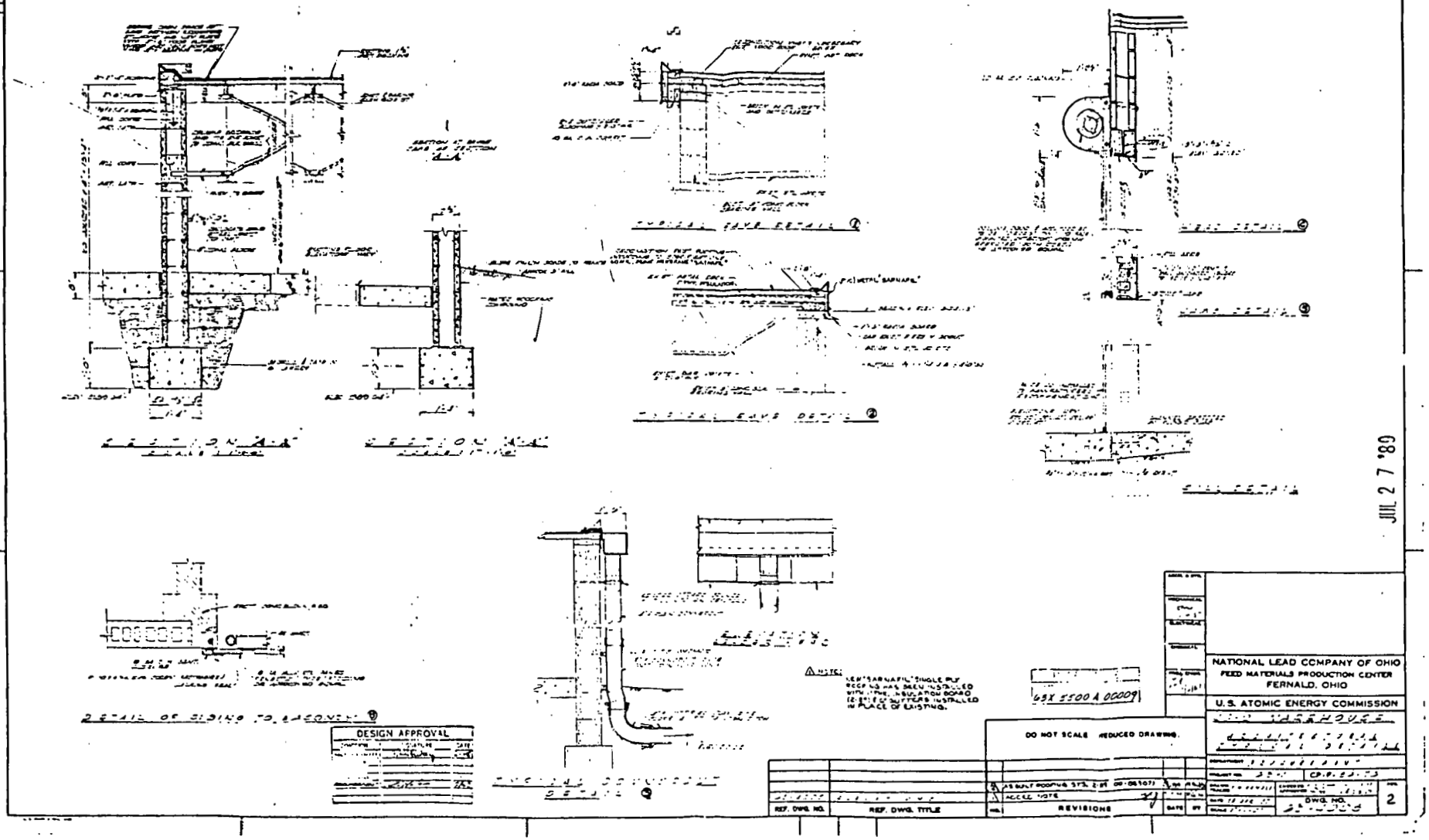


KC-2
BAY 7

30 P / 120 D

MAXIMUM CAPACITY 240D



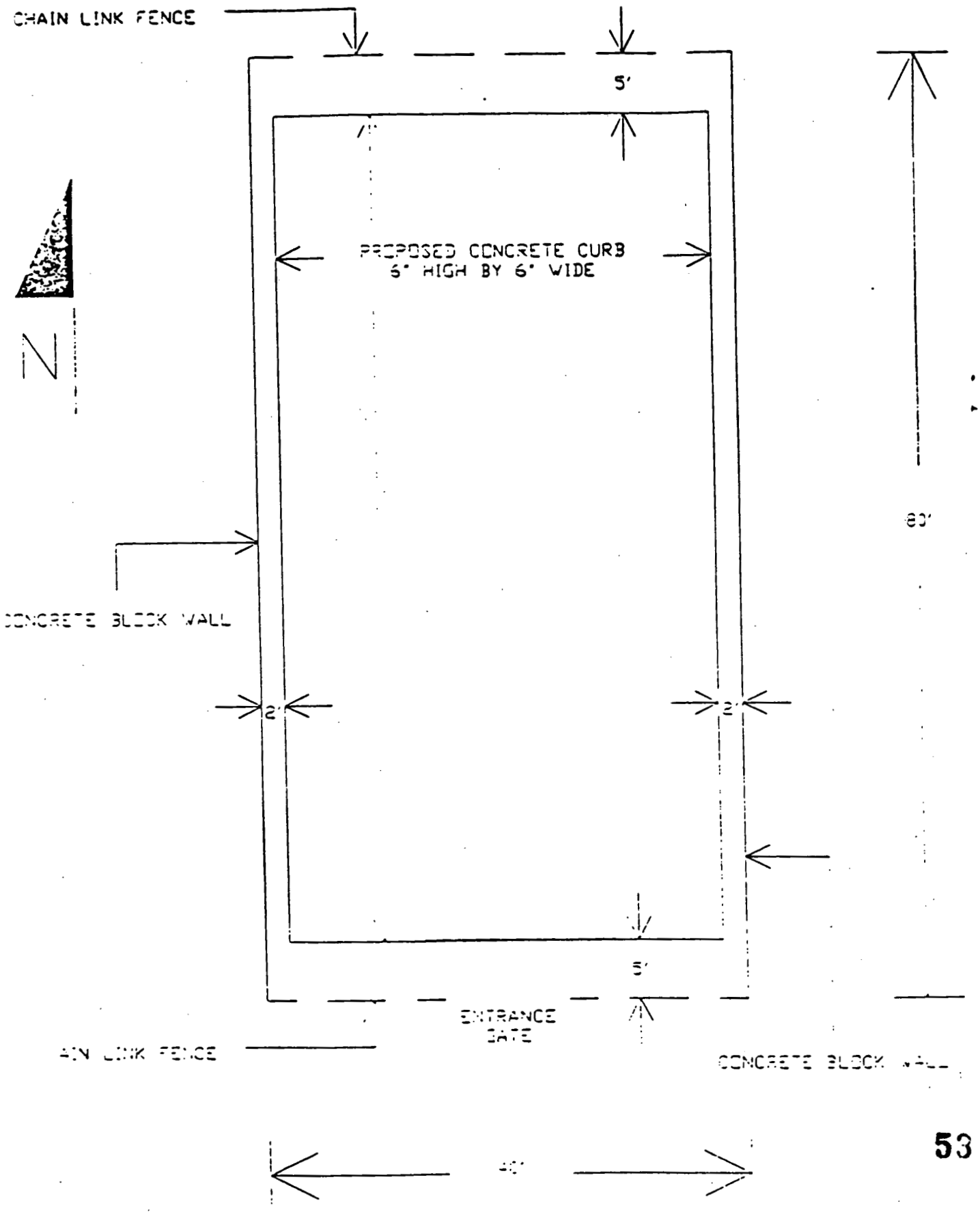

NATIONAL LEAD COMPANY OF OHIO
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO
U.S. ATOMIC ENERGY COMMISSION
DO NOT SCALE REDUCED DRAWING.
DESIGN APPROVAL
REF. DWG. NO.
REF. DWG. TITLE
REVISIONS
DWG. NO.
2
JUL 2 7 '80

KC-2 WAREHOUSE

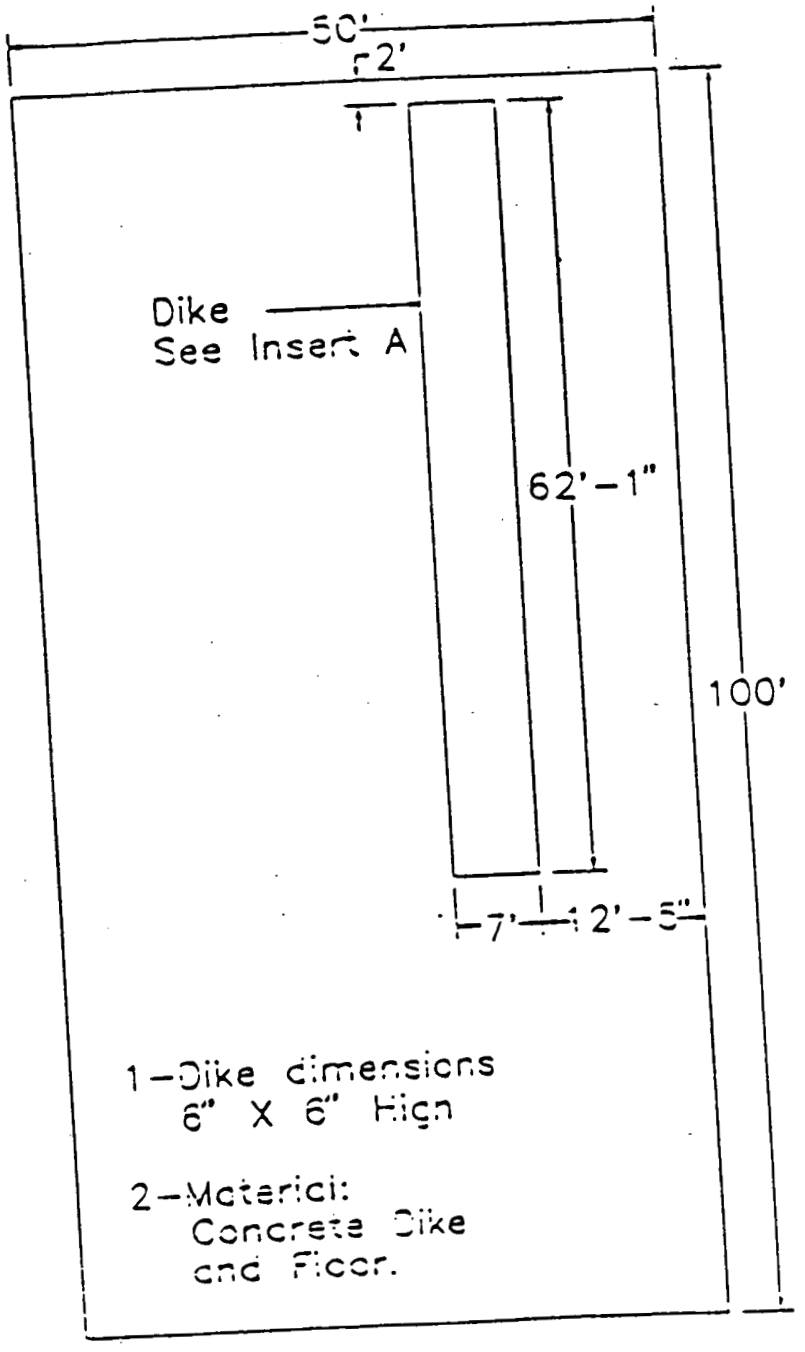
FIGURE D-15

PROPOSED CURB CONSTRUCTION

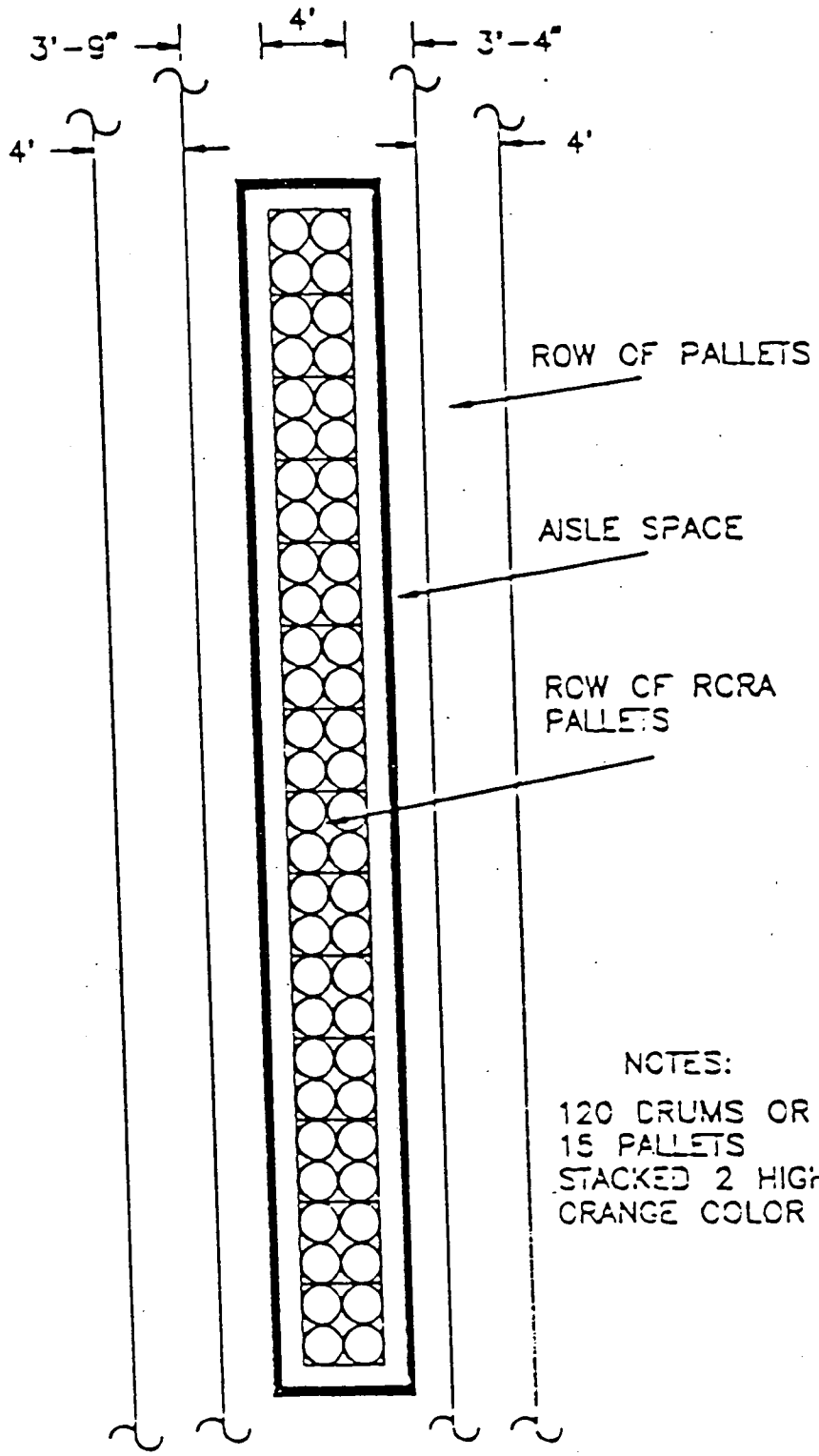
257



PILOT PLANT WAREHOUSE LAYOUT



PILOT PLANT WAREHOUSE
INSERT A



NOTES:

120 DRUMS OR 15 PALLETS STACKED 2 HIGH ORANGE COLOR

FIGURE D-18

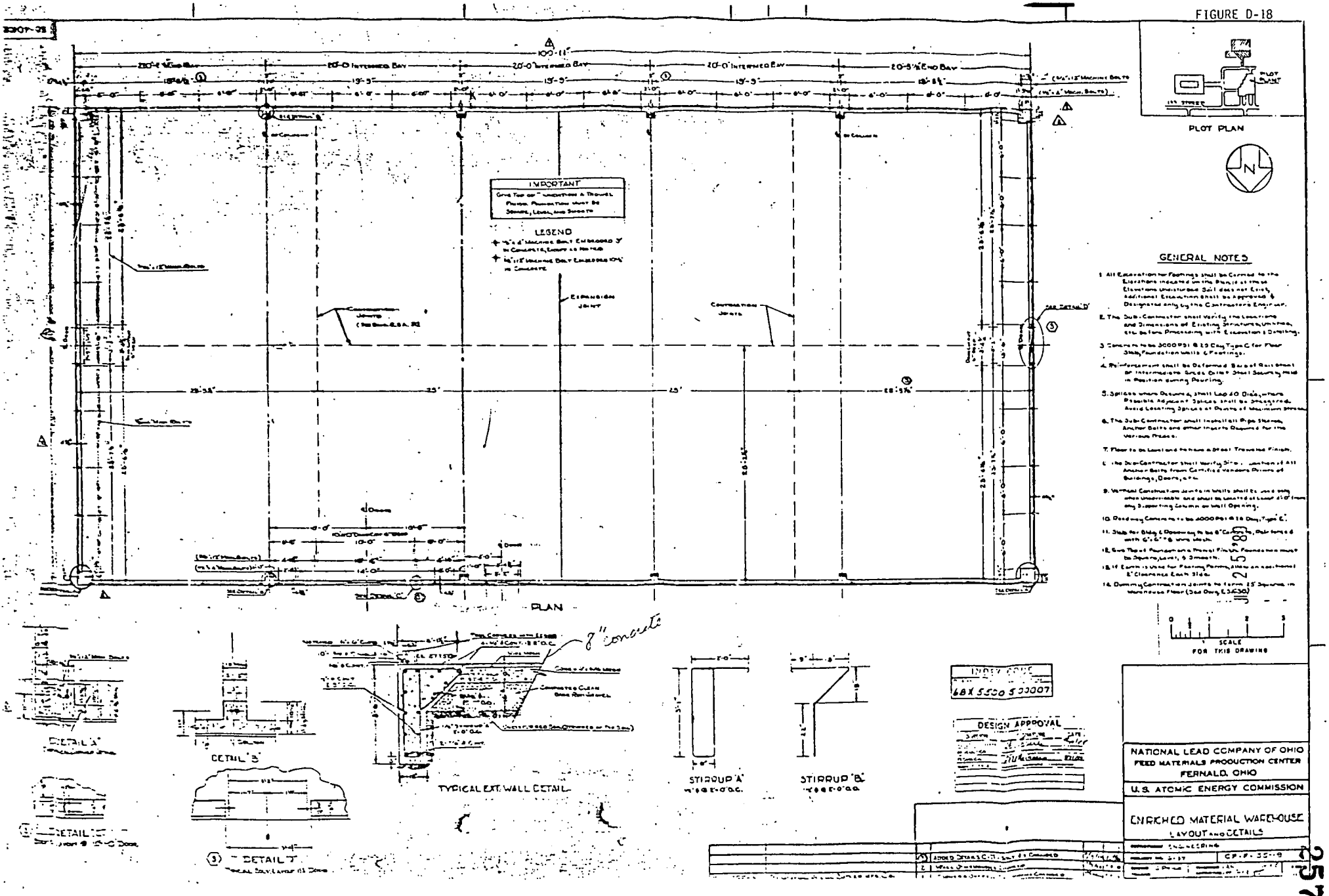

PLOT PLAN
PLAN
IMPORTANT
LEGEND
EXPANSION JOINT
CONSTRUCTION JOINTS
GENERAL NOTES
SCALE FOR THIS DRAWING
DETAIL 'A'
DETAIL 'B'
DETAIL 'C'
DETAIL 'D'
TYPICAL EXT. WALL DETAIL
STIRRUP 'A'
STIRRUP 'B'
8" concrete
INDEX CODE
DESIGN APPROVAL
NATIONAL LEAD COMPANY OF OHIO
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO
U.S. ATOMIC ENERGY COMMISSION
ENRICHED MATERIAL WAREHOUSE
LAYOUT AND DETAILS

FIGURE D-19

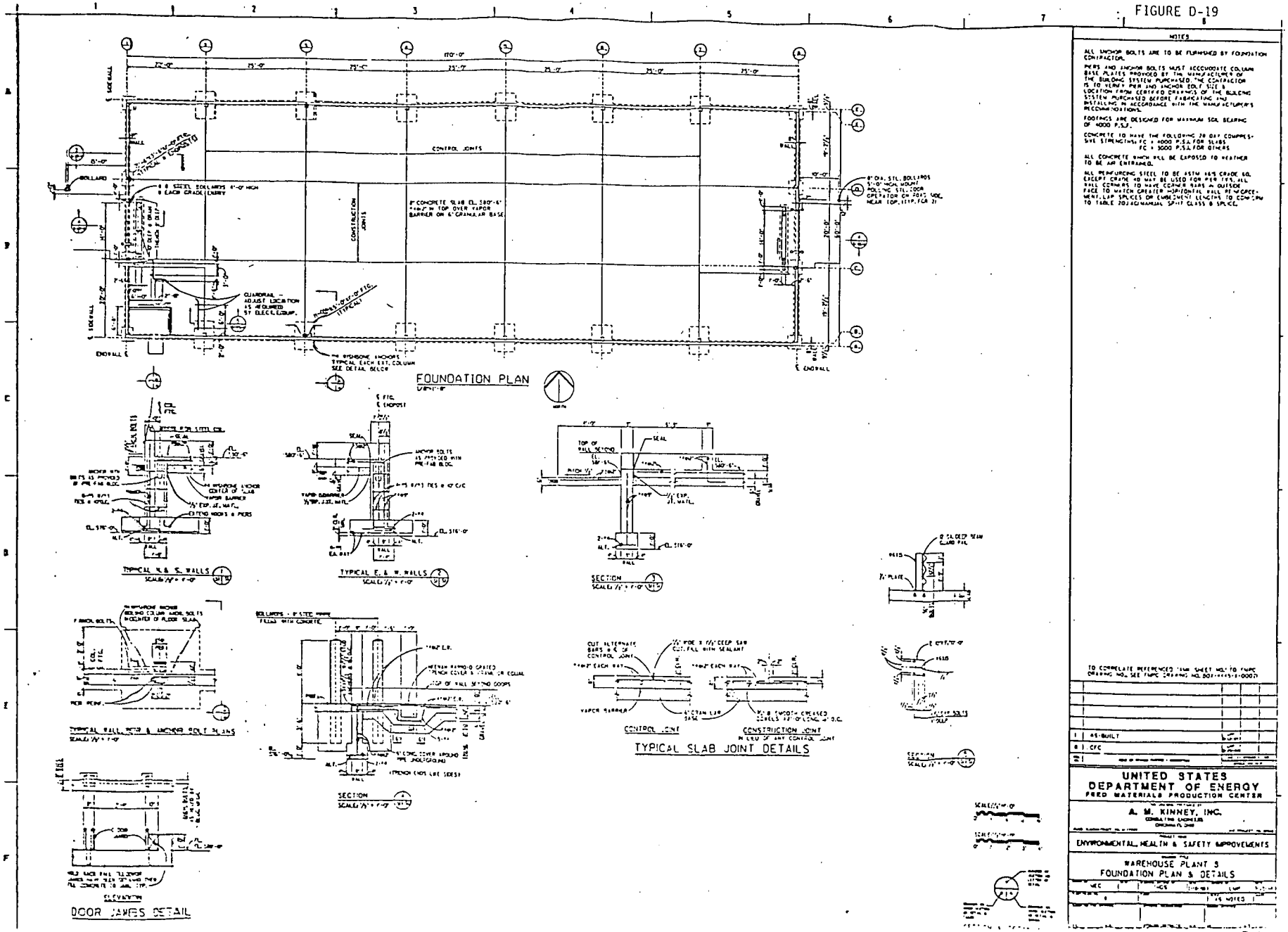
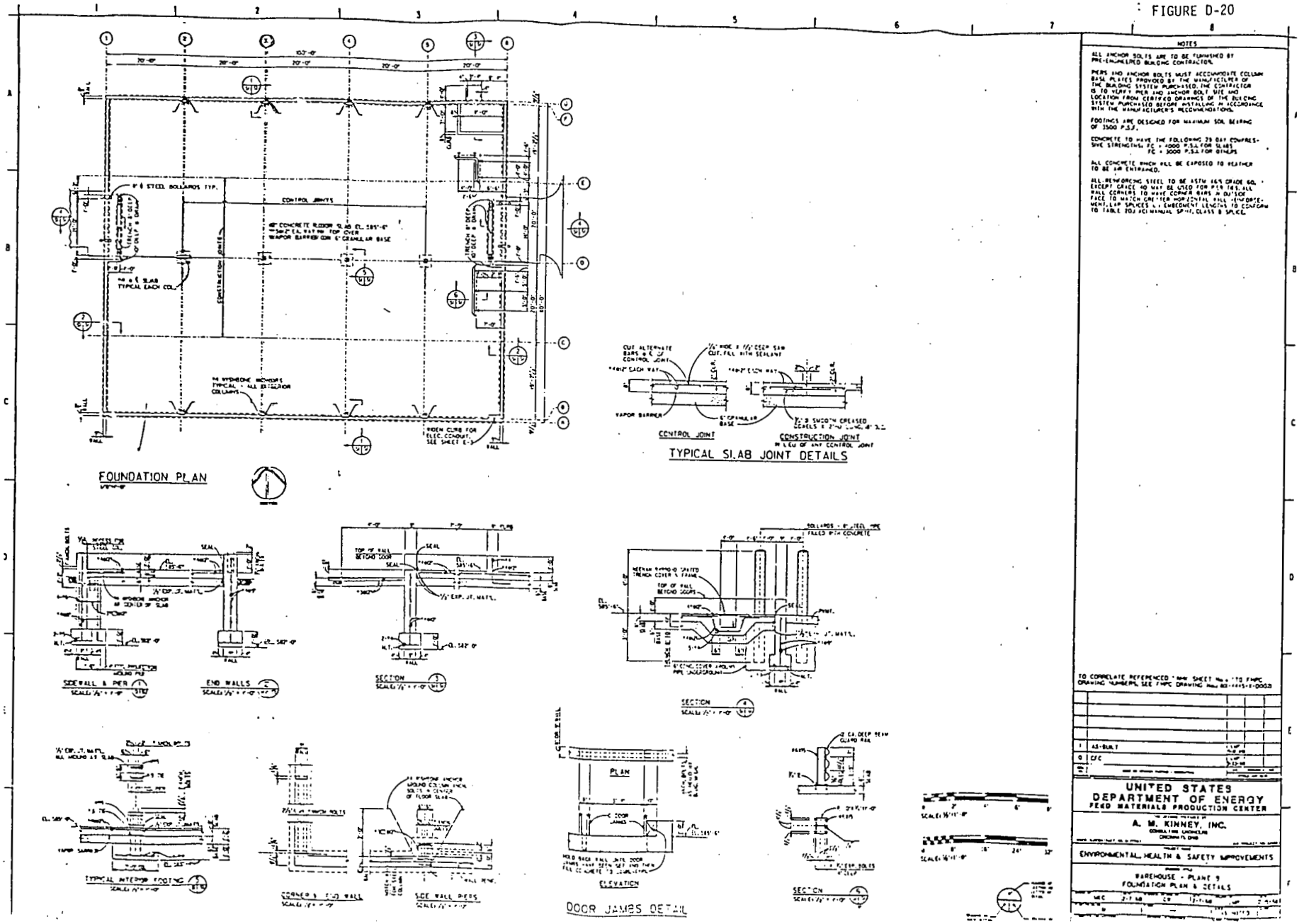
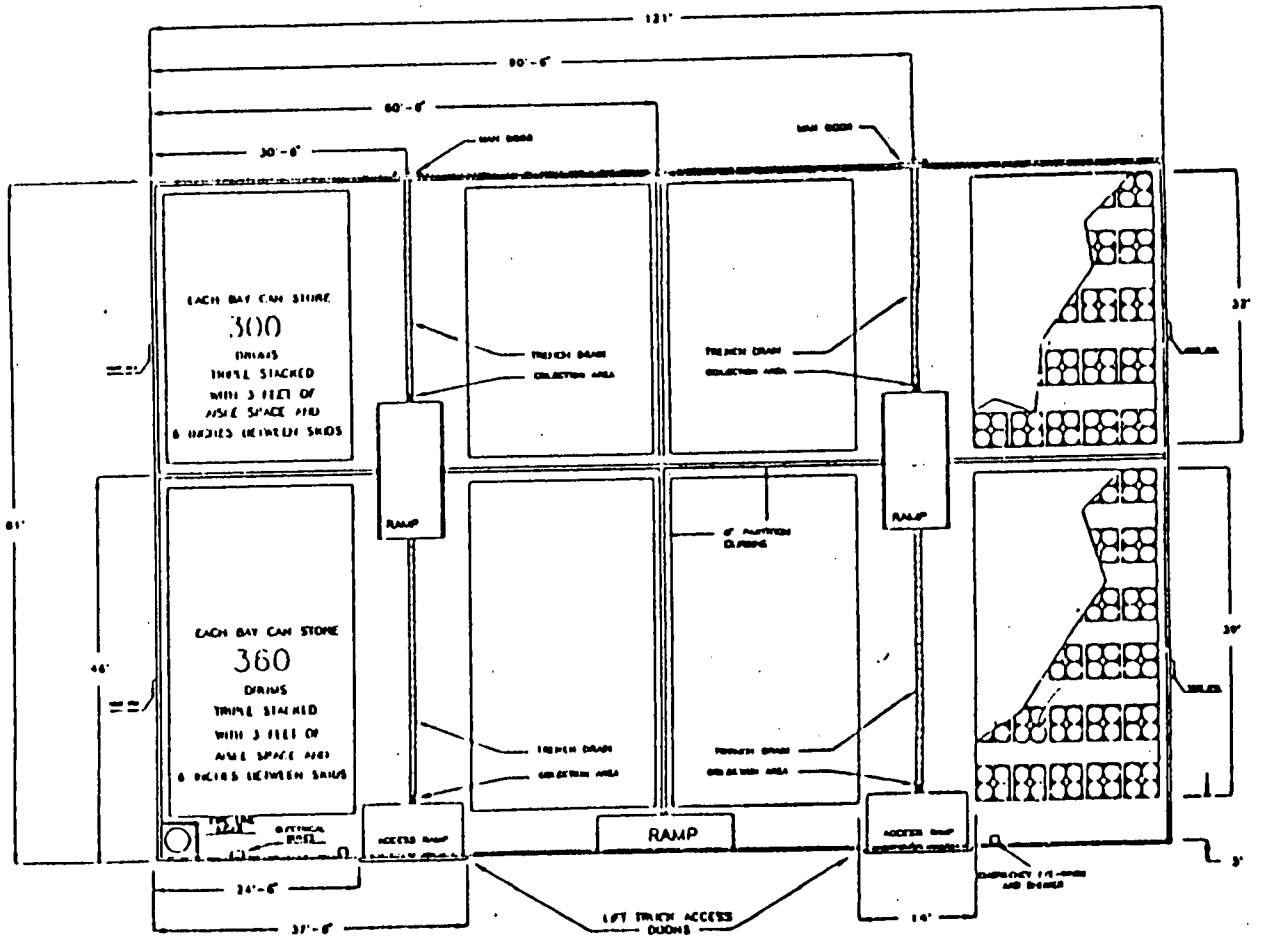
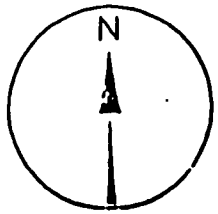

FOUNDATION PLAN
CONTROL JOINTS
CONSTRUCTION JOINTS
TYPICAL N. & S. WALLS
TYPICAL E. & W. WALLS
SECTION
TYPICAL WALL PIER & ANCHOR BOLT PLANS
SECTION
CONTROL JOINT
CONSTRUCTION JOINT
TYPICAL SLAB JOINT DETAILS
SECTION
ELEVATION
DOOR JAMES DETAIL
NOTES
ALL ANCHOR BOLTS ARE TO BE FURNISHED BY FOUNDATION CONTRACTOR.
PIERS AND ANCHOR BOLTS MUST ACCOMODATE COLUMN BASE PLATES PROVIDED BY THE MANUFACTURER OF THE BUILDING SYSTEM PURCHASED. THE CONTRACTOR IS TO VERIFY PIER AND ANCHOR BOLT SIZE & LOCATION FROM CERTIFIED DRAWINGS OF THE BUILDING SYSTEM PURCHASED BEFORE FABRICATING AND INSTALLING IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
FOOTINGS ARE DESIGNED FOR MAXIMUM SOIL BEARING OF 4000 P.S.F.
CONCRETE TO HAVE THE FOLLOWING 28 DAY COMPRESSIVE STRENGTHS: FC = 4000 P.S.I. FOR SLABS FC = 3000 P.S.I. FOR OTHERS
ALL CONCRETE WHICH WILL BE EXPOSED TO WEATHER TO BE AIR ENTRAINED.
ALL REINFORCING STEEL TO BE ASTM 615 GRADE 60, EXCEPT GRADE 40 MAY BE USED FOR PER TYS. ALL WALL CORNERS TO HAVE CORNER BARS ⊥ OUTSIDE FACE TO MATCH GREATER HORIZONTAL WALL REINFORCEMENT. LAP SPLICES OR EMBEDMENT LENGTHS TO CONFORM TO TABLE 7013 ACI MANUAL SPLIT CLASS B SPLICE.
TO COMPLETE REFERENCED TEAM SHEET NO. TO FMPC DRAWING NO. SEE FMPC DRAWING NO. 8021-XXXX-S-00001
AS-BUILT
CFC
UNITED STATES DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
A. M. KINNEY, INC.
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WAREHOUSE PLANT 3
FOUNDATION PLAN & DETAILS

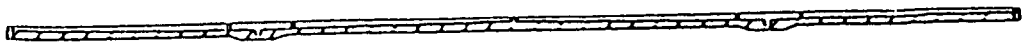
FIGURE D-20


FOUNDATION PLAN
TYPICAL SLAB JOINT DETAILS
CONTROL JOINT
CONSTRUCTION JOINT
SIDEWALL & PIER
END WALLS
SECTION
TYPICAL INTERIOR FOOTING
CORNER & END WALL
SIDE WALL PIERS
PLAN
ELEVATION
DOOR JAMBS DETAIL
NOTES
ALL ANCHOR BOLTS ARE TO BE FURNISHED BY PRE-ENGINEERED BUILDING CONTRACTOR.
PIERS AND ANCHOR BOLTS MUST ACCOMMODATE COLUMN BASE PLATES PROVIDED BY THE MANUFACTURER OF THE BUILDING SYSTEM PURCHASED. THE CONTRACTOR IS TO VERIFY PIER AND ANCHOR BOLT SIZE AND LOCATION FROM CERTIFIED DRAWINGS OF THE BUILDING SYSTEM PURCHASED BEFORE INSTALLING IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
FOOTINGS ARE DESIGNED FOR MAXIMUM SOIL BEARING OF 3500 P.S.F.
CONCRETE TO HAVE THE FOLLOWING 28 DAY COMPRESSIVE STRENGTHS: F'C = 4000 P.S.I. FOR SLABS
F'C = 3000 P.S.I. FOR OTHERS
ALL CONCRETE WHICH WILL BE EXPOSED TO WEATHER TO BE AIR ENTRAINED.
ALL REINFORCING STEEL TO BE ASTM 615 GRADE 60, EXCEPT GRADE 40 MAY BE USED FOR #3 BARS. ALL WALL CORNERS TO HAVE CORNER BARS IN OUTSIDE FACE TO MATCH CENTER HORIZONTAL WALL REINFORCEMENT. LAP SPLICES & EMBEDMENT LENGTHS TO CONFORM TO TABLE 7.2.1 ACI MANUAL SP-17, CLASS B SPLICE.
AS-BUILT
UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WAREHOUSE - PLANT 9
FOUNDATION PLAN & DETAILS





SCALE: 1"=20'



FLOOR CROSS-SECTION

FORMALD. 0140

U.S. DEPARTMENT OF ENERGY

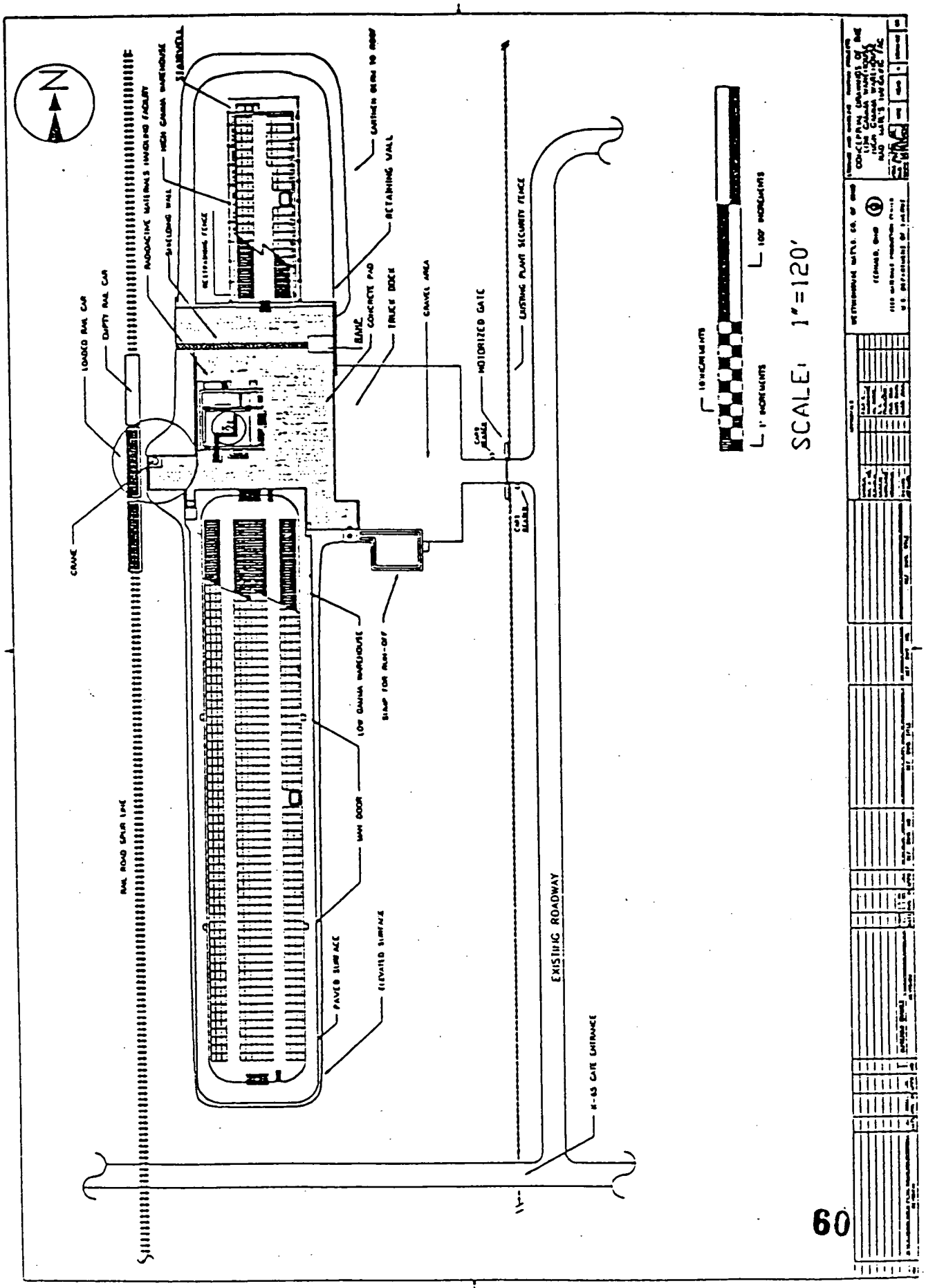
PROPOSED B
ROM WAREHOUSE
FLOOR PLAN

FIGURE 3-24

59

25

FIGURE D-22


N
LOADED RAIL CAR
EMPTY RAIL CAR
RADIOACTIVE MATERIALS HANDLING FACILITY
HIGH GAMMA WAREHOUSE
SHIELDING WALL
RETAINING FENCE
RETAINING WALL
CONCRETE PAD
TRUCK DOCK
GRAVEL AREA
MOTORIZED GATE
EXISTING PLANT SECURITY FENCE
CRANE
RAIL ROAD SPUR LINE
LOW GAMMA WAREHOUSE
SLOPE FOR RUN-OFF
MAN DOOR
PAVED SURFACE
ELEVATED SURFACE
EXISTING ROADWAY
K-65 GATE ENTRANCE
SCALE: 1"=120'

FMPC

RCRA BUILDIN('ECTION LOG

Inspector Badge No.: _____

Inspector Name: _____ Date: _____ Time: _____

Storage Area: _____

ITEM NUMBER	INSPECTION ITEM	STATUS		CORRECTIVE ACTION REQUIRED	DATE & DESCRIPTION OF REPAIR
		ACCEP-TABLE	UNACCEP-TABLE		
1	Security/Locks				
2	Curb Condition				
3	Floor Condition				
4	Aisle Width				
5	Roof Condition				
6	Communication Device				
7	Signs:				
8	Authorized Personnel				
9	No Smoking				
10	Emergency Eyewash & Shower				
11	Other (List)				
12	Fire Extinguisher				
13	Eye Wash				
14	Emergency Shower				
15	Spill Response Equipment:				
16	Recovery Drum				
17	Absorbent Pad				
18	Hazardous Material PIG				
19	Absorbent, Granular				
20	Leather Palm Gloves				
21	Rubber Gloves				
22	Shovel				
23	Broom				
24	Coverall, Disposable				
25	Electrical Power				
26	Maintenance Supplies:				
27	Hazardous Waste Label				
28	65 Card				
29	Spray Paint				
30	Certified Torque Wrench				
31	Clear Envelope				
32	Stencil Set				
33	DOT Labels				
34	68/69 Card				

Comments: _____

_____ INSPECTOR'S SIGNATURE _____ DATE

_____ SUPERVISOR'S SIGNATURE _____ DATE

FIGURE D-23

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Figure D-24

Pallet Calculations

According to SOP-01-104 the design parameters of our skids are as follows:

3456 cu. in.	1" x 6" x 4′ support boards - 12 required separated by
1728 cu. in.	3" x 4" x 4′ runner boards - 3 required
5184 cu. in or 3 cu. ft.	

4′ x 4′ x 6" = total volume of skid

$\frac{13,824}{1728}$ cu. in or 8 cu. ft.

∴ 3/8 = 37.5% solid or 3 cu. ft. displacement per floor skid

Conversions for Containment Capacities

From CRC handbook copyright 1964

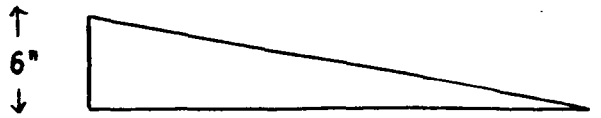
$$1 \text{ cu. in.} = 4.329 \times 10^{-3} \text{ gal}$$

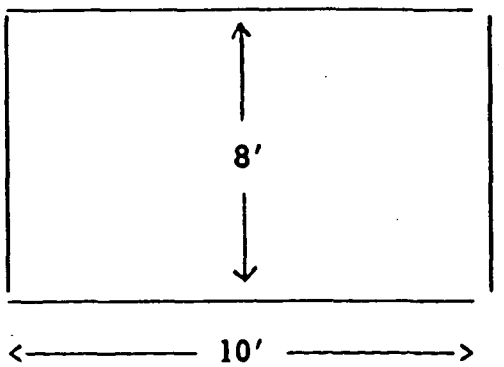
$$231 \text{ cu. in.} = \text{ gal}$$

$$12'' \times 12'' \times 12'' = 1728 \text{ cu. in./cu. ft.}$$

$$\frac{231 \text{ cu. in.}}{1728 \text{ cu. in./cu. ft.}} = .13368 \text{ cu. ft.} = \text{gal}$$

Ramp Displacement Calculations





Area of ramp 8
x 10
80 sq. ft.

Volume of .5' height
80 sq. ft. area
40 cu. ft. volume of block

1/2 the volume of the block = the volume of the ramp

20 cu. ft. volume of ramp

Plant 6 Containment System Capacities

Orange/Green Color Code Area

1152 drums	4076 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
63,360	2038 cu. ft.

96 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-25)
288 cu. ft.

2038 cu. ft. total containment volume
-288 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
1730 cu. ft.

1730 cu. ft. = 12,941 gal. containment capacity
.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 63,360 gallons = 6,336 gallons

∴ containment capacity (12,941 gal.) is > 10% of total capacity or (6,336 gallons)

Plant 6 Containment System Capacities

Orange/White Color Code Area

1332 drums	4802 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
73,260	2401 cu. ft.

111 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
333 cu. ft.

2401 cu. ft. total containment volume
-333 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
2048 cu. ft.

2048 cu. ft. = 15,320 gal. containment capacity
.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 73,260 gallons = 7,326 gallons

∴ containment capacity (15,320 gal.) is > 10% of total capacity or (7,326 gallons)

Plant 6 Containment System Capacities

Orange/Blue Color Code Area

1164 drums	4270 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
64,020	2135 cu. ft.

97 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
291 cu. ft.

2135 cu. ft. total containment volume
-291 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
1824 cu. ft.

1824 cu. ft. = 13,644 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 64,020 gallons = 6,402 gallons

∴ containment capacity (13,644 gal.) is > 10% of total capacity or (6,402 gallons)

KC-2 Warehouse Containment System Capacities

80 drums	262 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
4,400	131 cu. ft.

10 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
30 cu. ft.

131 cu. ft. total containment volume
- 30 cu. ft. displacement due to pallets
- 0 cu. ft. displacement due to ramp
101 cu. ft.

101 cu. ft. = 755 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 4,400 gallons = 440 gallons

∴ containment capacity (755 gal.) is > 10% of total capacity or (440 gallons)

KC-2 Warehouse Containment System Capacities

376 drums

x 55 gal. max.
20,680

2160 sq. ft. of floor space

x .5 curb height
1080 cu. ft.

47 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
141 cu. ft.

1080 cu. ft. total containment volume
-141 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
919 cu. ft.

919 cu. ft. = 6,874 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 20,680 gallons = 2068 gallons

∴ containment capacity (6,874 gal.) is > 10% of total capacity or (2068 gallons)

Warehouse Containment System Capacities

464 drums	2423 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
25,520	1211 cu. ft.

58 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
174 cu. ft.

1211 cu. ft. total containment volume
-174 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
1017 cu. ft.

1017 cu. ft. = 7,607 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 25,520 gallons = 2,552 gallons

∴ containment capacity (7,607 gal.) is > 10% of total capacity or (2,552 gallons)

Warehouse Containment System Capacities

240 drums	1460 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
13,200	730 cu. ft.

30 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
90 cu. ft.

730 cu. ft. total containment volume
- 90 cu. ft. displacement due to pallets
- 20 cu. ft. displacement due to ramp
620 cu. ft.

620 cu. ft. = 4,637 gal. containment capacity
.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 13,200 gallons = 1,320 gallons

∴ containment capacity (4,637 gal.) is > 10% of total capacity or (1,320 gallons)

Pilot Plant Warehouse Containment System Capacities

Color Code Area

180 drums	434 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
9,900	217 cu. ft.

15 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
45 cu. ft.

217 cu. ft. total containment volume
- 45 cu. ft. displacement due to pallets
- 0 cu. ft. displacement due to ramp
172 cu. ft.

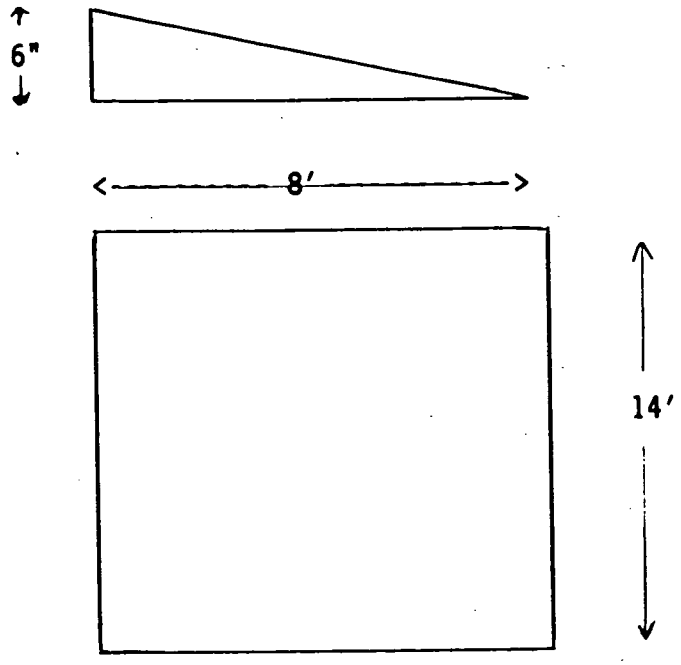
172 cu. ft. = 1,286 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 9,900 gallons = 990 gallons

∴ containment capacity (1,286 gal.) is > 10% of total capacity or (990 gallons)

Ramp Displacement Calculations for RCRA Warehouse



Area of ramp	8	
	x 14	
	112	sq. ft.
Volume of	.5	ft. height
	112	sq. ft. area
	56	cu. ft. volume of block

1/2 the volume of the block = the volume of the ramp

28 cu. ft. volume of ramp in RCRA Warehouse

Proposed RCRA Warehouse Containment System Capacities

720 drums
x 55 gal. max.
39,600

2700 sq. ft. of floor space
x .5 curb height
1350 cu. ft.

60 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
180 cu. ft.

1350 cu. ft. total containment volume
-180 cu. ft. displacement due to pallets
- 84 cu. ft. displacement due to ramp
1086 cu. ft.

1086 cu. ft. = 8,123 gal. containment capacity
.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 39,600 gallons = 3,960 gallons

∴ containment capacity (8,123 gal.) is > 10% of total capacity or (3,960 gallons)

Proposed RCRA Warehouse Containment System Capacities

600 drums	2100 sq. ft. of floor space
x 55 gal. max.	x .5 curb height
33,000	1050 cu. ft.

50 pallets on layout
x 3 cu. ft./pallet (provided on Figure D-24)
150 cu. ft.

1050 cu. ft. total containment volume
-150 cu. ft. displacement due to pallets
- 28 cu. ft. displacement due to ramp
872 cu. ft.

872 cu. ft. = 6,523 gal. containment capacity

.13368 cu. ft./gal. (conversion factor provided on Figure D-25)

10% of 33,000 gallons = 3,300 gallons

∴ containment capacity (6,523 gal.) is > 10% of total capacity or (3,300 gallons)

Plant 9 Warehouse Containment Capacity

minimum required

assuming a maximum capacity of 1,704 55-gallon containers

1,704 x 55 = 93,720 gal.

a total capacity of 93,720 gallons is projected with a minimum of 10% containment, the minimum containment will be 9,372 gallons or:

9,372 gal.
x .13368 cu. ft./gal.
~ 1,253 cu. ft.

$$\frac{1{,}253 \text{ cu. ft.}}{.5 \text{ ft. (typical curb)}} = 2{,}506 \text{ sq. ft. required}$$

with a 70′ x 170′ = 10,200 sq. ft. building

2,506 sq. ft. should be easily accomplished

Plant 9 Warehouse Containment Capacity

minimum required

assuming a maximum capacity of 1,992 55-gallon containers

1,992 x 55 = 109,560 gal.

a total capacity of 109,560 gallons is projected with a minimum of 10% containment, the minimum containment will be 10,956 gallons or:

10,956 gal.
x .13368 cu. ft./gal.
~ 1,465 cu. ft.

$$\frac{1{,}465 \text{ cu. ft.}}{.5 \text{ ft. (typical curb)}} = 2{,}930 \text{ sq. ft. required}$$

with a 70′ x 160′ = 10,200 sq. ft. building

2,930 sq. ft. should be easily accomplished

Quick TR-55 Version: 4.05 S/N: 87011316

>>>>> GRAPHICAL PEAK DISCHARGE METHOD <<<<<

Waste Pit #4 Cover: Peak Stormwater Runoff Flow
(25 year / 24 hour storm event)

CALCULATED 09-07-1989 09:07:37
DISK FILE : F:PIT4 .GPD

Drainage Area	(acres)	2.2	0.0034 sq.mi.
Runoff Curve Number	(CN)	98	
Time of Concentration,Tc	(hrs)	.11	
Rainfall Distribution	(Type)	II	
Pond and Swamp Areas	(%)	0	0.0 acres

	Storm #1	Storm #2	Storm #3
Frequency (years)	25		
Rainfall, P, 24-hr (in)	4.8		
Initial Abstraction, Ia (in)	0.041	0.041	0.041
Ia/p Ratio	0.009	0.000	0.000
Unit Discharge, * qu (csm/in)	982	0	0
Runoff, Q (in)	4.56	0.00	0.00
Pond & Swamp Adjustment Factor	1.00	1.00	1.00
PEAK DISCHARGE, qp (cfs)	15	0	0

Summary of Computations for qu

Ia/p	#1	0.100	0.000	0.000
C0	#1	2.553	0.000	0.000
C1	#1	-0.615	0.000	0.000
C2	#1	-0.164	0.000	0.000
qu (csm)	#1	982.102	0.000	0.000
Ia/p	#2	0.100	0.000	0.000
C0	#2	2.553	0.000	0.000
C1	#2	-0.615	0.000	0.000
C2	#2	-0.164	0.000	0.000
qu (csm)	#2	982.102	0.000	0.000
* qu (csm)		982	0	0

* Interpolated for computed Ia/p ratio (between Ia/p #1 & Ia/p #2)
If computed Ia/p exceeds Ia/p limits, bounding limit for Ia/p is used.

$$\log(qu) = C0 + (C1 * \log(Tc)) + (C2 * (\log(Tc))^2)$$

qp (cfs) = qu(csm) * Area(sq.mi.) * Q(in.) * (Pond & Swamp Adj.)

APPENDIX
D-I

COVER FOR WASTE PIT #4

COVER FOR PIT #4

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APPENDIX D-1
COVER FOR WASTE PIT #4

PART 1 - GENERAL

1.01 JOB CONDITIONS

A. Soils Conditions: Site topography and topographic maps, soil reports and other topographic or soil data shown on the plans or included in the specifications are for the information of the Subcontractor, and the Contractor is not responsible for their accuracy, completeness or usefulness and meaning. The Subcontractor shall make such additional investigations as required to acquaint himself adequately with the site topography, and the condition for preparation of his bid, and for the successful execution of the work.

B. Existing Conditions: The Subcontractor is to investigate the site to determine the necessary data to bid the project and to perform the work required under the contract or in the specification sections of Division 2.

C. Protection of Monuments, Landscape Features, Work and Structures

1. Monuments: The Subcontractor is to prevent the destruction of all survey monuments and bench marks shown on construction drawings. Where the removal of such points is necessary for the accomplishment of the work, the Subcontractor is to inform the Contractor in writing, prior to the disturbance of any point, and is not to disturb the point until written permission to do so has been issued by the Contractor. The Subcontractor shall be responsible for replacing any survey monuments disturbed or destroyed by him. The work is to be performed by a surveyor registered

in the state where the work is performed.

2. Landscapes: Trees, shrubs, grass or other growth designated to remain in place, or outside of the limits of work, are to be protected during the accomplishment of the work, so as not to create an erosion problem. If requested by the Contractor such growth damaged by the Subcontractor is to be repaired as directed at no additional cost. If requested by the Contractor, lawn surfaces, embankments, cut slopes, ditches, or other surfaces disturbed by the Subcontractor are to be regraded to the original shape, and the grass or lawn surface replaced in kind, at no additional cost.

3. Structures: Any structure outside the limits of work damaged in any manner is to be repaired or restored to its original condition as directed by the Contractor and at no additional cost. Concrete or asphaltic pavement are to be replaced in kind, as directed by the Contractor. The three monitoring wells within the limits of work and the seven monitoring wells within the limits of work must not be damaged or unearthed in any manner. Backfill may be placed around the wells to the point that at least 1 vertical foot of the wellhead remains exposed.

4. Protection of Work: In the area of his work such grading as is necessary to prevent damage to work by water will be solely the responsibility of the Subcontractor and will be at no additional cost. The Contractor may direct the Subcontractor to perform necessary grading and drainage to prevent surface runoff from damaging the work.

D. Location of Existing Utilities and Piping

1. The location of existing piping and utilities as shown on the drawings have been shown in an approximate way only. The utility locations shown may be different from the locations designated on the drawings.

1.02 QUALITY ASSURANCE

A. Soil Compaction Control: Qualified soils technicians will be employed by the Subcontractor for the purpose of identifying soils, checking densities and classifying soils materials during construction. Charges for this service are to be paid for by the Subcontractor.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The choice of equipment to perform the required operations in conformity with these specifications will be the responsibility of the Subcontractor. However, any equipment that results in waste or damage of material, or inaccurate work or is otherwise objectionable is to be promptly replaced as directed by the Contractor.

B. When the Subcontractor performs any type of operation after daylight hours, he is to provide and maintain at his expense sufficient artificial lighting to permit proper construction, observation and inspection. If in the opinion of the Contractor, the lighting is insufficient for construction, inspection, or observation, the Subcontractor is to provide additional lighting.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

A. The Subcontractor will be solely responsible for all field engineering required for construction, furnishing all lines, grades, and control points necessary for construction.

3.02 SPECIAL SAFETY REQUIREMENTS

a. The Subcontractor must comply with all Federal, State and Local Safety Codes and Regulations at all times and is responsible for educating his supervisors and employees of the safety requirements and practices to be followed during the course of his work.

1. Barricades: The Subcontractor shall barricade any open excavations and install adequate warning lights. Temporary bridges are to be installed and maintained by the Subcontractor to maintain traffic and accessibility of facilities in the area of work during excavation in accordance with OSHA Regulations.

2. Access: The Subcontractor must provide safe access to the bottom of trenches or excavations. Travel distance to such excavations shall not exceed 25 linear feet.

3. Side Slopes: Sides of excavations and trenches deeper than 4 feet must be sloped, or shored to maintain the stability of the wall in accordance with OSHA Regulations. Materials obtained from the excavation are to be piled a minimum of 4 feet from the edge of the excavation. Roads, streets, and traveled ways are to be kept clear of excavation material at all times. A 10 foot clear right-of-way will

be maintained on paved roadways at all times. No benching of excavations shall be permitted.

4. Working Conditions: Nothing contained herein is to be construed to relieve the Subcontractor of his responsibility to provide and maintain safe and clean working conditions for his employees and others in the area of his work.

5. No blasting will be allowed.

6. Large self-propelled construction machinery/equipment shall have both roll over protection and audible backup alarm maintained in working order (this includes dumpsters).

7. All flammable and combustible liquids shall be stored and handled in accordance with the requirements of NFPA 30, latest revision.

8. All flexible cords shall be UL listed for hard use in damp locations. GFCI's are required on all 110 V circuits. Portable generators shall be grounded in accordance with manufacturer's instructions.

3.03 FILED DRAWINGS

A. If changes to the design drawings are required due to field conditions and are approved by the Contractor and Operator, records of the changes will be kept and turned in to the Contractor before submitting the final invoice. Field drawings must show the change to size, location, and elevations and must be approved by the Contractor before approval of final payment.

3.04 COMPLETED WORK

A. Clean-Up: The Subcontractor will keep the area in which he is working free of debris, trash, garbage and other offensive waste material and keep all construction materials stockpiled in a neat, orderly manner at points designated by the Contractor until ready for use on the job site. During construction, walkways, passages, traveled ways adjacent to the area of work are to be kept clean and open to vehicular and pedestrian traffic. Upon completion of any stage of work in any area, all debris, trash, liter, construction materials, etc., are to be removed to the satisfaction of the Operator and the area left in suitable condition for the next stage of construction or for the use of the Contractor. The Operator may withhold payment of any funds due the Subcontractor under the following specifications, if in the opinion of the Operator the Subcontractor has not maintained the work area covered by his contract. Such funds, less any retainage or other sums due the Subcontractor shall be paid when required clean-up has been completed to the satisfaction of the Operator.

END OF SECTION

PART 1 - GENERAL

1.01 JOB CONDITIONS

A. The Subcontractor is to schedule his work with that of other trades and with the Contractor to minimize delay of construction and interruption of plant operation.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment used to accomplish the work is to comply with requirements of Section on General Provisions

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

A. Demolition: The demolition, removal and satisfactory disposal of all existing structures which are to be removed or abandoned and which interfere in any way with the new construction, are to be in accordance with the Drawings and these specifications. Materials removed shall become the property of the Operator unless otherwise noted on the drawings, and shall be disposed, in accordance with the Operator directions, on the Project site. The Operator will supply all containers for waste disposal at no additional cost to the Subcontractor. The Subcontractor will be responsible for disposing all waste material either in the appropriate waste containers or at the appropriate FMPC location. The Subcontractor will not allow rainwater to collect in any waste container. The Subcontractor will make the final

closure of all waste containers as needed.

B. Backfill: After removal of structures, all excavations not to be occupied by new work and all holes created during demolition operations are to be backfilled with approved materials thoroughly compacted in place in accordance with Section on Earthwork.

3.02 COMPLETED WORK

A. Protection: Protection is to be in accordance with Section on General Provisions

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK

A. The Section entitled Grading and Compaction Pit Surface will specify labor, material and equipment to construct a 2 foot high clay liner over Pit No. 4.

1.02 DEFINITIONS

A. Materials: Where the terms approved, suitable, unsuitable and similar designations are used in this section, it means earth or materials designated as being approved, suitable or unsuitable for their intended use by the soils technicians or the Contractor. Also, suitable materials shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GM, GC, CL, SC, SM, ML, or as designated in other sections of these specifications.

B. Earthwork Debris: All material unsuitable for reuse encountered during earthwork operations performed under this project such as, but not limited to, muck, rock, refuse, stumps, logs, and combustible materials.

C. Rock: Rock includes detached pieces of stone and boulders one-half cubic yard or more in volume, all solid rock in ledges, bedded deposits, and conglomerate deposits so firmly cemented as to present the characteristics of solid rock. Materials that can be removed on a production basis using a D-9 tractor with a No. 9 ripper or equivalent are not included for measurement as rock.

1.03 QUALITY ASSURANCE

A. Qualified soils technicians will be employed by the Subcontractor for the purpose of identifying soils, checking densities and classifying soils materials during construction. Charges for this service will be paid for by the Subcontractor.

B. Density tests are to be made in accordance with the following minimum schedule or as required by the soils technician.

1. One every layer of fill,

2. One every 2,000 cubic yards of fill,

3. One per each work shift of earthwork operations, or

4. Areas where degree of compaction is in question at the discretion of the Construction Manager.

1.04 SUBMITTALS

A. The soils technicians will submit formal reports of all compaction tests and retests. The reports are to be furnished to the Contractor and the Operator within 1 week upon completion of the required tests. Compaction tests are to be initiated on soil samples within 2 days of the date the sample was obtained.

B. This report information is to include, but not be limited to, the following:

1. Date of the test and date submitted.

2. Location of test.

3. Wet weight, moisture content and dry weight of field sample.

4. Description of soil.

5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ration of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. comments about recompaction, if required.

1.05 STORAGE AND HANDLING

A. All materials and earthwork debris shall be stored in an area where surface water runoff control structures are in place and erosion is prevented.

1.06 SITE CONDITIONS

A. Normal Construction Hazards

During the construction of the interim cover, workers should encounter normal construction hazards.

B. Radiation Hazards

Pit No. 4 does contain radioactive material (the pit is known to contain uranium). The possibility of worker radiation

contamination does exist, especially during the first phase of construction. All clearing, grubbing,stripping, and earthwork within the limits of the clay cover will require a radiation work permit which will be obtained through the Contractor.

C. Chemical Hazards

An estimated 23,500 pounds of barium chloride salt is intermixed with the 143,000,000 pounds of material contained in Pit No. 4. The possibility of worker chemical contamination does exist, especially during the first phase of construction.

D. Asbestos Hazards

Pit No. 4 contains at least a small amount of asbestos. The possibility of worker asbestos contamination does exist, especially during the first phase of construction.

E. Earth Stability Hazards

Some of the areas within the waste storage area that have been used for the location of various pits may not be stable for personnel or vehicular traffic. Caution should be taken whenever workers leave roads in the waste storage area. The immediate area around Pit No. 4 (including Pit No. 4) is considered stable for both personnel and vehicular traffic.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

A. Field engineering is the responsibility of the Subcontractor in accordance with the requirements of the Section on General Provisions.

3.02 CLEARING

A. Clearing: Completely clear, remove and dispose of all earthwork debris resting on or protruding above the surface of existing ground that would prohibit normal construction activities. The earthwork debris removed from the surface of Pit No. 4 shall remain on-site at the Feed Materials Production Center and be disposed of as directed by the Contractor for clearing work to be done within the limits of the clay liner Section on Grading and Compacting Pit Surface.

3.03 TOPSOIL

A. Topsoil Removal: Excavate or strip topsoil in all cut and fill areas outside the defined pit boundaries (see Drawings C007) and stockpile for later use in connection with finish grading. Excavate topsoil to the depths directed by the Construction Engineer, as required to remove all organic material from the subgrade, but not less than 4 inches.

Transport and deposit topsoil in stock piles at designated locations in a manner convenient for spreading and finished grading. Construct silt fence around all downslope downgrade sides of stockpile. See plans for location and silt fence detail.

B. Stockpiling: Stockpile excavated topsoil, separate from other excavated materials for later use. The stockpile area shall be cleared and grubbed prior to replacing any topsoil. Keep stockpile free of all undesirable materials. Make stockpiles nearly shaped, and free to drain. Place stockpiles at location shown on the drawings or as directed by the Construction Engineer.

C. Spreading: Spread topsoil on all newly graded areas not occupied by structures, pavement, rip rap, or other construction. Obtain topsoil from stockpiles and spread in 4 inch thick layers in accordance with Section on Seeding, Paragraph 3.02, unless otherwise directed or shown on the plans. Finished topsoiled areas are to be graded and suitable for sowing and proper maintenance of grass. Stockpile areas are to be dressed up smooth after topsoil is spread.

3.04 EXCAVATION

A. Excavating: Excavate the areas designated on the drawings to the elevations of depths shown or as indicated by the Contractor. Suitable materials from excavation are to be spread and compacted within the area to be covered by the clay liner. When excavation has reached required subgrade elevation, notify the Operator who will make an inspection of conditions. If unsuitable surface materials are encountered at required subgrade elevations, carry excavation deeper and replace excavated material as directed by the Operator. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

B. Dewatering: Reference is made to Section on Dewatering for Excavation for dewatering requirements.

C. Stockpiling: Stockpile suitable excavated materials in areas designated on the plans or directed by the Contractor. The Contractor is responsible for a safe excavation for the protection of the workmen and work. The stockpiled materials are to be no greater than 4 feet in height unless approved by the Contractor and are not to obstruct proper drainage of the area.

3.05 FILLS

A. Preparatory Work

1. Prior to fill construction, clearing and grubbing is to be completed as specified in this section.

2. All stump holes, cavities and other irregularities resulting from the clearing and grubbing operation within the fill construction are to be backfilled with suitable material and compacted to the specified density for the fill. Holes may be enlarged to permit use of compaction equipment.

3. Areas to be occupied by fill are to be proof rolled with heavily-loaded pneumatic-tired equipment, such as a loaded dump truck. Any unstable areas detected by proof-rolling operations outside the limits of the clay liner shall be undercut to stable ground and replaced with engineered fill. The density and moisture content of the soil underlying the 6 inch compacted layer is to be altered as necessary to obtain the specified density of the fill foundation. Side ditches, as shown on the drawings or as directed by the Construction Engineer, are to be constructed prior to fill construction.

4. Dewatering system is to be maintained as directed by the Contractor and will comply with the requirements of Section on Dewatering for Excavations.

B. Placement of Fill Material

1. In fill construction, the material shall be deposited and spread in successive uniform approximately horizontal layers of not more than 8 inch depth loose measurement for the full width of the required cross section. It shall be placed so that during construction the center of the fill shall be kept higher than the edges. Sandy or rocky material encountered shall be spread in full width layers to form drainage planes from the center through the edge of embankments, except that rocky material larger than 6 inches in size shall not be used in fill. Care shall be taken to avoid pockets of open graded material surrounded by tight or more impervious material. Each layer of fill shall be rolled and compacted to the specified density. Successive trips of compaction equipment shall be finished true and straight, in conformity with lines and grades as shown with true and even surfaces. Fill shall be constructed of approved materials. Moisture content of soils shall be maintained within the percentage of optimum moisture content specified in this section. During periods of dry weather, the Subcontractor shall water material to provide sufficient moisture for compaction. Water required to provide sufficient moisture will not be measured for direct payment. Materials containing excessive moisture will not be measured for direct payment. Materials containing excessive moisture shall be permitted to dry out to the proper moisture content before compaction is attempted. Borrow areas shall be drained and otherwise properly operated to assist in achieving this objective.

2. If the top layer of fill material is too sandy to remain compacted during the rolling operations, the density tests will be run on that layer. Should the density of the preceding layer fail to meet requirements, it shall be brought to the required minimum by further rolling or removed before depositing another layer.

C. Completed Work: The Subcontractor shall be responsible until final acceptance for maintaining the stability of all fills made under the contract and shall bear the expense of replacing any portions which, in the opinion of the Construction Engineer have become displaced due to carelessness or negligence on the part of the Subcontractor, including failure to properly route or contain surface water runoff. Damage to embankments from natural causes and through no fault or negligence of the Subcontractor will be replaced and paid for at the contract unit price. Specifically excluded from extra payment is replacement of slope material washed away by natural rainfall or runoff, which shall be at the expense of the Subcontractor.

3.06 SOIL COMPACTION CONTROL

A. Compaction Requirements: The percent compaction of maximum dry density as specified herein, and required for fill and embankment areas within the scope of the project, unless otherwise defined in other sections, are as follows:

1. General fill areas are located under roads, railroads, buildings, or other structures, 95 percent compaction, with reference to standard proctor.

2. Fill sections required for construction of roads, 95 percent compaction, with reference to standard proctor.

3. Backfill for underground utilities not falling under roads, railroads, or structures, including electrical conduit and duct banks, sewers, and general piping, 95 percent compaction, with reference to standard proctor.

4. Backfill for underground utilities, as listed above, but falling under roads, railroads or structures, 95 percent compaction, with reference to standard proctor.

5. Fill or embankment sections for the retention of liquids, such as dams or dikes, 95 percent compaction, with reference to standard proctor.

6. Backfill for retaining walls, 95 percent compaction, with reference to standard proctor.

7. Material located under clay liner 90 percent compaction, with reference to standard proctor.

8. Moisture Content: In addition, all fill material is to be within 4 percent of optimum moisture content when placed on the fill and is to be placed in 6 inch lifts unless directed otherwise in writing from the Contractor.

B. Compaction Results

1. The soils technician is to advise the Construction Engineer immediately of any compaction tests failing to meet the specified minimum requirements. The Construction Engineer will inform the soils technician of any retesting required. Formal reports of all test results will be submitted.

2. The soils technician is to advise the Subcontractor's superintendent immediately of any compaction tests failing to meet the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

3.07 FINISHED GRADING

A. Preparatory Work: Prior to finish grading of the area, all back filling shall be completed. Any washouts or other similar irregularities are to be corrected.

B. Finish Grading: All exposed earth surfaces and roadway subgrades are to be flush graded to within ±0.10 foot of theoretical grade. Finish for grading slopes shall be that degree ordinarily obtainable for either blade-grade or scraper operations, or that obtainable by hand shovel operations. When directed or noted, the accuracy of finish obtained by using templates and stringline or hand raking methods is required in case of shoulders, gutters, and similar areas. All ditches are to be finished so they drain readily.

C. Protection: Maintain the finish grades until finally accepted. Repairs required resulting from negligence is at the Subcontractor's expense.

3.08 SEEDING

A. For limits on seeding, see Section on Seeding.

3.09 DISPOSAL OF EARTHWORK DEBRIS

A. Disposal of Earthwork Debris

1. No burning on site will be allowed.

2. The Subcontractor will deposit noncombustible materials, including, but not limited to, rock, much, and metals, in designated disposal area as directed by the Construction Engineer.

B. Disposal of Surplus Material

1. Dispose of all surplus material as directed by the Contractor. The Subcontractor will either utilize or contain all surplus material on site as directed by the Contractor. Upon written approval, use surplus material to uniformly widen embankments, and flatten slopes, or deposit as directed by the Construction Engineer. Natural drainage will be maintained or improved as directed to protect adjacent facilities.

3.10 PROTECTION OF UTILITIES

A. Protect all existing service lines and related structures encountered in the excavation work. Where such lines and structures have been undermined due to the excavation work, the subcontractor shall provide suitable supports. If utilities shown on the drawings are damaged, the Subcontractor shall repair such lines and structures or arrange for their repair with the proper authorities or companies, without additional cost to the Operator.

If utilities not shown on the drawings are encountered, the Subcontractor will provide suitable support and notify the Operator. The Subcontractor shall repair or arrange for the repair of such utilities if authorized by the Project Engineer at Operator's expense and as an amendment to the contract based on contract conditions.

B. Existing utilities which are to remain and are shown on the drawings or the location of which is made known to the Subcontractor prior to excavation, shall be protected.

C. Report any uncharted or incorrectly charted lines or utilities to the Construction Engineer for further direction.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

A. Grading

1. The General Contractor shall furnish all labor, material, and equipment to prepare the Pit No. 4 surface within the limits of the clay cover, including hauling, grading, compacting, removal of surface water runoff, and all necessary incidental items as detailed or required to complete the work, all in accordance with the Contract Drawings and Specifications.

B. Clay Compaction

1. The General Contractor shall furnish all labor, material and equipment to construct a two (2) foot thick clay liner over Pit No. 4, including hauling, discing, compacting, removal of surface water runoff, removal of all previously placed material unsuitable due to weather conditions or construction disturbance, final grading and sealing, and all necessary and incidental items as detailed or required to complete the compacted clay cover, all in accordance with the Contract Drawings and Specifications.

PART 2 - PRODUCTS

2.01 CLAY CAP SOIL

A. The soil to be used for construction of the clay cap shall be provided by the Subcontractor. The permeability of the soil

shall be the controlling criteria for approval of the borrow soil. The subcontractor is responsible for locating the borrow source, obtaining samples for testing, obtaining test results by an approved geotechnical laboratory, and submitting test results to the Construction Engineer for approval. The geotechnical engineer shall determine by preliminary testing the suitability of borrow site soils for the clay liner prior to performing permeability tests. Permeability testing will be performed on at least two of the borrow sources. The Construction Engineer shall approve the borrow soil prior to its transport to the site.

B. The Subcontractor shall obtain two samples of each soil type at each proposed borrow site. The potential borrow materials shall be free of roots, sharp objects, debris and other deleterious matter. Each soil type shall be tested to identify the following properties:

1. Maximum Dry Density ASTM D698

2. In-place Moisture Content

3. Grain Size Distribution

4. Attenberg Limits

5. Unified Soil Classification

6. Permeability (Falling Head)

C. Soil approved for construction of the clay cap must have a coefficient of permeability of 1×10^{-7} cm/sec or less. The laboratory test program will determine the percentage of maximum dry density required for compaction in the field to obtain the

required permeability results.

D. The following are guideline soil properties for initial identification of potential borrow materials:

1. Liquid Limit, 40 Percent

2. Plasticity Index, 10 Percent

3. Minus 200 Sieve Portion, 70 Percent

E. The Subcontractor shall allow sufficient time for identification and approval of the borrow source prior to initiation of earthwork operations.

PART 3 - EXECUTION

3.01 STRIPPING AND SPREADING OF SUITABLE MATERIAL FOR CLAY LINER BASE

A. Stripping: There shall be no stripping or removal of material within or under the limits of the clay cover except as directed by the Contractor and approved by the Project Engineer. Outside the area of the clay cover and within the limits of earthwork for the drainage channel and new berm, the area shall be stripped of existing debris such as vegetation and root mats. All stripping work within the boundary of the clay cover will require a Radiation Work Permit which will be obtained through the Contractor.

B. Spreading: The suitable fill material shall be placed in 6 inch compacted layers for the clay liner base. The surface of each lift shall be proof rolled to achieve proper compaction in accordance with density test results. The finish grade of the clay liner base shall be 2 feet below the final clay cover

grade.

C. Fill: Fill shall then be placed in depressed or unstable areas identified by the proper rolling or as needed to achieve initial grades. The fill of suitable material shall be approved by the Construction Engineer. Lifts will be placed in 6 inch compacted layers for the clay liner base fill material. Each lift shall be compacted to a minimum of 95 percent Standard Proctor Density, ASTM D698 as stated before. All remaining fill material (aside from project cut material) used for the clay liner base will be taken from soil stockpiles located on the FMPC site. The maximum haul distance will be 3.5 miles round trip. The Subcontractor will be responsible for hauling all fill material. Any cavities identified by proof rolling will be filled with granular material (either sand or gravel) by the Subcontractor at the Operator's expense as an amendment to the contract based on contract conditions.

D. Drainage: The Subcontractor shall maintain the surface of Pit No. 4 to provide positive drainage of surface water. On days that the clay liner is being constructed, seal the surface of the pit with a flat wheel roller at the end of the working day if precipitation is anticipated. This determination shall be made by the Contractor who will telephone the Operator's Emergency Operations Center at 3:00 p.m. If the Emergency Operations Center predicts a 30 percent or greater change of precipitation on the following day, the pit shall be sealed with a flat wheel roller.

3.02 PIT SURFACE COMPACTION

A. Preparatory Work

1. After the placement of the pit fill material, the Subcontractor shall construct a test strip using the compaction equipment to be used for construction of the clay liner. The purpose of the test fill is to determine the capability of the equipment to achieve compaction. For rollers used in general compaction of clay liners, the test fill shall be at least two times the width of the compactor and sufficient length for the compactor to achieve normal operating speeds. For clay used as backfill of FML Trenches, either tampers or plate compactors shall cover at least 9 times the area of the equipment's compacting surface. All test fills shall be construed within the limits of the Pit No. 4 cover and will be incorporated into the clay liner. The Subcontractor will follow the guidelines in Section on Grading and Compacting Pit Surface, Paragraph 2.01 to determine the number of passes (for rollers) and the number of blows (for tampers or plate compactors) required to achieve compaction.

   Density testing shall be performed to determine that compaction of the test strip meets the density requirement to achieve a permeability of 1×10^{-7} cm/sec or less as stated in paragraph 2.01C, of this section. The subcontractor is responsible for obtaining samples and test as specified in paragraph 2.01A of this section.

B. Compaction

1. Lift compaction shall be performed with an appropriately heavy, properly ballasted, penetrating-foot compactor

meeting U.S. Bureau of Reclamation of U.S. Army Corps of Engineers standards. Smooth wheeled compactors will not be allowed for lift compaction. Compaction equipment shall be subject to approval by the Construction Engineer.

2. The cover soil shall be spread in near horizontal lifts of no greater than 6 inch compacted thickness. Rock fragments, cobbles and boulders allowed in the compacted clay cover shall not exceed 3 inches in any dimension.

3. Each lift of soil shall be compacted with at least the minimum number of compactor passes established with the test fill to achieve the minimum acceptable percent of maximum dry density determined in the laboratory test program.

4. The Subcontractor shall be responsible for preparing the materials for the compacted clay cover, including but not limited to, drying or wetting of the soil necessary to achieve the compaction criteria determined in the laboratory test program. Frozen particles will not be permitted in the fill nor shall fill be placed on frozen ground. No earthwork will be permitted unless ambient air temperature is 20°F or greater as determined at the Operator Emergency Operations Center.

5. Moisture content of the soil at the time of compaction shall range within ± 3 percent of optimum moisture determined by ASTM D698. If wetting of the soil is required, only clean water obtained from the FMPC Production Facilities or brought from offsite may be used.

6. Any compacted soil liner surface which is smooth or has a moisture content more than 3 percent wet or dry of optimum

moisture, as defined by ASTM D698, shall be scarified to a depth of 1 to 2 inches and brought to a proper moisture content prior to placement of a subsequent lift.

7. Construction Quality Assurance (CQA) service shall be provided by an independent geotechnical consulting company provided by the Contractor. The frequency of the field compaction tests shall be determined by the Construction Engineer. The Subcontractor shall cooperate with the geotechnical representative when compaction or other required tests are taken and make adjustments, as required, in the filling and compacting operations to meet the compaction specifications. If compaction test results do not meet the above specified requirements, the Subcontractor shall add water or dry the material, as may be necessary, and continue compaction to achieve these requirements at his own expense, or remove and replace the materials to achieve the compaction requirements, at his own expense.

8. The surface to be lined with flexible membrane liner (FML) shall be free of all roots, sharp objects, or debris. Such materials shall be removed from the soil liner surface prior to FML installation. The Subcontractor shall walk the clay liner surface, visually inspect for such materials, and remove them by hand just prior to liner installation. Embedded, non-protruding smooth rocks or stones may remain in place on the soil liner surface, unless otherwise directed by the Construction Engineer. The subgrade surface shall provide a firm, unyielding foundation for the geomembrane with no sudden or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed. The soil surfaces to be lined with FML shall be rolled and sealed with a smooth drum

compactor wherever practical.

9. The Subcontractor shall work in a cooperative fashion in coordinating the final surface preparation with the FML Contractor.

10. At the completion of the placement of the clay liner, a 17-day waiting period for pit settling will be allowed. During this time, no work will be performed and no vehicles will be allowed on the pit. The Operator reserves the right for the Project Engineer to waiver or reduce the time duration of this requirement. The Subcontractor is to make final surface grading at the end of the 17-day waiting period. Soil borings of Pit #4 are to accompany the construction specifications. The Subcontractor is responsible for using the soil boring data to determine anticipated pit settling. The Subcontractor is responsible for additional fill material needed due to pit settling. Excavation of the clay liner for FML trenching will not be allowed until after the final surface grading has been completed following the 17-day waiting period.

11. The Subcontractor shall maintain the surface of the compacted soil liner until installation of the FML is complete. Temporary covering of the compacted clay cover may be required until installation of the FML. Surfaces not properly maintained shall be repaired by the Subcontractor at no additional cost to the Operator. A suitable surface for FML construction shall be a surface at the specified compaction and at a moisture content no more than ± 3 percent wet or dry of optimum moisture, as defined by ASTM D698.

END OF SECTION

TRENCHING AND BACKFILL

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. the quantity and location of testing shall be determined by the soils technicians. The Subcontractor shall cooperate to the fullest extent with the soils technicians.

PART 2 - PRODUCTS

A. Materials for backfill (which shall include backfill under loaded areas up to not less than 1 foot above buried pipe) shall be free from debris, organic materials, stumps, frozen materials, stones over 3 inches in any direction or other undesirable material. Also, backfill materials shall be clean and shall contain no more than 15 percent of particles passing the No. 200 sieve, determined in accordance with ASTM D1140.

PART 3 - EXECUTION

3.01 SPECIAL SAFETY REQUIREMENTS

A. At the end of each work day, trenches breaching vehicular pathways that are not backfilled shall be barricaded and marked with warning lights. Temporary bridges and crossings shall be provided and maintained by the Subcontractor, where they are required to maintain traffic. Materials obtained from excavation shall not be piled closer than 4 feet to the edge of the excavation. Along streets and roads excavated material shall be kept clear of any traveled way.

B. The Subcontractor shall locate all existing underground structures and utilities, shown on the drawings or made known to Subcontractor during construction, by hand digging and exposing the structure or utility for the full width of the new trench. Each utility exposed shall be fully protected and supported during construction. An FMPC construction excavation/penetration permit shall be obtained from the contractor prior to excavation of known utilities.

C. Special care shall be taken when backfilling around existing utilities. Any damage caused to existing utilities during backfilling operations shall be promptly repaired at no cost to the Operator. All temporary protective and support systems installed on existing utilities shall remain in place until they can be supported and protected by the trench backfill. All workmen shall be out of the trench in the areas where backfill material is being placed in the trench by clamshell buckets or backhoes. Under no circumstances is backfill material to be transported to the trench over workmen. When powered impact type tamping equipment is being used, all workmen in proximity to the work shall wear metal foot protectors in footwear. Nothing contained herein relieves the Subcontractor of his responsibility to provide safe working conditions for the workmen in the area of construction.

3.02 EXCAVATION

A. General Excavation: Excavation for trenches to receive pipe shall be for the proper installation of the utility and shall be at the lines and grades shown on the drawings. Trench walls shall be maintained as nearly vertical as possible to an elevation 1 foot above the top of the utility, not to exceed a vertical height of 4 feet above the bottom of the trench. Any trench exceeding a height of 4 feet shall be sloped, benched,

or sheeted and shored materials suitable for backfill shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading and prevent slides or cave-ins. No benching of trench excavations shall be permitted.

B. If suitable bearing for the pipe is not encountered at the depth indicated for trench bottom due to wet or unstable material, such material shall be excavated to depth required and refilled and compacted to proper grade with coarse sand, fine gravel, or other suitable approved material.

C. Excavation shall be open cut and the width of the trench 1 foot above the top of the pipe shall be such that the clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.

D. Bedding: The bottoms of trenches shall be shaped in undisturbed soil and bedded with compacted granular material as directed by the Contractor.

3.03 BACKFILL

A. General: Backfilling operations shall not proceed until all necessary tests, inspections or observations have been performed as required by the applicable utility specification, or unless directed by the Construction Engineer. All debris, rocks, broken concrete, formwork, etc., shall be removed from the trench and backfill material prior to the start of backfilling operations. Backfill shall be placed in uniform 6-inch layers, loose measure, and compacted the full width of the trench to 95 percent of maximum dry density as determined by ASTM Specification D1557, Modified Proctor. In addition, all

backfill materials shall be within ±4 percent of optimum moisture content when placed in the trench. This procedure shall be carried out for the full height of the utility plus one foot above the utility. All backfill material shall be free of much, rock, organic material, broken concrete or other debris.

B. Placing Backfill Material: Backfill material shall be placed in the trench in such a manner so as not to disturb the alignment of the utility. Under no circumstances is a bulldozer or other equipment to be allowed to push fill material into the trench. The material shall not be dropped on the pipe, but placed in a manner as to allow the pipe to remain in place and to allow for the uniform spreading and compaction of the material. Material shall be placed on both sides of the utility so that the backfill will have the same elevation on each side during compaction operations.

C. Backfill Above the Utility: After the backfill has reached an elevation one foot above the top of the pipe the backfill material shall be placed in uniform 8-inch layers, loose measure and compacted as specified above for the remaining depth of the trench.

3.04 DEWATERING

A. Reference is made to Section on Dewatering for Excavations for dewatering requirements.

END OF SECTION

DEWATERING FOR EXCAVATIONS

PART 1 - GENERAL

1.01 EQUIPMENT

A. Equipment used to accomplish the work shall comply with requirements of Section on General Provisions.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 SYSTEM

A. the Subcontractor shall be responsible for installing, maintaining, operating, and removing the dewatering system as necessary in performance of the work specified herein and as related to other sections of the specifications, and as shown on the plans. If well-point system is used, Subcontractor shall submit plans for review.

3.02 OPERATION

A. An adequate dewater system shall be employed at excavations for structures and pipe work and other excavations. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The area excavated at any one time shall be limited to that which can be properly dewatered by the equipment or system in use. Slope the surface of the ground away from the excavation, or provide berms or

piping to prevent surface water from entering the excavation. Continue to operate system until backfilling of the structure or pipe system is complete or as directed by the Construction Engineer.

3.03 DISPOSAL OF WATER

A. Water to be disposed from dewatering within the limits of the centerline of the existing berm as defined on Drawing C002, shall be collected in the existing sump located in the southwest corner of Pit No. 4. This water will be sampled by Operator personnel and then pumped by the Subcontractor to holding tanks for temporary storage. The Subcontractor shall purchase six 850 gallon polyethylene bulk storage tanks (Chem-Tainer Industries, Inc.; VA Series or approved equal) with flanged drain and valve, and short drainage hose (>10 feet in length). These tanks are to become the property of the Operator and will not be removed from site without written approval from the Project Engineer. These tanks are to be used for dewatering only. The Subcontractor shall be responsible for supplying a power source for operating the dewatering pump (220V, 8.2 amp). If the analysis proves that the water is nonhazardous, the water shall be discharged into Waste Pit No. 6. If the water proves hazardous, it shall be placed into storage containers provided by the Operator and removed from the work site by the Operator. The Operator will supply the dewatering pump and dewatering hose. Lab analysis should take about one day.

B. Water to be disposed from dewatering operations outside the limits of the centerline of the existing berm shall be allowed to drain in a manner that is natural to the area.

END OF SECTION

STORM SEWER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide storm sewer system as shown on the Drawings and specified herein, including but not necessarily limited to the following:

1. Complete on-site storm sewer system.

2. Excavating, trenching, pumping and backfilling.

3. Culverts and headwalls.

4. Restoration of damaged construction and landscaping.

1.02 QUALITY ASSURANCE

A. Comply with all codes, laws, ordinances and regulations of governmental authorities.

B. Provide protection for all persons and property in accordance with ANSI/NFPA 241, Building Construction and Demolition Operations.

1.03 EXAMINATION OF SITE AND RECORDS

A. The Subcontractor shall examine the site and Plant Drawings available through the Operator to determine the conditions under which the work will be performed.

1.04 PROTECTION OF UTILITIES

A. Protect all existing service lines and related structures encountered in the excavation work. Where such lines and structures have been undermined due to the excavation work, the Subcontractor shall provide suitable supports. If utilities shown on the drawings are damaged, repair such lines and structures or arrange for their repair with the proper authorities or companies, without additional cost to the Operator.

If utilities not shown on the drawings are encountered, the Subcontractor will provide suitable support, and notify the Operator. The Subcontractor shall repair or arrange for the repair of such utilities if authorized by the Project Engineer at the Operator's expense and as an amendment to the contract based on contract conditions.

B. Existing utilities which are to remain and are shown on the drawings or the location of which is made known to the Subcontractor prior to excavation, shall be protected.

C. Report any uncharted or incorrectly charted lines to the Construction Engineer for further direction.

D. Any existing utility, to be abandoned, shall be disconnected and sealed before machine excavation.

1.05 PROTECTION OF WORK

A. Trenches shall be kept free of water until joints have set. Any section found to have defective or damaged joints shall be removed and replaced at no additional cost to Operator.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fill under existing roadways shall be granular material as defined by ODOT. Other fill shall be as stated here. Repairs to roadways shall be performed so that new roadway sections match existing roadway sections in terms of material thickness and type.

B. Reinforced Concrete Pipe

1. Reinforced concrete sewer pipe used in culverts shall be Class III, Wall B, ASTM C76, with bell and spigot joints or joints for circular concrete sewer culvert pipe, using flexible, watertight, rubber gaskets per ASTM C443.

C. Mortar: One part portland cement complying with ASTM C150, Type I, to two parts fine sand mixed only with sufficient water to make a workable mixture.

D. Concrete: All concrete cast-in-place shall have a compressive strength of not less than 3,000 pounds/square inch after 28 days and shall contain not less than 4 - 6 percent air entrainment. Concrete shall comply with ACI 318.

E. Grout: Non-catalized metallic grout "EUCO Hi-Mod" (Euclid Chemical Company); "Embeco 636 Grout" (Master Builders); "Supreme Plus Grout" (Gifford Hill & Company, Inc.).

PART 3 - EXECUTION

3.01 EXCAVATION

A. General Excavation: Excavation for trenches to receive pipe shall be for the proper installation of the utility and shall be at the lines and grades shown on the drawings. Trench walls shall be maintained as nearly vertical as possible to an elevation 1 foot above the top of the utility, not to exceed a vertical height of 4 feet above the bottom of the trench. Any trench exceeding a height of 4 feet shall be sloped, or sheeted and shored materials suitable for backfill shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading and prevent slides or cave-ins. No benching of trench excavations shall be permitted.

B. If suitable bearing for the pipe is not encountered at the depth indicated for trench bottom due to wet or unstable material, such material shall be excavated to depth required and refilled and compacted to proper grade with coarse sand, fine gravel, or other suitable approved material.

C. Excavation shall be open cut and the width of the trench 1 foot above the top of the pipe shall be such that the clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe. The Width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.

D. Bedding: The bottoms of trenches shall be shaped in undisturbed soil and bedded with compacted granular materials as noted on the Drawings.

3.02 BEDDING

A. The bottom of trenches shall be accurately graded and so shaped that one-half of the exterior circumference of each section of pipe, for its entire length, shall rest firmly on 6 inches of bedding made of coarse aggregate between 1/4 inch to 3/4 inch in size. The trench width below the top of the pipe shall be as narrow as possible while being consistent with providing adequate working space at the sides of the pipe.

3.03 INSTALLATION

A. Culverts shall be constructed of the materials specified and as shown on the Drawings. Pipes shall be laid true to the lines and grades shown on the Drawings. Any pipe which has its grade or joint disturbed or which is found to be defective or damaged shall be taken up and relaid or replaced without additional cost to the Operator. Under no circumstances shall pipe be laid in water and no pipe shall be laid when the trench conditions or the weather is unsuitable for such work. Excavation, trenching and backfilling shall be in accordance with the requirements of the applicable portions of these specifications.

B. Approved lubricant shall be used to facilitate the joining of pipe. Installation of pipe and preparation of joints shall conform to manufacturer's recommendations.

C. Upon completion of the 24 inch culvert and headwall installation, a plug shall be placed into the inlet side of the culvert pipe and sealed. This will prevent surface water from flowing through the pipe and create a catch basin for Pit No. 4 surface water runoff. The plug shall remain in place until the first lift of clay has been completely installed over the area designated on the drawings. Once the first lift of clay

has been placed and compacted, the plug will be removed and surface water will be allowed to drain through the culvert.

3.04 BACKFILLING

A. The trenches shall not be backfilled by the Subcontractor until the Culvert has been inspected and approved by the Contractor. After the trench bedding has been placed and the culvert installed, granular fill shall be placed in layers not exceeding 6 inches in depth. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur. This method of filling and compacting shall be continued to the top of the trench. All fill under existing roadways shall be compacted to 95 percent of maximum dry weight as determined by AASHTO T99. When powered impact type equipment is being used, all workmen in proximity to the work shall wear metal protected footwear.

Backfill material shall be placed in the trench in such a manner so as not to disturb the alignment of the utility. Under no circumstances is a bulldozer or other equipment to be allowed to push fill material into the trench. All workmen shall be out of the trench in the areas where backfill material is being placed in the trench by clamshell buckets or backhoes. Under no circumstance is backfill material to be transported to the trench over workmen. The material shall not be dropped ont he pipe, but placed in a manner as to allow the pipe to remain in place and to allow for the uniform spreading and compaction of the material. All backfill material shall be free of much, rock, organic material, broken concrete or other debris.

B. Settling of backfill with flooding, ponding, or jetting, with water shall not be employed.

3.05 TRENCH SETTLEMENT

A. The Subcontractor shall be responsible for any failure of pavement or other surfaces that have settled due to improper backfilling that the Subcontractor has replaced, and the cost of repairing said failures shall be paid by the Subcontractor. This condition will terminate at final acceptance of the project plus 30 days.

END OF SECTION

SEEDING

PART 1 - GENERAL

1.01 SCOPE

A. This section covers furnishing of all labor, materials, equipment, tools, supervision, and incidentals necessary for grassing as herein specified. The Subcontractor shall deliver a satisfactory stand of perennial grass which is defined as a full cover of grass that is alive and growing with no bare spots. Areas to be grassed shall include all finished grades of bare soil and all existing grassed area disturbed by construction.

B. Seeding and Excelsior Matting - All 2 to 1 ditch slopes not covered by rock channel protection, as shown on drawings shall be seeded and excelsior matted. All slopes greater than 3 to 1 shall be established with Crown Vetch ground cover and excelsior matted. All remaining areas not covered by rock, matting or ground cover shall be seeded with Bluegrass and Fescue mixture.

C. Crown Vetch and Bluegrass/Fescue seeding shall be established in accordance with Section 659 of "Ohio Department of Transportation (ODOT), Construction and Materials Specification," 1983 Edition. Seeding and excelsior matting shall be installed in accordance with item 668 of ODOT specifications.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment is to comply with the requirements hereinafter specified.

2.02 MATERIALS

A. Lime shall be ground or pulverized limestone passing the requirements of the U.S. Department of Agriculture and the Agriculture Conservation and Production Administration.

B. Fertilizer shall be a mixed, commercial, non-acid forming fertilizer, containing percentages of available nitrogen, phosphoric acid and potash of 12-12-12. Fertilizer shall be dry in granular or powdered form, shall be delivered to the site in the manufacturer's original bag or container which shall be plainly marked as to formula and non-acid reaction and shall comply with the state fertilizer laws.

C. Seed: Quality requirements and type of seed used shall comply with applicable sections of the Ohio Department of Transportation Construction and Material Specifications (1983).

D. Water: Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass.

E. Excelsior Matted: Excelsior matting shall consist of a machine-produced mat of wood excelsior as specified by ODOT 668.02.

PART 3 - EXECUTION

3.01 PREPARATORY WORK

A. Liming shall be done immediately after grading has reached the final "smoothing" stage, even though actual seeding may not be done until several months later. Lime shall be used at 2 tons per acre and shall be spread evenly by means of approved mechanical spreaders or distributors. Lime shall be incorporated in the top 2 to 3 inches of soil by harrowing, discing, or other approved means.

B. Fertilizer shall be spread not more than two weeks in advance of seeding. Fertilizer shall be spread at a rate of 20 pounds per 1,000 square feet. Fertilizer shall be protected from damage by weather or otherwise until used. Lumpy fertilizer shall be thoroughly pulverized before placing in the distributor. Even distribution shall be accomplished with approved mechanical spreaders, by spreading half of the rate in one general direction, and the other half at right angles to the first. Within 24 hours after spreading, the fertilizer shall be incorporated into the top 2 to 3 inches of soil by discing, harrowing or other approved methods. No fertilizer shall be placed within 1 foot of the FML.

C. Tillage: Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition, and shall be approved before the work is started. The ground surface shall be cleared of all vegetation, debris, stone, roots, grade stakes, and any other materials which might hinder proper grading, tillage, or subsequent maintenance operations. The areas to be planted shall be thoroughly tilled to a depth of at least 4 inches by plowing, discing, harrowing, or other approved

operations. The work shall be performed only during periods when beneficial results are likely to be obtained. Grades on the areas to be seeded shall be maintained in a true and even condition and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

3.02 PLACEMENT

A. Seed shall be sown in accordance with the applicable sections of the Ohio Department of Transportation Standard Specifications.

B. Subsequent Nutriment: Sixty days after grass is planted or when grass is 2 inches high, 100 pounds of Ammonium Nitrate per acre shall be applied to the grassed area, unless this condition occurs in the fall or winter, in which case the Ammonium Nitrate shall be applied the next spring when the grass begins to grow.

C. Watering: Immediately following seeding, or when necessary to maintain growth of grass, and in any case when planting is permitted in dry weather, seeded areas shall be watered. Each watering shall be in sufficient quantities to obviate rapid drying out, and at a rate which will not cause erosion. The watering equipment shall be of a type which will not damage finished surfaces.

3.03 COMPLETED WORK

A. Protection: All seeded areas shall be protected from traffic damage by barricades, signs, or other appropriate means. Any damage occurring before acceptance of the areas shall be repaired at the Subcontractor's expense.

B. Acceptance: Areas to be planted will be accepted when all work of seeding and liming and fertilizing is completed, and when all work on adjacent area which might result in damage to the planted area is also completed. Planted areas shall be watered and mowed as necessary to maintain a healthy growth until accepted. Final acceptance will not be granted, although conditional acceptance may be granted, until both seed and crown vetch are established and it is evident to the Contractor that a visible signs of germination are present above these soil surface over the entire area planted.

END OF SECTION

STEEL BAR

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. Applicable Standards: Conform to the following Standards:

ASTM A615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

ACI 315: Manual of Standard Practice for Detailing Reinforced Concrete Structures.

ACI 318: Building Code Requirements for Reinforced Concrete.

CRSI: Manual of Standard Practice for Reinforced Concrete Construction.

CRSI: Recommended Practice for Placing Reinforcing Bars.

B. Observations: Materials and shop workmanship shall be subject to observations by the Contractor. Notify the Contractor in advance of starting shop work in order that observations may be made.

C. Mill Tests: Prepare mill tests on all specified ASTM materials.

1.02 SUBMITTALS

A. Mill Test Reports: Unless requirement is waived in writing, submit to the Contractor two copies of mill test reports certifying that materials meet specified ASTM requirements.

B. Shop Drawings: Submit shop drawings. Shop drawings shall show complete information for placing reinforcement and accessories, including critical dimensions to ends of bars, amount of concrete cover, and minimum spacing between bars. Do not scale Design Drawings or use Design Drawings for shop drawings.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver reinforcement clean, free from loose mill and rust scale, dirt and other coatings. Deliver reinforcing bars straight, free from twists, kinks and irregularities except as necessary to conform to the reinforcing details.

B. Storage: Store materials above ground and protect from dirt and grease.

C. Handling: Exercise care to prevent damage to steel reinforcement during delivery and storage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Metal Accessories: All metal devices necessary for placing, spacing, supporting and fastening reinforcement shall conform to CRSI's "Manual of Standard Practice for Reinforced Concrete Construction". When concrete surfaces are exposed to weather or rust impairs the architectural finish, provide plastic or stainless steel accessories when accessories are in contact with formwork.

2.02 FABRICATION

A. Shop fabricate all reinforcing bars. Fabricate reinforcement as detailed or in accordance with ACI 315 if detailed bending diagrams are not shown.

2.03 IDENTIFICATION

A. Tie reinforcing bars in bundles and tag with non-rusting metal tags showing shop drawing numbers.

PART 3 - EXECUTION

3.01 CLEANING

A. Before placing, remove all ice, dirt and other coatings from reinforcement.

3.02 PLACEMENT

A. General: Except at slabs on grade, continue reinforcement across all joints in concrete unless otherwise indicated on the drawings. At slabs on grade, terminate all reinforcement at construction joints and at least 50 percent of reinforcement at control joints.

B. Reinforcing Bars

1. General: Place bars accurately, securely supported and wired together to prevent displacement from construction loads or the depositing of concrete. Do not tack weld bars or use bars with kinks or bends not shown on the drawings.

2. Bar Supports: Concrete bricks may be used to support bars for concrete on grade. Install metal or plastic chairs and spacers over framework.

3. Splices: Splices not shown on the drawings will be subject to Construction Engineer's approval.

4. Concrete Protection: If concrete covering over bars is not shown on the drawings or specified, conform to ACI 318. Where concrete for structural members is deposited against the ground provide not less than three inches of concrete between bars and ground surface. If formed concrete surfaces are exposed to the weather or in contact with the ground, protect No. 5 bars and smaller with not less than 1-1/2 inches of concrete and bars larger than No. 5 with not less than 2 inches of concrete.

5. Tolerances: Place reinforcing bars to tolerances specified in CRSI's "Recommended Practice for Placing Reinforcing Bars".

END OF SECTION

CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the design, tests, materials and formwork for placement of concrete.

1.02 STORAGE OF MATERIALS

A. Cement and aggregate shall be stored to preclude deterioration or intrusion of foreign material. Reinforcing steel shall be stored under cover and protection from rust, oil, grease or distortion. Only materials needed for immediate use shall be removed from storage.

B. No material which has deteriorated or which has been damaged shall be used for concrete.

1.03 SPECIAL SAFETY REQUIREMENTS

A. Workmen engaged in concrete placement and finishing shall wear clothing to protect against dermatitis.

1.04 DESIGN

A. Formwork shall conform to ACI 301-72(81), ACI 318-83 and ACI 347-78.

1.05 TESTS

A. Materials

1. Specific Requirements

a. Aggregate: Aggregate which fails to meet requirements of the applicable ASTM specification specified but which have shown by special tests as conducted by an independent laboratory or through actual service to produce concrete of specified quality may be used upon review and approval by the Subcontractor prior to use.

b. Molds shall be furnished by the Subcontractor, and testing will be performed by the Subcontractor. The Subcontractor shall furnish labor and facilities required for taking samples and the handling and storing of concrete test cylinders at site of the work.

c. Compression test specimens shall be made in accordance with ASTM C31-83. Specimens taken to the laboratory for curing will be cured in accordance with ASTM C192-81. Specimens will be tested in accordance with ASTM C39-83a.

d. If the average strength of the 28-day test cylinders falls below the required strength, further test samples (taken by the Subcontractor) may be required by the Contractor before the structure will be accepted. Core drilling and testing, if required, shall be per ASTM C42-82.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall conform with latest editions of referenced standards as noted below.

B. Portland Cement, ASTM C150-83a, Type I, except that with written approval of the Subcontractor, high-early-strength cement, ASTM C150, Type III, may be used.

C. Concrete aggregate, provisions and test methods of ASTM C33-82. Maximum size aggregate ACI 318-83.

D. Water used in mixing the concrete shall be clean and free from injurious amounts of oil, acid, alkai, organic materials or other deleterious substances.

2.02 CONCRETE PROPORTIONS AND CONSISTENCY

A. Proportions of cement, aggregate and water for concrete shall produce a minimum compressive strength of 3,000 psi at 28 days. The mixture shall work readily into corners and angles of forms and around reinforcement without permitting segregation of material or collection of free water on the surface.

B. Slump tests shall be in accordance with ASTM C143-78. Tests shall be made by the Subcontractor when specified on the drawings or required by the Operator. Slumps for various phases of concrete work shall conform to the following:

Types of construction	Slump in Inches Maximum	Minimum
Reinforced drainage structures	5	2

C. Concrete shall contain entrained air and shall comply with the provisions of paragraph 4.5.1 of ACI 318.83.

2.03 FORMWORK

A. Wood forms for exposed surfaces of concrete shall be of plywood or other dressed wood material and shall be free from knots, warps, breaks or other defects likely to cause irregular surfaces.

B. Metal forms shall be free from irregularities, dents and sags.

C. Form ties shall be snap-off type with ends terminating 1 inch below finished concrete surface.

D. The Subcontractor shall be responsible for design of formwork, safe practice in removing forms and shoring and placing adequate shores.

E. Form surfaces that are to be exposed to concrete will be coated with a non-staining mineral oil before the reinforcement is placed.

F. Forms shall not be removed without the approval of the construction Engineer.

PART 3 - EXECUTION

3.01 MIXING AND PLACING CONCRETE

A. Mixing and placing of concrete shall be in accordance with ACI 318-83. Transit-mixed concrete shall be in accordance with ASTM C94-83. The plant producing concrete, handling and manufacturing equipment, and transportation of concrete shall be subject to approval of the Subcontractor.

B. Concrete shall not be placed until forms, reinforcement and other inserts have been approved by the Subcontractor.

C. Curing of Concrete, cold weather requirements and hot weather requirements shall be in accordance with ACI 318-83, ACI 305-77 and ACI 306-78.

D. For each concrete batch delivered, the manufacturer of all structural concrete shall supply batch ticket information to the Subcontractor in accordance with ASTM C94 "Standard Specification for Ready-Mixed Concrete," Section 16. Within 3 working days from the date of each structural concrete pour, the Subcontractor will supply the Project Engineer with the original batch ticket information.

E. Site-mixed concrete shall not be permitted except with the specific approval of the Project Engineer.

F. The water used in the manufacturing of structural concrete shall be clean and free from injurious amounts of oils, acids, alkalies, organic materials, or deleterious substances.

G. Concrete shall be conveyed rapidly from the mixer to forms and shall be deposited as nearly as practicable in its final

position to avoid segregation due to handling or flowing. In no case shall concrete be dropped through a free height of more than 5 feet.

H. All structural concrete shall be consolidated by mechanically vibrated equipment. Vibrators shall be inserted and removed vertically (not dragged horizontally) at such regular intervals as to insure uniform consolidation throughout the entire section of concrete being placed. In no case shall vibrators be used to transport concrete inside the forms. The number of vibrators shall be sufficient to consolidate the concrete properly. At least one standby vibrator shall be on hand at all times when structural concrete is being placed.

I. Once concrete placement is started, it shall be carried on as a continuous operation until the placing of that structure is completed. Division of the total concrete work into sections for placement shall be subject to approval by the Project Engineer.

J. No anti-spalling compounds shall be used on this project.

K. When forms are removed, all fins and other projections shall be removed, offsets shall be leveled, and all voids and damaged places shall be saturated with water and filled with a mortar mixture of the same composition as that used in the concrete. Exposed surfaces shall be rubbed with cement or abrasive brick to remove blemishes and form marks, and to provide a uniform and smooth finished surface.

3.02 CURING

A. General: Curing of concrete shall be done in accordance with ACI 318-83.

B. Exterior Work: Curing shall be by an approved moist curing method or by spraying with an approved curing compound.

C. Fresh concrete shall be protected from heavy rain, running water and mechanical injury. All concrete shall be protected from the injurious action of the sun.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

A. This section includes furnishing all labor, equipment, supervision and materials necessary to install a flexible member liner for the new cover for Pit No. 4.

1.02 QUALITY ASSURANCE

A. The Subcontractor prior to being approved to do the work, shall provide a list of successful installations, names of a knowledgeable person from each installation and their telephone number.

B. The quality of the installation shall be verified by a competent testing company selected and paid by the Subcontractor and approved by the Construction Engineer. The Subcontractor shall cooperate to the fullest extent with representatives of the testing laboratory while the testing is being performed.

C. The installation Subcontractor shall provide a site superintendent with 5 years experience installing chlorosulfonated polyethylene (CSPE) liners.

1.03 SUBMITTALS

A. Qualifications

1. The Subcontractor shall supply a history of satisfactory service which lists at least five installations of CSPE liners over 200,000 square feet. Also included in the list will be the name and telephone number of a person on the

Subcontractor's staff that is familiar with the project. The Subcontractor should have at least 10 years experience in this work.

2. The Subcontractor shall provide the information requested on the following attachment: Manufacturer's Data Required (Attachment No. 1).

B. Field Seam Locations

1. The Subcontractor shall provide a drawing which shows the prefabricated panel details and the location of all field seams. The layout shall provide for a minimum number of field seams.

2. The Subcontractor shall provide a detailed description of the methods for making field seams.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. The flexible membrane lining material shall be chlorosulfonated polyethylene (CSPE) made from a composition of chlorosulfonated polyethylene (CSPE) with an encapsulated reinforced fabric of 10 by 10-1,000 denier polyester scrim. The finished material shall conform to the minimum material properties of Type 3-45 as shown in Table 10A of the Standard Number 54 as prepared by the National Sanitation Foundation (Attachment No. 2).

2.02 FACTORY FABRICATION

A. The flexible membrane lining shall consist of 58-inch widths of sheeting fabricated into large sections by means of 1 inch

(minimum) wide (heat/fusion) seams.

B. The fabricator shall certify that the seams are of sufficient strength that the parent material will break before seam separation occurs.

C. The fabricated material will be packed in a manner to protect the product and to minimize handling in the field. The fabricator will notify the Subcontractor of the area required for storage during the construction of the liner. Normal section for sloped sides shall be as shown on drawings.

2.03 INSTALLATION

A. The Installation Subcontractor shall provide a site superintendent with 5 years experience installing CSPE liners. Workers welding seams must (1) provide evidence from previous jobs or (2) perform before the Construction Engineer welding CSPE liner material prior to making welds. The welds must pass (or have passed) a vacuum-box or air lance and be stronger than the parent lining material.

B. Field Joints

Lap joints shall be used to seal factory fabricated panels of the liner together in the field. All field joints between section of the liner shall be made on a supporting smooth surface such as a board, and heat guns shall be used to make the sealing temperature at least 100°F. Lap joints shall be formed by lapping 4 inches (10 cm) minimum of the reinforced portion of the film. The contact surfaces of the panels shall be wiped clean to remove all dirt, dust, or other foreign materials. Scrub the mating surfaces at splices with trichloroethylene or approved substitute. The surface shall be

scrubbed in only one direction (away from the previous seam) and only clean towels or paper towels used. Apply bodied solvent adhesive (approved by the liner manufacturer) sufficiently that the entire bottom liner surface is covered and that a bead of the adhesive, the two liner surfaces shall be joined together and rolled smooth with hand rollers.

C. Joints to Structures

Securing the lining to structures shall be in accordance with those shown on the drawings submitted by the Subcontractor and approved by the Construction Engineer.

D. Repairs to the Liner

Any necessary repairs to the liner shall be patched with the liner material itself. Use a patch with rounded corners, large enough to extend 6 inches in all directions from the puncture. Use field joint procedure.

E. The Subcontractor shall furnish a sufficient temporary anchoring system to prevent damage to the liner due to wind or other forces.

F. Quality of Workmanship

Upon completion of the installation, the liner shall be jointly inspected by the testing company's Installation Subcontractor and the Operator's representative to determine the integrity of the field seams as well as the general condition of the lining. The Construction Engineer at his discretion may conduct tests to the field seams as well as the general condition of the lining. The Construction Engineer at his discretion may conduct tests to the field seams that will demonstrate to his

satisfaction that the parent lining material will break prior to separation of the field seams. Any lining surface injury due to scuffing, penetration by foreign objects, or distress from rough subgrade shall, as agreed to by the Installation Subcontractor, be replaced or covered and sealed with an additional layer of the liner.

G. Field Testing by Air Lance

Field testing shall be by using the Air Lance Method. A compressed air source will deliver 40-50 psi minimum to a 3/16 inch nozzle. The nozzle will be directed to the lip of the field seam in a near 45 degree angle direction to the length of the field seam. The nozzle will be held 4 inches maximum from the seam and travel at a rate not to exceed 15 feet per minute. Any loose flaps of 1/8 inch or greater will require repair. Follow OSHA requirements for the protection of personnel during this and all field tests.

H. Shipping and Storage of Liner Material

The liner material shall be kept dry and out of direct sunlight until installation. The Subcontractor will be responsible for storage of the FML. The FML may not be stored at the FMPC for longer than a two week period without prior approval by the Project Engineer. Material delivered to the site ill be uncured (not vulcanized) and stored away from dampness and sunlight. For periods of long storage, the FML must be stored inside. The new CSPE must be shielded from light and dampness to maintain seamability.

I. Liner Repairability

The liner material must be repairable. This will require welding new liner panels to then aged liner panels installed by this contract. Therefore, the panels must be weldable (fusible) in the future. The CSPE liner material must not completely cure (vulcanize) allowing a fusion weld of the liner material (then aged) to be made to new CSPE liner material.

The Subcontractor shall certify that this will be possible and submit a procedure for liner repairs.

J. Testing of Basin Liner

The Subcontractor shall provide the necessary personnel and equipment to perform the following:

1. The completed installation shall be cleaned of all debris, construction material, etc.

2. All field welds (not factory welds) and repair patches shall pass an air lance test performed by the Subcontractor and witnessed by Contractor's representative. A definitive log, with sign-offs, shall be maintained. The log shall show all seams and repairs that pass testing and shall be approved by the Contractor.

K. Flexible Membrane Liner Trench

FML trenches shall not be excavated until the clay liner has been completed and found acceptable to the Operator's Project Engineer and the RUST Construction Engineer. This includes the 17 day waiting period (see Section on Grading and Compacting Pit Surface, 3.02, B.10). At the end of trench excavation, each

trench will be visually inspected for objects or conditions that may cut or breach the FML during backfill compacting operations (this includes, but is not limited to, jagged objects, caved in trench walls, debris, standing water, wind blown refuse, and nails).

L. Flexible Membrane Liner Backfill

1. The backfill used in the FML trenching will be the same clay material used to construct the clay liner. FML trench backfill operations cannot begin until after the specific FML panel or section has been placed.

2. Backfill compaction shall be performed with an appropriately heavy, tamper or plate compactor meeting U.S. Bureau of Reclamation and U.S. Army Corps of Engineers Standards. The smallest dimension of the equipment's compacting surface shall be no larger than the width of the trench.

3. The backfill clay material will be free from debris, rocks, or any material that will damage the FML during backfill compaction. Trench backfill shall be placed in layers not thicker than 6 inches. Each lift of trench backfill will be compacted at least the minimum number of blows established with the test fill to achieve the minimum acceptable percent of maximum dry density determined in the laboratory test program.

4. The Subcontractor shall be responsible for preparing the materials for the compacted clay cover (including but not limited to drying or wetting of the clay necessary to achieve the compaction criteria determined in the laboratory test program. Frozen particles will not be

permitted in the fill nor shall fill be placed on frozen clay or FML. No compaction will be permitted unless ambient air temperature is 20°F or greater as determined at the Operator Emergency Operations Center.

5. Moisture content of the clay backfill at the time of compaction shall range within ±3 percent of optimum moisture determined by ASTM D698. If wetting of the clay backfill is required, only clean water obtained from the FMPC Production Facility or brought from offsite may be used.

6. The finished surface of the clay backfill shall provide a firm, unyielding foundation for the FML with no sudden or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed. Wherever practical, the finished backfill clay surface shall be made smooth.

2.04 WARRANTY

A. The installation Subcontractor shall provide a minimum of 2 years warranty covering installation of the liner.

B. The fabricator shall provide a minimum of 5 years prorated warranty.

C. The liner manufacturer shall provide a 10 year prorated warranty.

PART 3 - EXECUTION

3.01 The installation crew shall use proper equipment to move the heavy rolls or bundles of liner material from truck to storage to the pit cover. No vehicles will be allowed on the pit cover that will cause

depressions to form on the clay liner surface that will affect surface water drainage. Just prior to placing the FML, any clay cover areas which have been run over by vehicles must be visually inspected to assure that depressions that will affect surface water drainage have not formed. Any depressions that will affect surface water drainage must be repaired prior to FML placement.

3.02 Unrolling or unfolding the material shall be done by sufficient forces to easily prevent overstressing any individual section.

3.03 Nothing contained herein relieves the Subcontractor of his responsibility to provide safe working conditions for his men in the area of work.

3.04 SUBMITTALS

A. The Subcontractor shall provide data requested on the Manufacturer's Data Required Sheet (Attachment No. 1).

END OF SECTION

Except for Attachments

Manufacturer's Data Required - Attachment No. 1

Material Properties-Chlorosulfonated Polyethylene - Attachment No. 2

ATTACHMENT NO. 1

MANUFACTURER'S DATA REQUIRED

DESCRIPTION: SYNTHETIC LINER	NUMBER OF COPIES WITH BIDS	FOR INFORMATION	FOR APPROVAL	CERTIFIED FOR CONSTRUCTION (CFC)
The Subcontractor shall provide data below in quantities shown:				
1. Name of Sheeting Manufacturer	6			
2. Name of Liner Panel Fabricator	6			
3. Name of Liner Installation Firm	6			
4. Name of Inspection Firm	6			
5. Reinforced Liner Sample, 6 Inches Square	6	6		
6. Certification by Sheeting Manufacturer that Sheeting Material Contains at Least 45 Percent CSPE by Weight	6			
7. Certified Reinforced Liner Material Test Results		6	6	6
8. Destructive test Samples with Report of Representative Factory and Field Welded Seams			6	
9. Shop Drawings A. Sealing Around Vent B. Anchoring of Liner C. Vent D. Field Seams			6	6
10. Detailed description/ Procedure for Making Field Seams and Repairs			6	

ATTACHMENT NO. 1
MANUFACTURER'S DATA REQUIRED

DESCRIPTION: SYNTHETIC LINER		NUMBER OF COPIES WITH BIDS	FOR INFORMATION	FOR APPROVAL	CERTIFIED FOR CONSTRUCTION (CFC)
11.	Certification that CSPE Membrane Delivered to Site will be uncured (not vulcanized) and stored indoors until shipment			6	
12.	Certification that liner material is repairable and weldable after aging			6	

GENERAL NOTES:

1. Within 3 weeks after award, the Contractor shall furnish the required data "for approval" as outlined above. Subsequent revisions shall also be submitted for approval.

2. CFC issues of drawings shall include two reproducible copies in addition to the number of copies required above.

3. Test reports and logs for vacuum-box or air lance testing shall be submitted at test completion.

ATTACHMENT NO. 2

TABLE 1

MATERIAL PROPERTIES - CHLOROSULFONATED POLYETHYLENE (CSPE)
(Excerpted from Table 10A, Standard Number 54,
National Sanitation Foundation [NSF])

PROPERTY	TEST METHOD	SUPPORTED (S) TYPE
Gage[1] (Nominal)	---	45
Plies, Reinforcing	---	1
Thickness (mils minimum)	ASTM D751	
1. Overall		41
2. Over Scrim	Optical Method (Reference Appendix A, NSF)	11
Breaking Strength-Fabric (pounds, minimum)	ASTM D751 Method A	200
Tear Strength (pounds, minimum)	ASTM D751 (As modified in Appendix A, NSF)	
1. Initial		70
2. After Aging		25
Low Temperature (°F)	ASTM D2136 (1/8 inch mandrel, 4 hours, pass)	- 40
Dimensional Stability (each direction percent change maximum)	ASTM D1204 212°F, 1 hour	2
Volatile Loss (percent loss maximum)	ASTM D1203 Method A, 30 mil sheet	0.5
Resistance to Soil Burial (percent change maximum in original values)	ASTM D3083 30 mil sheet (As modified in Appendix A, NSF)	
a. Unsupported Sheet		
1. Breaking Strength		5
2. Elongated at Break		20
3. Modulus at 100 Percent Elongation		20
b. Membrane Fabric	ASTM D751 Method A	25
Hydrostatic Resistance (pounds/square inch, minimum)	ASTM D751 Method A, Procedure 1	250

ATTACHMENT NO. 2 (Continued)

TABLE 1

MATERIAL PROPERTIES - CHLOROSULFONATED POLYETHYLENE (CSPE)
(Excerpted from Table 10A, Standard Number 54,
National Sanitation Foundation [NSF])

PROPERTY	TEST METHOD	SUPPORTED (S) TYPE
Ply Adhesion (Each direction pounds/inch width, minimum)	ASTM D413 Machine Method Type A	7
FACTORY SEAM REQUIREMENTS[2]		
Bonded Seam Strength (factory seam, breaking factor, pound, width)	ASTM D751 (As modified in Appendix A, NSF)	180
Peel Adhesion (pounds per inch minimum)	ASTM D413 (As modified in Appendix A, NSF	Ply sep in plane of scrim or 20 pounds per inch
Resistance to Soil Burial (percent change maximum in original value)	ASTM D3083 (As modified in Appendix A, NSF)	
Peel Adhesion		20
Bonded Seam Strength		- 25

1 Type 1 gage liner has two values. Coating is stronger than fabric and gives a breaking strength value of 100 pounds for nominal 30 mil and 120 pounds for nominal 45 mils with 150 percent minimum elongation at break for both.

2 Factory seam requirements are the responsibility of the fabricator. Factory seams are further discussed in item 4.2, NSF Document.

This table provides reliable and dependable means for industry to furnish such materials of known and consistent quality. Before selection of any material for an FML; however, the user should consult with appropriate manufacturers, because these materials may not be appropriate for every application. Specific information should be obtained from the manufacturers regarding installation requirements, exposure conditions, performance expectations, and experience factor.