UCC-ND WASTE MANAGEMENT SEMINAR

R. E. Lampton – Chemical Process Design Department

View Graph No. 1 (Schedule)

The Solid Waste Handling & Decontamination Facility will be a line item FY-81 capital facility. At present we are just finishing a revision of the Conceptual Design and are involved in the Title I design of the decontamination part of the facility. The project is scheduled to be completed in early FY-87. The solids handling part of the work is now being defined.

View Graph No. 2, No. 3, and No. 4 (Criteria)

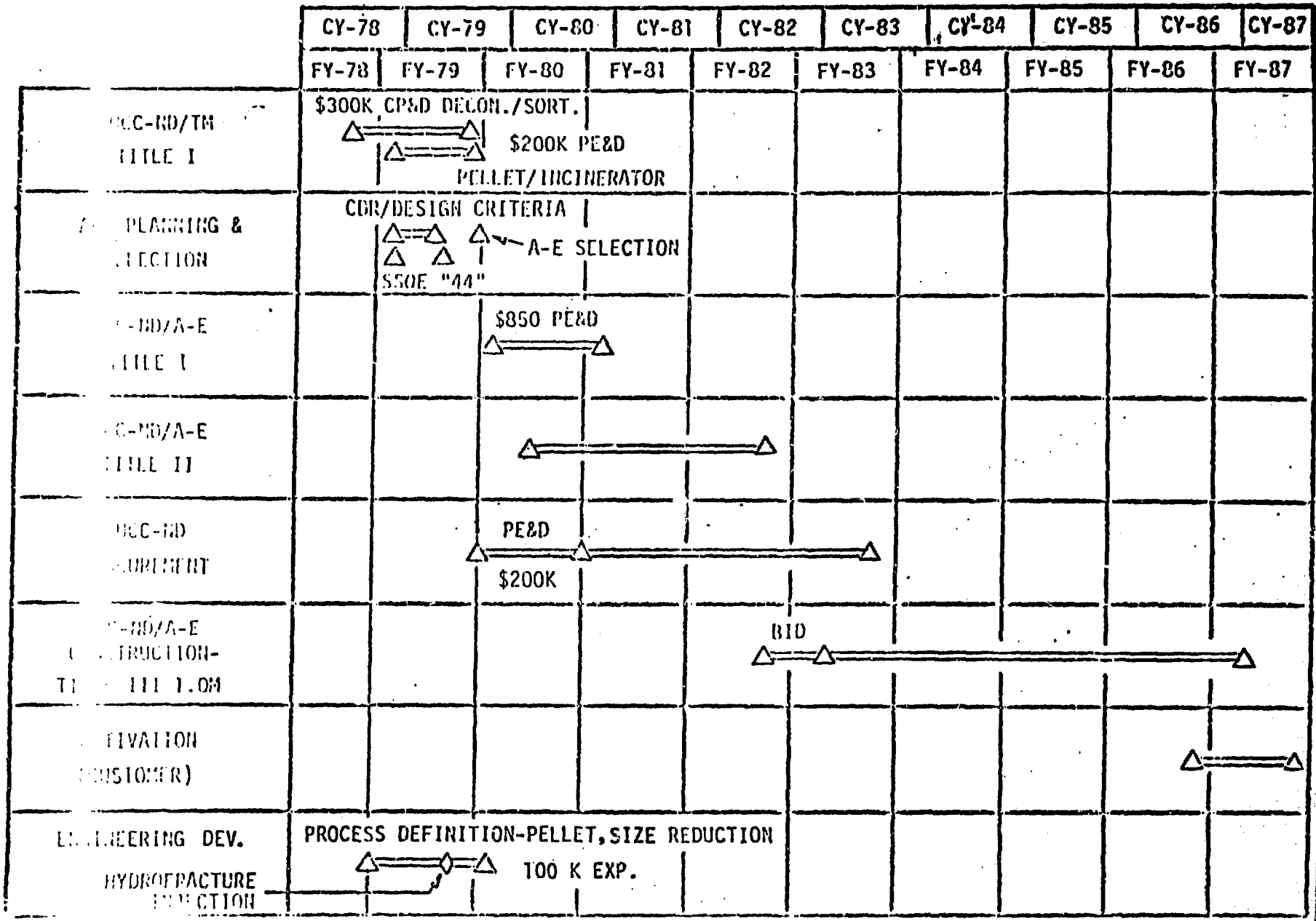
These view graphs define the design criteria.

View Graph No. 5 (Solid Waste Reduction Flow Sheet)

The burnable solid waste is brought to the SWH&DF site in plastic bags inside a dumpster. The waste has been segregated into burnable and nonburnable at the source. The bags are removed from the dumpster, weighed, and surveyed for their surface radiation level. The bags then pass through a magnetic detector and an x-ray detector unit. The magnetic detector detects large metal objects that must be removed; and the x-ray detector detects large, dense, nonmagnetic material which will be removed. The bags that contain materials to be removed are moved to a sorting conveyor for sorting. After passing the detector, the bags are fed through a large rotary seal to a shredder and then through a grinder. The shredding and grinding are done under a nitrogen blanket to prevent fires. Depending on the requirements of the moisture content and binder required to make pellets, water may be added to the ground waste at the outlet of the grinder as it goes to the waste blender. The blender also homogenizes the waste to produce a more

PELLET/HYDROFRACTURE OR INCINERATION

PROJECT SCHEDULE FY '81 LINE ITEM



SOLIDS WASTE HANDLING & DECONTAMINATION FACILITY DESIGN CRITERIA

FACILITY WILL BE DESIGNED TO HANDLE LOW LEVEL RADIOACTIVE CONTAMINATED (NO TRANSURANICS) WASTE.

SOLID WASTE CRITERIA

SOLID WASTE SYSTEM WILL BE DESIGNED TO HANDLE 300 POUNDS OF COMBUSTABLE WASTE PER HOUR. THE WASTE WILL HAVE THE FOLLOWING COMPOSITION:

75% - PAPER AND CLOTH (SHIRTS, COVERALLS, MOP HEAD, ETC.)

20% - PLASTICS (ASSUMED TO BE PVC FOR OFF-GAS REMOVAL OF CHLORIDES)

3% - RUBBER (STOPPERS AND TUBING), LEATHER (SHOES) WOOD (FILTER FRAME, ETC.)

1% - METAL (SAFETY TOES, NAILS, BUTTONS, SNAPS AND ZIPPERS)

1% - GLASS (SAMPLE BOTTLES, TUBING, AND LAB WARE)

TOTAL WEIGHT RECEIVED WILL BE 306 POUNDS/HOUR

ANY BAG OF WASTE RECEIVED THAT HAS A SURFACE RADIATION LEVEL IN EXCESS OF 200 MR/HR WILL BE REJECTED AND TERMED HIGH LEVEL WASTE.

90% OF ALL WASTE BAGS RECEIVED WILL HAVE A SURFACE RADIATION LEVEL OF 10 MR/HR OR LESS. 10% OF ALL WASTE BAGS RECEIVED WILL HAVE A SURFACE RADIATION LEVEL OF GREATER 10 MR/HR BUT LESS THAN 200 MR/HP.

THE MAXIMUM LEVEL WHICH RADIATION WILL ALLOW TO BE BUILDUP WITHIN THE SYSTEM WILL BE [illegible]

THE OUTSIDE SURFACE OF ALL EQUIPMENT AND/OR SHIELDING, WHERE PERSONNEL WILL BE OPERATING, SHALL BE DESIGNED FOR 0.25 MR/HR AT THE SURFACE

DECONTAMINATION

DUMPSTERS - ASSUME 1 OUT OF EVERY 20 DUMPSTERS RECEIVED WILL REQUIRE INTERNAL DECONTAMINATION

GLOVE BOXES - ASSUME THAT ONE TWO PORT GLOVE BOX WILL BE RECEIVED PER WEEK. DECONTAMINATION REQUIRED IS PRIMARILY INTERNAL AND THE RADIATION LEVEL SHALL NOT EXCEED 300 MR/HR.

SHIPPING CARRIERS - ASSUME A MAXIMUM OF 5 SHIPPING CARRIERS A WEEK WHICH SHALL NOT EXCEED 2 FEET DIAMETER BY 3 FEET HIGH AND NOT WEIGH MORE THAN 8000 POUNDS MAXIMUM RADIATION LEVEL AT THE EXTERNAL SURFACE OF ANY CARRIER RECEIVED, SHALL NOT EXCEED 1R/HR AND THE INTERNAL RADIATION SHALL NOT EXCEED 5R/HR.

SMALL HAND TOOLS - ASSUME 50 SMALL PIECES WILL BE RECEIVED PER WEEK WITH NONE EXCEEDING 1R/HR AT THE SURFACE.

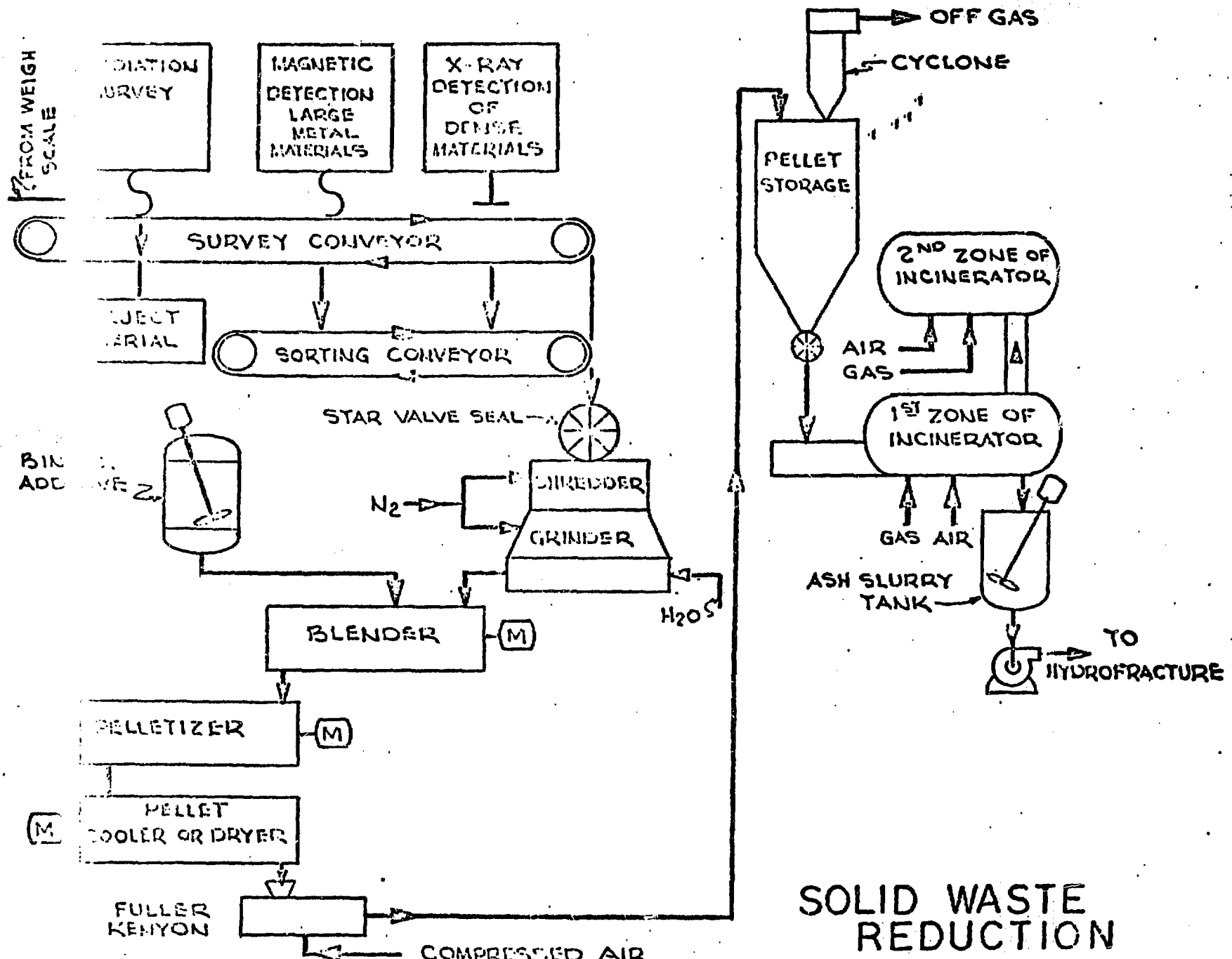
MISCELLANEOUS - THESE MATERIALS ARE ASSUMED TO BE SMALL TOOLS, DUCT PIECES, METAL PARTS, ETC., THAT WILL NOT EXCEED 3 FEET DIAMETER BY

- 4 FEET LONG, AND DO NOT HAVE A SURFACE AREA EXCEEDING 3000 SQUARE INCHES. NO MORE THAN 5 ITEMS PER WEEK WILL BE RECEIVED IN THIS CATEGORY. THE MAXIMUM RADIATION LEVEL OF INCOMING MATERIALS SHALL NOT EXCEED 1R/HR AT THE SURFACE.

- ANY ITEMS THAT CAN NOT BE DECONTAMINATED TO THE LEVEL LISTED IN THE FOLLOWING TABLE 1 SHALL BE RETURNED TO THE CUSTOMER FOR USE IN A RESTRICTED CONTAMINATION AREA OR SENT TO THE BURIAL GROUND. ALL MATERIALS THAT MEET THE DECONTAMINATION REQUIREMENTS OF TABLE 1 MAY BE MOVED ANYWHERE IN ORNL OR SOLD ON THE MARKET.

TABLE 1

	TRANSFERABLE CONTAMINATION	DIRECT READING
ALPHA	30 DPM/CM^2 OR LESS	300 DPM/CM^2 OR LESS
BETA-GAMMA	LESS THAN 200 DPM/CM^2	LESS THAN 0.05 MR/HR



SOLID WASTE REDUCTION FLOW SHEET

constant Btu content. The waste from the blender goes to the pelletizer where pellets are made that can be fed to the incinerator or to the existing Hydrofracture Facility for disposal down the well. The pellets will be approximately 1/8 inch in diameter by 1/8 inch long primarily to allow slurrying into the hydrofracture well. According to the present flow sheet, the pellets are conveyed to a storage hopper that discharges the two-zone incinerator feed mechanism. The two-zone incinerator is based on the Los Alamos Scientific Laboratory (LASL) incinerator which is undergoing testing at LASL. The first zone is operated with approximately stoichiometric amount of air and at a temperature of 1500 to 1600°F. The second zone is operated with 50% excess air and a temperature of approximately 2300°F. The ash is removed from the incinerator to a wet box where it is slurried and pumped to the Hydrofracture Facility for disposal down the well.

View Graph No. 6 (Incinerator Scrubber)

The flue gases leaving the incinerator at approximately 2300°F pass through a heat exchanger to produce steam. The temperature of the off-gas is reduced to approximately 400°F. The gas then passes through a quench chamber where it is cooled by a water spray to about 180°F. The off-gas then flows to a wet venturi scrubber for removal of submicron particulate and some of the acid gases. The noncondensable gases pass from the venturi scrubber to a packed-bed scrubber for removal of the remainder of the acid gases. The gases then pass through a condenser and a heater to reduce the relative humidity before passing through the HEPA filters to the stack.

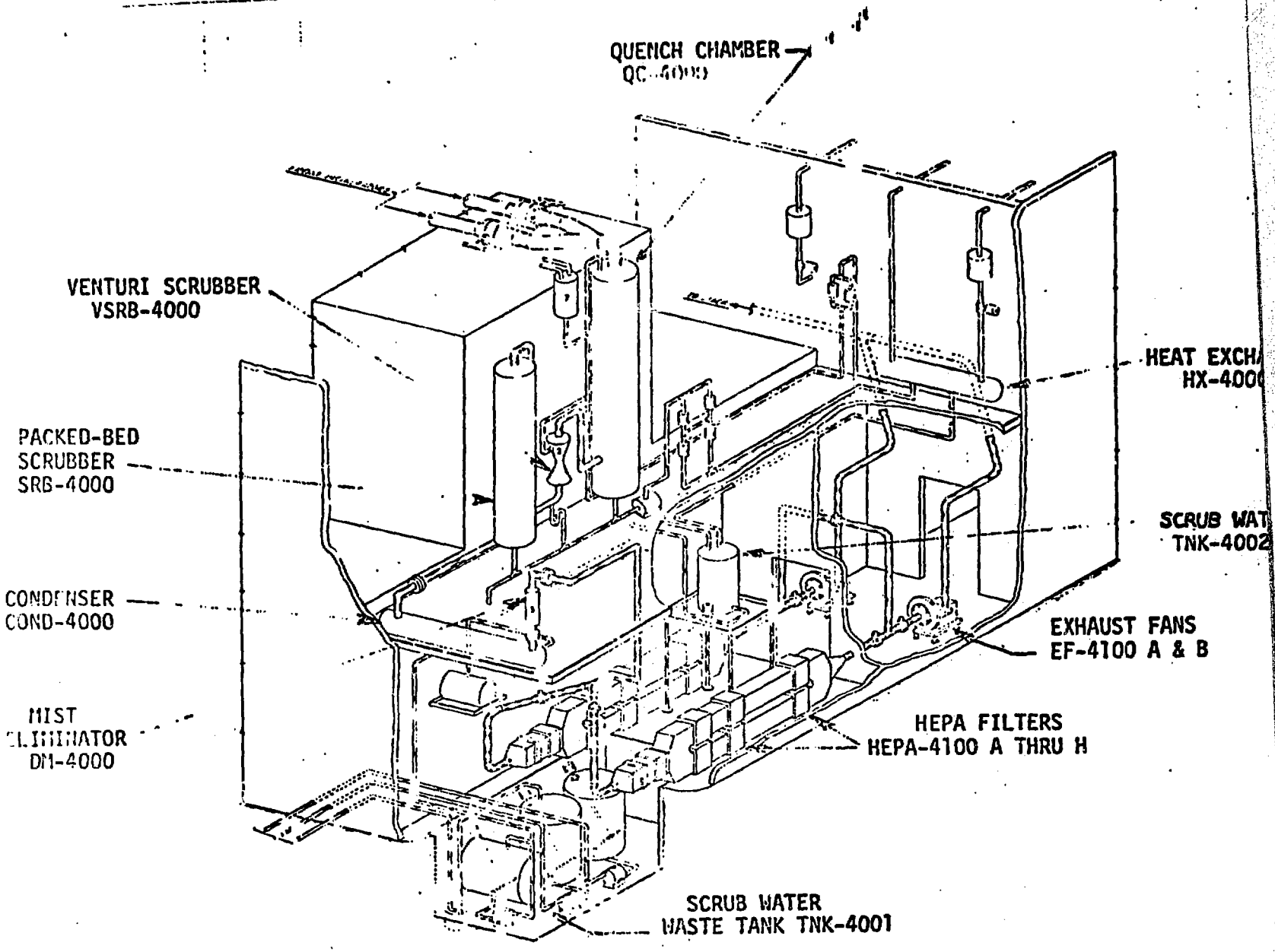

QUENCH CHAMBER
QC-4000
VENTURI SCRUBBER
VSRB-4000
HEAT EXCHA
HX-4000
PACKED-BED
SCRUBBER
SRB-4000
SCRUB WAT
TNK-4002
CONDENSER
COND-4000
EXHAUST FANS
EF-4100 A & B
MIST
ELIMINATOR
DM-4000
HEPA FILTERS
HEPA-4100 A THRU H
SCRUB WATER
WASTE TANK TNK-4001

FIG. 2.3.5

View Graph No. 7

The decontamination area will be a group of essentially batch operations where materials to be decontaminated are routed according to their materials of construction, contamination level, and size. View graph 7 gives the various operations in the decontamination area.

The next topic is the Gunite Tank Sludge Removal Project. Six unlined gunite concrete storage tanks at ORNL have been used to collect low-level radioactive waste for the past 35 years. The tanks are 50 feet in diameter by 12 feet to the spring line. The waste in the tanks has been maintained in a basic condition (pH of 10 to 12). The basicity has caused precipitation of sludge. The tanks now contain 350,000 to 400,000 gallons of sludge containing 10 to 15 million curies of radioactive material. A new tank farm is presently under construction which will allow the gunite tanks to be emptied and retired.

View Graph No. 8 (Engineering Design Features)

Since the tank dome is approximately 10-inch thick Gunite and has 6 ft. of earth shielding, a work platform that does not apply loads on the tanks will be required. The removal of the sludge from the tanks will be done by hydraulic sluicing to form a slurry. The slurry will pass through a grinder which will reduce the solids to approximately 100 microns in diameter. A suspension agent will be added to the slurry to increase solids in suspension to approximately 18 percent and to maintain solids in suspension when pumping to the Hydrofracture Facility. The equipment, including a TV viewing camera, will be remotely operated. All slurry piping will be doubly contained.

DECONTAMINATION AREA

THE DECONTAMINATION AREA WILL CONTAIN AN AREA FOR DISASSEMBLY AND ASSEMBLY, A SPRAY DECONTAMINATION ROOM, AND CONTAMINATE STORAGE AREA. SPECIAL EQUIPMENT CONTAINED IN THE AREA IS AS FOLLOWS:

PLASMA TORCH
VIBRATORY POLISHER
LARGE, DRY GRIT BLASTER
ULTRASONIC CLEANER
WET GRIT BLASTER
SMALL, DRY GRIT BLASTER
ELECTROPOLISHER
ACID AND CAUSTIC DIP TANKS

GUNITE TANK SLUDGE REMOVAL
DESIGN ENGINEERING FEATURES

1. WORK PLATFORMS

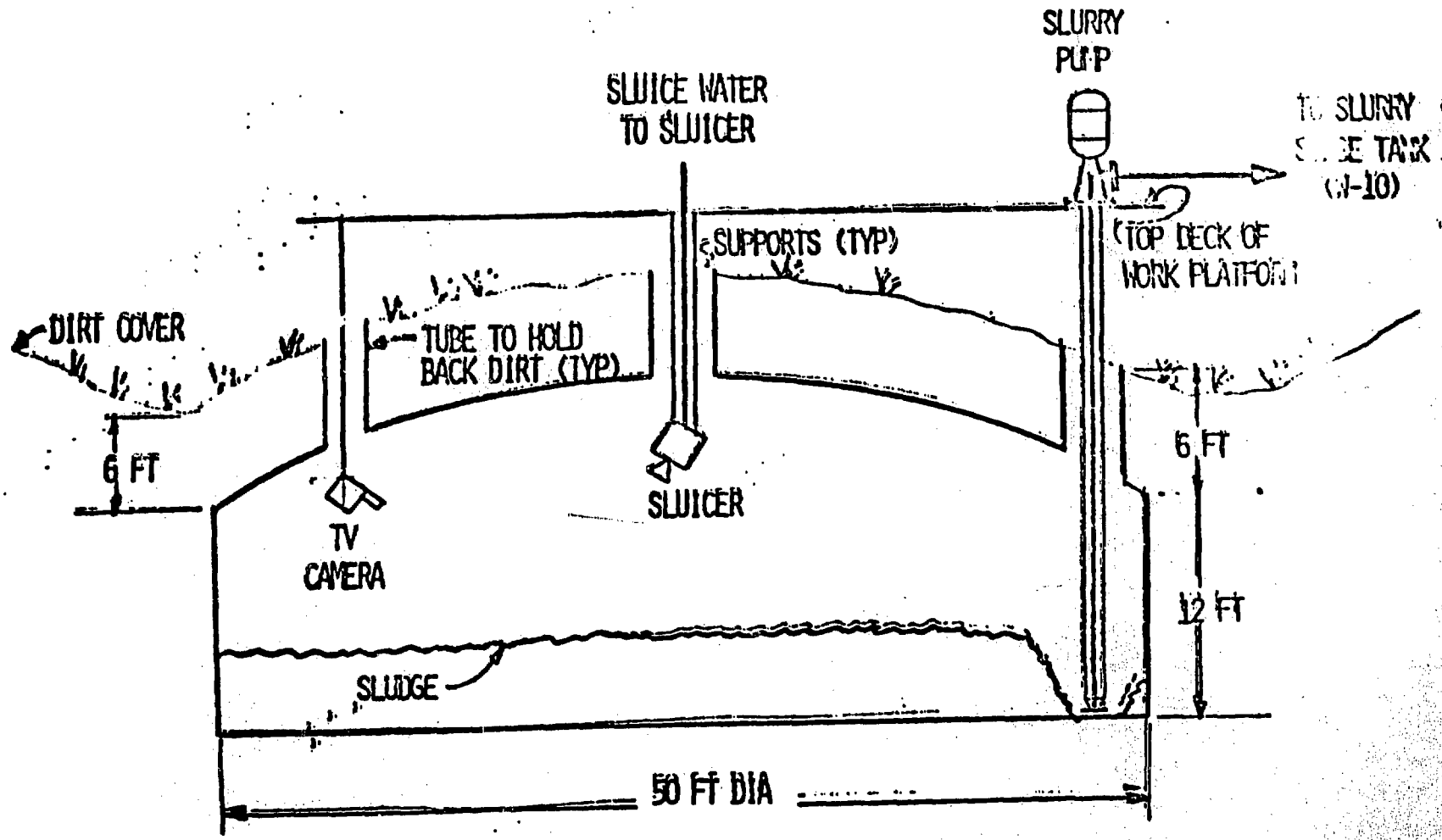
2. HYDRAULIC SLUICING OF SLUDGE

3. REMOTE OPERATION OF EQUIPMENT

4. REMOTELY CONTROLLED VIEWING

View Graph No. 9

This is a view graph showing a schematic of the sluicer, TV camera, and recirculating system.


SLURRY
PUMP
SLUICE WATER
TO SLUICER
TO SLURRY
SLUICE TANK
(W-10)
SUPPORTS (TYP)
TOP DECK OF
WORK PLATFORM
DIRT COVER
TUBE TO HOLD
BACK DIRT (TYP)
6 FT
6 FT
TV
CAMERA
SLUICER
12 FT
SLUDGE
50 FT DIA