ATTACHMENT D-1
PROCESS DESCRIPTION

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ATTACHMENT D-1
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The objective of the Chemical Stockpile Disposal Program is to demilitarize the entire United States' stockpile of unitary chemical agents and munitions in a safe and environmentally acceptable manner. Although the United States ended its chemical weapons program in 1969, inventories of chemical-agent-filled weapons still are stockpiled at eight locations within the continental United States. One of these locations is the Pueblo Chemical Depot (PCD), located in Pueblo, Colorado.

The method proposed to destroy the chemical weapons stockpile is called the Assembled Chemical Weapons Assessment (ACWA) Water Hydrolysis of Energetics and Agent Technologies (WHEAT) process. The Pueblo Chemical Agent Pilot Plant (PCAPP), to be located within the PCD, is being designed and constructed to remove the chemical agent from mortars and projectiles; destroy the chemical agent and explosives; and decontaminate emptied munition bodies.

This attachment provides a general overview of the demilitarization process planned for the PCAPP and the associated support systems and facilities. Section 1.0 provides a description of munitions to be processed at the PCAPP. Section 2.0 describes the operations and process of the PCAPP. Section 3.0 gives an overview of the ventilation system; Section 4.0 gives an overview of the filtration system; Section 5.0 gives an overview of the Cooling Water System; Section 6.0 gives an overview of the Process Water System; Section 7.0 gives an overview of the Steam System; and Section 8.0 gives an overview of Bulk Chemical Storage.

1.0 CHEMICAL WEAPONS

The Army has initial plans to destroy the following stockpiled munitions located at the PCD:

- M60 (105mm) cartridges containing chemical agent
- M110/M104 (155mm) projectiles containing chemical agent
- M2/M2A1 (4.2-inch) cartridges containing chemical agent.

Each chemical agent/munition combination represents a processing run referred to as a campaign. Campaigns will be run serially, beginning January 2007. The design peak throughput rates will be as follows:

- 155mm projectiles 60 per hour
- 105mm cartridges 120 per hour
- 4.2-inch cartridges 120 per hour.

2.0 DESTRUCTION SYSTEMS AND DEMILITARIZATION OPERATIONS

The ACWA WHEAT process uses hydrolysis/neutralization, followed by biodegradation, to destroy the chemical agent and energetics contained within the weapons. This section provides an overview of demilitarization operations (decontamination of metal parts and dunnage), as well as an overview of chemical agent destruction operations. **Figure Attachment D-1-1**[1] depicts a block flow diagram of the ACWA WHEAT processing system.

Munitions destined for demilitarization, as designated by the Department of the Army, will be removed from the PCD's Chemical Surety Materiel Exclusion Area at a rate compatible with the operating schedule of the PCAPP. The movement of munitions within the PCD's Chemical Surety Materiel Exclusion Area will be observed by guards, and emergency response vehicles will be available on site.

The following description presents the overall flow of the demilitarization process for projectiles and mortars.

2.1 Automatic Control System

The processing steps, which are specific to projectiles and mortars, will be fully automated and computer driven.

Interlocks will be checked before starting and will be monitored continuously during munition processing by the program in the control system. Should any interlock fail, appropriate action will be taken, such as immediate shutdown, programmed shutdown, or operator-assisted shutdown. Two types of interlocks will be used. If a shutdown interlock occurs, the system will take immediate action. If a permissive

[1] All figures are located at the end of this section.

interlock occurs, the system will allow completion of a process step but will not allow a new function to be initiated.

Once programmed and started, the system will operate automatically without intervention of an operator, unless an abnormal condition arises. Sequencing of operations will be controlled automatically based on munition feed into the system from the Unpack Area (UPA) and completion of operations by the demilitarization machines.

The presence of a munition at locations throughout the process will be displayed on the automated graphic displays. In addition, the number of munitions into and out of processing areas will be totaled and the total displayed on the automated graphic displays. Cross-checks will be made to determine discrepancies in these counts. The total number of munitions processed will be determined and recorded.

Each programmed step will be monitored continuously for completion. If the system fails to complete a required step within a specified period of time, the system will halt that step and halt all process steps "upstream" of that function. The halt will continue until a continuation signal is given either by the operator or by the system upon eventual completion of the function that caused the halt. When a halt occurs, the operator will be informed in the Control Room. The operator will have three choices: (1) to initiate the function again through the keyboard and, if successful, continue the process; (2) to visually inspect by means of the closed-circuit television or by observing the machine itself to determine whether the function actually occurred and, if it actually occurred, continue operation by an entry into the keyboard; or (3) to halt further processing by entering a halt command through the keyboard.

A Process Data Acquisition and Recording System will be provided for acquiring operational data for analysis and historical recordkeeping. Data concerning measurements, sequence of operations, total munitions processed, process alarms, environmental data, chemical agent levels and alarms, and equipment run times will be acquired for generation of daily, weekly, and monthly reports. Reports generated and printed will include production totals, alarm shutdown summaries, Automatic Continuous Air Monitoring System alarms, preventive maintenance, filter operations, environmental reports, utilities status, and sequential events. In addition, selected data on alarms and operations will be collected on electronic media for historical data.

Following initialization of the process line equipment (proper valve line-up and interlock verification), munitions will be delivered from the Munitions Storage Building (MSB), then munitions will be unloaded from the Modified Ammunition Van (MAV), reconfigured in the Propellant Removal Room, if required, and fed onto the process lines in the UPA. The lot number and quantity of munitions received (unloaded from the MAV) will be recorded on either DD-Form 1348-1, “Single Line Item Release/Receipt Document,” or DA Form 4408, “Ammunition Transfer Record.” Once the process line is ready (has been initialized) to receive munitions and the munition receipt paperwork has been completed, demilitarization operations will start.

Maintenance panels will be located at the processing equipment to allow maintenance personnel to operate the equipment locally. A hand-held pendant control until will be attached to the local panel to allow the maintenance personnel to operate the equipment. When the switch on the local panel is in the LOCAL position, control from the central process controller will be locked out, except for emergency stops. When the switch is in the REMOTE position, the system can only be controlled from the central process controller/Control Room.

A hardwire backup system will be used to handle critical functions in extraordinary situations. In monitoring critical functions, the control system will issue advance warning of alarms indicating that an alarm condition is developing so that an operator may take corrective action.

2.2 Munitions Processing

Munitions of each caliber will be processed in individual campaigns due to equipment tooling requirements.

2.2.1 Unpack Area

Pallets of munitions are stored in igloos at the PCD. They will be transported to the PCAPP by MAVs during daylight hours. Munitions will be off loaded at the MSB, a temporary storage area within the PCAPP. The MSB will hold a maximum of 24 hours worth of munitions processing.

The palletized munitions will be transported via MAVs from the MSB to the loading/unloading area of the Munitions Demilitarization Building (MDB). The munitions will be off loaded with forklifts and moved into the vestibule area of the MDB. Inventory check and inspection will be performed prior to moving them into the UPA. If a leaking munition is discovered, it will be isolated and overpacked. The overpacked round will be transferred to the Toxic Maintenance Area (TMA) for further treatment.

After confirmation of correct lot number and quantity, the munitions will be moved to the UPA. The UPA will be sized to provide a maximum of 4 hours staging capability.

2.2.2 Munitions Reconfiguration: Propellant and Primer Removal (010-DIPR-101); Drawing AAC-01-A-005

The majority of the munitions have been reconfigured, which means that their propellant and primers were already removed. Approximately 16 percent of munitions that have not been reconfigured (all of the 4.2-inch cartridges and 28,375 of the 105mm cartridges) will be moved to the Propellant Reconfiguration Room (PRR), adjacent to the UPA in the MDB. The PRR will consist of three Glove Box Tube Opening/Agent Sniff Stations, four Propellant Removal/Tail Disassembly Workstations, and two Munition Unload Stations. All of the work will be performed manually except for removal of flash tubes from the 105mm cartridges, which will be removed using the Ignition Cartridge Removal Machine (010-DIPR-101). This machine will be located in one of the Propellant Removal/Tail Disassembly Workstations. Before the munition is removed from its fiberglass container, it will be monitored and checked to ensure that it is leak free. This monitoring function will be performed inside one of the Glovebox Tube Opening/Agent Sniff Stations. If a leaking round is found, it will be isolated and overpacked. The overpacked round will be transferred to the TMA for further treatment. The munitions will be unpacked by cutting the steel strapping, removing the fiberglass tubes containing the projectiles/mortars from their wooden boxes, and loading the fiberglass container onto a transfer cart. The propellant and ignition cartridges are removed. A cabinet will be provided in the Propellant Staging Room for holding ignition cartridges and primer containers. Propellant and ignition cartridge containers will be placed on a pallet and sent for storage in an empty munitions storage igloo at the PCD for later processing during the propellant campaign. After reconfiguration, munitions will be moved back to the UPA.

The munitions will be placed on conveyers by the UPA operator to be moved to the Explosive Containment Rooms (ECRs) in the MDB.

All steel strapping will be collected in waste collection boxes for later treatment in the Batch Metal Parts Treater (BMPT). The BMPT is discussed further in Section 2.2.11. Chemical-agent-contaminated pallets and boxes will be placed in dunnage containers and moved to the Continuous Steam Treater (CST) Room in the MDB. The CST is discussed further in Section 2.2.14.

Within the ECRs will be the WHEAT Projectile Mortar Disassembly (WPMD) machine, the Energetic Rotary Deactivator (ERD), the Burster Washout Machine (BWM), the Energetics Shredder, and the Energetics Slurry Tank. These items are discussed in the subsequent paragraphs. The ECRs will be reinforced concrete enclosures designed to totally contain the effects of an accidental explosion.

2.2.3 WHEAT Projectile/Mortar Disassembly Machine (010-WPMD-101/2); Drawing AAC-50-F-010

The unpacked munitions first will be fed to one of two WPMD machines, each located in one of the ECRs. **Figure Attachment D-1-2** depicts a WPMD machine. The WPMD machine will remove all the explosive components from all calibers of munitions. The WPMD machine will be an eight-position, rotating-table machine with five main stations remotely controlled by a programmable logic controller (PLC). The main components of the WPMD machine will include the following:

- In-feed transfer station
- Nose closure removal station
- Miscellaneous parts removal station
- Burster removal station
- Discharge/output station.

The WPMD machines will perform four basic functions:

- Remove nose plugs or nose fuzes from projectiles. Fuzes with booster cups will be removed and punched to expose the explosive.
- Remove fuze cups, miscellaneous parts, and/or supplementary charges from projectiles.
- Remove burster tubes from projectiles.
- Feed bursters to the BWM for energetics removal.

If any of the functions cannot be completed, the round will be rejected and returned to the ECR vestibule. Burster tubes filled with solid energetics will be removed and sent to the BWM by conveyor.

Note: If a leaking round is detected during WPMD operation, munitions feeding into the ECR from the UPA will be stopped. Munitions already present in the ECR will continue to be processed. The contents of the Energetics Neutralization Reactor receiving the potentially chemical-agent-contaminated energetics will be tested for chemical agent destruction prior to discharge to the Energetics Hydrolysate Holding Tank. The WPMD machine and other equipment inside the ECR will be decontaminated with 18 weight percent (wt.%) sodium hydroxide (NaOH) prior to restarting the munitions processing line. The caustic decontamination solution will be collected in a sump and pumped to the Spent Decon Holding Tanks. Spent decontamination solution will be processed in the Agent Hydrolysers, and fed to the BioTreatment System following the normal chemical agent hydrolysate path. The Agent Hydrolysers and BioTreatment System are discussed further in Sections 2.2.9 and 2.2.18, respectively. The Energetics Neutralization Room (ENR) and Energetics Hydrolysate Holding Tank are discussed further in Section 2.2.6.

Fuzes, booster cups, and other miscellaneous energetic parts removed by the WPMD machine will be sent to the ERD (010-ERD-101/102), which will deactivate the energetic component in a nitrogen atmosphere.

The BWM will receive burster tubes from the WPMD. It will wash the solid energetics from the burster tube using a high pressure water spray.

The munition bodies will be transferred to the WMDM. The WMDM is discussed further in Section 2.2.7.

2.2.4 Energetics Rotary Deactivator (010-ERD-101/2); Drawing AAC-50-F-010

The two ERD machines—one in each of the two ECRs within the MDB—will receive parts removed by the WPMD machine. The ERD will be a horizontal cylindrical heater 2 feet 6 inches in diameter by 6 feet 0 inches long. A feed conveyor will carry the parts to the top of the ERD at the inlet end. The parts will be fed through an airlock, dropping into the ERD. These parts will be de-energized in the ERD via electric induction heating to approximately 650°F. The process will be performed under an inert (N_2) atmosphere to prevent thermal formation of nitrogen oxides (NO_x) and nitrous oxide (N_2O). After treatment, the de-energized parts leaving the ERD will be sent to the Metal Parts Treater (MPT) Room of the MDB for 5X decontamination in the BMPT (076-MPT-101). During the 155mm projectile campaign, the ERD will act as materials handling equipment to transfer the lifting lugs to the Energetics Parts Containers. The induction heating coils will not be activated. The BMPT is discussed in further detail in Section 2.2.11. Each ERD vents to the MPT Quench Tower, which is discussed in further detail in Section 2.2.12.

2.2.5 Burster Washout Machine (010-WASH-101/2) and Energetics Shredder (010-CRSH-101/102); Drawing AAC-50-F-010

There will be two BWMs (010-WASH-101/102) and two Energetics Shredders (010-CRSH-101/102), one in each of the two ECRs.

Bursters removed from the 4.2-inch cartridge, the 105mm cartridge, and the 155mm projectile will be processed through the BWM (010-WASH-101/102) to remove the explosive content. Bursters will be fed into the BWM at a minimum rate of one per minute for 105mm cartridges or 4.2-inch cartridges and one per 2 minutes for 155mm projectiles by a pick-and-place machine from the burster discharge conveyor of the WPMD. Except for the 4.2-inch cartridge bursters, the explosive charges will be encased in metal tubes whose fuze end provides direct access to the explosive. The 4.2-inch burster tubes will be attached to the fuzes, which when taken apart by the WPMD, also will provide direct access to the explosives. The end opposite the fuze will be the metal sealed end of the tube in all cases.

The BWM will have a rotary carousel with multiple burster holding receptacles. Bursters will be aligned with a multi-nozzle waterjet washout probe so that the jet will cut into the explosive charge axially from the open end. The width of the jet will be adjusted to obtain maximum coverage of the interior of the burster tube, ensuring that the walls will be thoroughly cleaned of explosive. The washout probe will be aligned with the open end of the burster and waterjet flow will be initiated at approximately 12,000 psi. The washout water will entrain the explosive particles and chunks and wash them clear of the burster casing and washout station spray. Upon reaching the metal end of the burster tube, the waterjet washout probe will be withdrawn.

The resulting energetics slurry then will pass through an Energetics Shredder (010-CRSH-101/102), which will reduce all particles to less than 1/8-inch diameter to facilitate transport and the hydrolysis reaction. The slurry will discharge from the shredder to the Energetics Slurry Tank (010-TANK-101/102), where process water will be added, diluting energetics concentration in the slurry to 20 wt.%. This will minimize explosion risk. Then, it will be pumped to the Energetics Neutralization Reactors using air driven double diaphragm pumps. The shredder and collection tank are expected to be physically integrated into the BWM. Energetics slurry volume will be kept to a minimum and will not be allowed to accumulate within the system. **Figure Attachment D-1-3** depicts the BWM.

Empty burster tubes, although not considered contaminated with chemical agent, will be deposited on a conveyor and placed in an Energetics Parts Container for subsequent 5X decontamination (15 minutes at or above at least 1,000°F) in the BMPT. The BMPT is discussed further in Section 2.2.11.

2.2.6 **Energetics Neutralization Reactors** (050-RCTR-101/2/3); Drawing AAC-50-F-050

There will be three Energetics Neutralization Reactors (050-RCTR-101/2/3) in the ENR of the MDB. They will be in parallel, nominally 300 gallons each. Two of the three reactors will be in operation, either receiving energetics feed or in process. The third reactor will be on standby, waiting to receive feed.

The energetics to be processed are tetrytol and tetryl. A propellant campaign will be run once the chemical agent campaigns are complete.

Water and antifoam will be initially charged to the reactor. Then 50 wt.% NaOH will be charged. The amount of NaOH added to the reactor will be a 4.5:1 molar ratio dry caustic to tetrytol or tetryl. The agitator and recirculation loop will be started. The temperature in the reactor will rise due to heat of dissolution. The caustic solution in the reactor will be heated to 194°F. The energetics slurry will be charged into the side of the reactor above the normal liquid level. The batch will be isothermally mixed at 194°F for 3 hours and then sampled for the presence of energetics. If the sample is within specification for energetics concentration, it will be pumped to the Energetics Hydrolysate Holding Tank (050-TANK-104), common to all three reactors. The energetics hydrolysate will be pumped to one of the ICB™ Feed Tanks (60-TANK-101/102/103/104), where it will be mixed with chemical agent hydrolysate and diluted with process water. Heating and cooling will be provided to the vessel jackets by the closed loop Energetics Heat Transfer Fluid System.

All three reactors and the Energetics Hydrolysate Holding Tank will vent to the MPT Quench Tower. The MPT Quench Tower is discussed further in Section 2.2.12.

2.2.7 **WHEAT Munitions Demilitarization Machine** (020-WMDM-101/102); Drawing AAC-01-F-020

The WMDM will receive munitions from the WPMD after all energetic components are removed. This machine is depicted in **Figure Attachment D-1-4**. There will be two Munitions Demilitarization Machines (020-WMDM-101/102) located in the Munitions Demilitarization Machine Room (MDMR) of the MDB. Each WMDM will have an associated Particle Reducer-Drained Agent (020-CRSH-101/103).

The two WMDMs will be aligned so that one receives the munitions coming from ECR-1 and the other receives munitions from ECR-2. The area category for the MDMR will be A. The WMDM will remove the burster well from the munition body, exposing the chemical agent. The round will be tilted, draining the chemical agent. Chemical agent will be collected in a basin under the WMDM and transferred via pipeline through a Particle Reducer-Drained Agent. The drained chemical agent then will be pumped to the Agent Holding Tank located in the Toxic Room. Burster wells will be placed in the Energetics Parts Containers for 5X decontamination in the BMPT. The BMPT is discussed further in Section 2.2.11. The WMDM will have a cutting station to counter the eventuality of a failed pull operation by cutting through the munition casing wall. Munition bodies continue on to the Projectile (Rotary) Washout Machine.

2.2.8 Projectile (Rotary) Washout Machine (020-RW-101); Drawing AAC-01-F-020

Any sludge or heel remaining in the munition after WMDM processing will be washed out in one of two Rotary Washout Machines (020-RW-101/2), which is depicted in **Figure Attachment D-1-5**. The resulting chemical agent/water mixture will be transferred to one of the two Agent Settling Tanks (020-TANK-102/104) via the Washed Agent and Booster Pump (020-PUMP-108/109/118/119). Once inside the Agent Settling Tank, the slurry will be allowed to settle into a heavier chemical agent phase and a lighter wash water phase.

The heavier phase will be agent concentrate. Chemical agent concentrate will be stored in the Agent Concentrate Holding Tank (030-TANK-110) located in the Toxic Room of the MDB. The Agent Concentrate Pump (020-PUMP-104/105/114/115) will transfer the chemical agent to the holding tank after passing it through the Particle Reducer-Agent Concentrate (020-CRSH-102/104). The composition of the chemical agent concentrate will be set at 90 percent (by weight) of chemical agent as a performance specification for the phase separation step of the washout operation. This performance specification serves the current design effort and is to be verified by testing the chemical agent washout system and the process design modified accordingly.

The lighter phase will be wash water that contains dissolved thiodiglycol (TDG), hydrochloric acid (HCl), and entrained chemical agent. Since chemical agent is only slightly soluble in water and the hydrolysis reaction will be slow below 194°F, the concentration of chemical agent, HCl, and TDG in the wash water will be expected to be low. The wash water will be recycled to the Projectile (Rotary) Washout Machines via the Wash Water Recirculation Pump (020-PUMP-102/103/112/113), Wash Water Recirculation Heat Exchanger (020-EXCH-101/102), and the Agent Water Jet High Pressure Pump (020-PKG-101/102/103). A wash water purge will be fed to the Agent Hydrolysers (040-RCTR-101/102/103/104/105/106).

The water-washed munitions will be fed to the Rotary Metal Parts Treater (RMPT) (070-MPT-101) for 5X decontamination.

2.2.9 **Agent Hydrolysers** (040-RCTR-101 to 106); Drawing AAC-01-F-040

There will be six batch reactors in parallel, nominally 2,520 gallons each, which will be located in the Agent Neutralization Room (ANR) of the MDB.

The Agent Hydrolysers will receive drained chemical agent from the Agent Holding Tank, chemical agent concentrate from the Agent Concentrate Holding Tank, and spent decontamination solution from the Spent Decon Holding Tanks. They also will receive chemical-agent-contaminated condensate from the MPT/CST Condensate Holding Tanks.

Hydrolysis is the first step in the treatment process. In each batch, hot process water will be added to a reactor. This water charge will include a wash water purge from the Projectile (Rotary) Washout Machine. The reactor will be agitated and recirculated through an external heat exchanger and static mixer. The jacket and external heat exchanger will be used to heat the process water to approximately 194°F. Over a 30-minute period, chemical agent will be added to the reactor upstream of the static mixer. Once the exothermic reaction between chemical agent and water begins, the jacket and external heat exchanger will be switched to cooling water. The cooling water flows will be controlled to maintain an isothermal reaction temperature of approximately 194°F. The hydrolysis is represented by the following equation:

$$\text{Chemical Agent} + 2\ H_2O_{(excess)} \rightarrow \text{Thiodiglycol} + 2\ HCl$$

When the chemical agent charge is complete, the reactor will be recirculated and agitated for 75 minutes. Then, the reactor contents will be sampled. If the chemical agent concentration is greater than 20 parts per billion (ppb) by weight, the reactor will continue mixing at approximately 194°F for resample at a later prescribed time. If the chemical agent concentration is less than 20 ppb by weight, the process will be forwarded to the next step, neutralization.

In this step, 18 wt.% NaOH will be added to adjust the pH of the reactor contents to just under 12, neutralizing the HCl produced in the hydrolysis step. The caustic will be pumped from the Sodium Hydroxide (18% NaOH) Storage Tank into the vapor space of the reactor.

The product leaving the reactor is called chemical agent hydrolysate, an aqueous solution of TDG and salts. The product will be stored in the Agent Hydrolysate Holding Tank (040-TANK-107), which will be common to all six reactors. From this tank, the hydrolysate will be pumped to the ICB™ Feed Tank, where it will be mixed with energetics hydrolysate and diluted with process water.

Each Agent Hydrolyser will be kept under a nitrogen blanket, and have a pressure indicator controller to control reactor pressure. A vent valve will be expected to open only during filling and water heating operations. The Agent Hydrolysate Holding Tank also will be equipped with a pressure indicator controller and vent value to control its pressure. The vents from all six reactors and the holding tank will be treated in the MPT Offgas Treatment System. This system is discussed in further detail in Section 2.2.16.1.

Heating and cooling water will be provided on a closed loop as part of the Agent Hydrolyser Heat Transfer Fluid System.

2.2.10 Rotary Metal Parts Treater (070-MPT-101); Drawing AAC-01-F-070

There will be one RMPT (070-MPT-101) located in the MPTR of the MDB. The RMPT will receive drained and washed munition bodies from the Rotary Washout Machine (020-RW-101/2). These munition bodies may be contaminated with residual chemical agent. The RMPT will be designed to meet the Army definition of 5X decontamination (for a minimum of 15 minutes at or above 1,000°F) for the munition bodies.

The RMPT will be a horizontal cylindrical heater with an outer shell heated by electric inductance coils and an inner rotating basket. The inner basket will hold 15 cages, evenly distributed around a 36-inch outer diameter. There will be three cage designs, one for each type of munition. Cages for the 4.2-inch cartridges and 105mm cartridges will be long enough to hold ten rounds. Cages for the 155mm projectiles will be long enough to hold seven rounds.

Drained and washed munitions from the Projectile (Rotary) Washout Machine (020-RW-101) will be transported by a conveyor system and loaded into the RMPT on a unit feed basis. Each round will pass through an airlock and be positioned in front of a pneumatic pusher. The pusher will feed the round into a cage, displacing another round from the opposite end of the same cage.

The inner basket will continue to rotate, indexing the pusher to the next cage. Again, a round will be pushed into the cage at the inlet end of the RMPT, discharging a round from the same cage at the outlet end of the RMPT. The RMPT will be fed continuously in this manner.

Munitions leaving the RMPT will pass through one of the Munitions Monitoring Containers (070-MMC-101/102/103) where they will be monitored to verify 5X decontamination. After 5X decontamination has been verified, the munitions will be fed by conveyer to a press to be deformed before being deposited into a roll-off container for transportation to offsite waste disposal.

A nitrogen purge will remove oxygen from the RMPT system. This will prevent thermal formation of NO_x and N_2O in the high temperature environment. The shell of the RMPT will be heated to 1,250°F. Superheated steam at 1,000°F from the RMPT Steam Superheater (070-HEAT-103) will be fed countercurrently to the munition bodies. There will be an interlock preventing munitions discharge if the minimum required temperature (1,000°F) is not met. Two types of chemical agent destruction reactions are expected to occur in the RMPT system: hydrolysis and steam reforming. The hydrolysis reaction will form TDG and HCl, while the steam reforming reaction will form carbon dioxide, hydrogen chloride, and sulfur dioxide according to the following reaction equations:

- Hydrolysis:
  $C_4H_8Cl_2S + 2H_2O \rightarrow C_4H_{10}O_2S + 2HCl$

- Steam Reforming:
  Subreaction 1:
  $C_4H_8Cl_2S + 10H_2O \rightarrow 4CO_2 + 2HCl + 13H_2 + SO_2$
  Subreaction 2:
  $C_4H_8Cl_2S + 6H_2O \rightarrow 4CO + 2HCl + 9H_2 + SO_2$

The heat and material balance will be based on the criteria of hydrolyzing one-third of the MPT feed; the balance will be reformed. This will be achieved by maintaining high temperatures with excess steam inside the RMPT. This will result in an overall HD destruction and removal efficiency of 99.9999 percent. The Heat and Material Balances are located in **Attachment D-2**.

The steam also will act as a carrier gas. The RMPT will vent to the RMPT Effluent Heater (070-HEAT-101), where the vent gas will be heated by electrical inductance to 1,250°F, causing steam reforming of any residual chemical agent. There will be a chemical agent analyzer downstream of the effluent heater confirming that the chemical agent has been destroyed. The RMPT Effluent Heater will vent to the MPT Quench Tower (070-TOWR-101).

The design throughput for the RMPT will be 120 rounds/hour for 105mm and 4.2-inch munitions and 60 rounds/hour for 155mm munitions. The RMPT will use external induction coils as the primary heat source, with a process heat load of 250 kilowatt (kW) (installed duty 450 kW). The dimensions of the RMPT will be 4 feet 8 inches internal diameter (ID) by 15 feet 7 inches, with design conditions of 15 pounds per square inch gauge (psig)/full vacuum at 1,500°F. The RMPT will be constructed of Hastelloy® C-276.

The 5X munition bodies will continue on to be deformed and sent offsite as scrap metal. The RMPT is depicted in **Figure Attachment D-1-6**.

2.2.11 Batch Metal Parts Treater (076-MPT-101); Drawing AAC-50-076

Metal strapping from the UPA, burster wells from the WMDM, and miscellaneous parts discharged from the ERD and BWM collected in Energetics Parts Containers will be fed to the BMPT for 5X decontamination. The BMPT will be a horizontal cylindrical heater with an internal conveyor. There will be sealed doors on each end. Each batch will process three Energetics Parts Containers, each measuring 3 feet by 3 feet by 2 feet. The parts containers will be placed on a conveyor and positioned up against the inlet door of the BMPT. A push machine will feed the three containers into the heater. The BMPT will be heated to 1,250°F by electrical inductance coils. Superheated steam at 1,000°F will be fed to the BMPT. The materials will be heated for a prescribed time (15 minute minimum) under continuous superheated steam feed. Then, the BMPT will be purged with nitrogen. Sensors on the vent line will confirm chemical agent is not detected. The 5X metal parts will be removed from the BMPT and sent offsite as scrap metal.

The BMPT will vent to the BMPT Effluent Heater (076-HEAT-101), where the vent gas will be heated by electrical inductance to 1,250°F, causing steam reforming of any residual chemical agent. The BMPT Effluent Heaters, in turn, will vent to the MPT Quench Tower. The BMPT is depicted in **Figure Attachment D-1-7**.

2.2.12 MPT Quench Tower (070-TOWR-101); Drawing AAC-01-F-070

There will be one MPT Quench Tower (070-TOWR-101). It will be located in the Offgas Treatment Room (OTR) of the MDB. The quench tower will be made of Hastelloy® C-276 and designed for a vapor feed rate of 8,000 actual cubic feet per minute (acfm) [1,200°F, 12 pounds per square inch absolute (psia)], 15 psig/full vacuum at 175°F with tower dimensions of 1 foot 6 inches ID by 12 feet 0 inch tangent to tangent.

The MPT Quench Tower will receive the hot vent streams exiting the RMPT Effluent Heater, BMPT Effluent Heater, ERD, ENR, and Energetics Hydrolysate Tank. These vent streams will be combined and fed to the MPT Quench Tower through a common lower nozzle. The stream will pass through a sparger upon entering the column. Cool water will be sprayed down the column, contacting the hot vapor stream moving up the column. There will be three rows of spray nozzles in the top of the column. The top row of spray nozzles will receive fresh process water. The lower two rows will receive condensate from the MPT Condensate Surge Tank (070-TANK-101).

Condensable vapor such as steam will liquefy and fall to the bottom of the column along with the water. The water that will be collected in the bottom of the column is called condensate. The condensate that will collect in the bottom of the column will flow by gravity to the MPT Condensate Surge Tank. Non-condensable gases will continue to flow up the column. They will leave the top of the column, passing through the MPT Condenser (070-EXCH-102) on their way to the MPT Condensate Surge Tank.

The vent stream will be introduced into the top of the Condensate Surge Tank just under a demister. It will pass through the demister and continue on to the MPT Offgas Treatment System.

The condensate in the MPT Condensate Surge Tank will be neutralized with 18 wt.% NaOH. The condensate will be recycled to the lower two rows of MPT Quench Tower spray nozzles after passing through the MPT Quench Recirculation Cooler (070-EXCH-103). A condensate purge stream will be transferred to the MPT/CST Condensate Holding Tanks.

The MPT/CST Condensate Holding Tanks will provide storage capacity for condensate purged from the MPT and CST Condensate Surge Tanks. Each batch of the combined condensate will be collected and sampled for presence of chemical agent. If chemical agent is not detected, the condensate will be blended with material in the Agent Hydrolysate Tank. If chemical agent is detected, the condensate will be processed in the Agent Hydrolysers.

2.2.13 Contaminated Solid Waste Preparation: Plastic Material Shredder (120-SHRD-101) and Wood Material Shredder (120-SHRD-102); Drawing AAC-50-F-120

There will be two contaminated solid waste preparation lines, one for plastic material and the other for wood material. The lines will be located in the Waste Shredding Room (WSR) of the MDB. The area classification of the WSR will be B.

A typical operating scenario for contaminated solid waste preparation will consist of receiving contaminated wood pallets/boxes and demilitarization protective ensemble (DPE) suits by forklift/pallet trucks. The plastic suits and wood will be introduced into the shredding room through dedicated airlocks located on the west wall of the CST Room. The two dedicated shredders, one for wood and the other for DPE suits, will be located in the shredding room. Flexible screw conveyors will transfer the shredded material from the respective shredders to an enclosed belt conveyor through a surge bin/loss in weight feeder system.

All material being shredded will drop down to the bottom compartment of the shredder, along with any minor dust/small particles that may have been generated in this operation. The enclosed screw conveyor will transfer shredded material, along with settled dust/small particles, through a closed conveyor system to the CST (075-CST-121). A dedicated dust collection system will not be necessary for this type of system as very minimal dust will be generated in the shredding, and the dust that is generated will settle, along with the larger particles, at the bottom of the shredder.

Any metal, such as nails, generated from the wood shredding operation will be collected and placed in a miscellaneous parts container for transfer to the BMPT for treatment. The flex screw conveyor will transfer alumina as aggregate from the CST Alumina Storage Bin (075-STOR-101) onto the enclosed belt conveyor carrying shredded wood and plastic suits to the CST. The crushed tabular alumina will add bulk to the shredded material and act as a scouring agent for the CST shell. At the CST the material will be dropped through a double flap gate airlock valve into the CST and be thermally treated as it moves through the CST. The discharged mixture in the form of ash and alumina will be transferred to the CST Discharge Classifier (075-CLAS-101) for separation by a water-cooled screw conveyor. The CST Discharge Classifier (075-CLAS-101) will separate the ash form the alumina. The ash will be collected in bins through a gravity chute and the alumina will be fed directly back to the CST Alumina Storage Bin (075-STOR-101) for reuse.

2.2.14 Continuous Steam Treater (075-CST-121); Drawing AAC-50-F-075

Continuous steam treatment will be performed in the CST Room of the MDB.

The CST (075-CST-121) will be designed to achieve 5X decontamination for chemical-agent-contaminated plant non-process wastes and dunnage. Shredded wood pallets, cardboard boxes, spent activated carbon from the heating, ventilation, and air conditioning (HVAC) carbon filters, and shredded plastic (DPE with boots and gloves) will be decontaminated in the CST unit. The shredded dunnage will have the consistency of a pulp. Feed aggregate/carrier material (crushed tabular alumina or other suitable material) will be needed to provide bulk to shredded feedstock such as wood or plastic (DPE). The CST will operate in a continuous feed mode.

The CST design will be based on hourly feed ratios of 100 pounds wood:200 pounds aggregate; 15 pounds DPE:285 pounds aggregate; mixed feed at 15 pounds DPE:85 pounds wood:200 pounds aggregate. Aggregate attrition rate will be assumed to be 10 percent of the feed aggregate. This quantity will be recalculated based on CST testing results. Spent carbon will be fed alone (no aggregate) at 300 pounds per hour.

The following summary describes the decomposition reactions expected to occur in the CST system. Please refer to Section D-2.2.10 of this attachment for chemical agent destruction chemistry.

- Carbon Feed Case:

  Reaction 1:

  $C + 2H_2O \rightarrow CO_2 + H_2$

  Reaction 2:

  $C + H_2O \rightarrow CO + H_2$

- Wood Feed Case:

  Reaction 1:

  $CH_2O + H_2O \rightarrow CO_2 + 2H_2$

  Reaction 2:

  $CH_2O \rightarrow CO + H_2$

- DPE Feed Case:

  Reaction 1:

  $C_2H_3Cl + 4H_2O \rightarrow 2CO_2 + HCl + 5H_2$

  Reaction 2:

  $C_2H_3Cl + 2H_2O \rightarrow 2CO + HCl + 3H_2$

The heat and material balance will be based on 1 percent conversion (or gasification) of the carbon fed to the CST, and 85 percent conversion for wood and DPE. In all three cases, it will be assumed that two-thirds of the gasified product will form carbon dioxide and hydrogen chloride, while the balance will be products of incomplete oxidation (in particular, carbon monoxide). These criteria will be verified upon completion of the CST testing.

The CST will be a horizontal cylinder. The dimensions of the CST will be 4 feet 8 inches ID by 11 feet 0 inch, with design conditions of 15 psig/full vacuum at 1,500°F. The CST will be constructed of Hastelloy® C-276. The shell is heated to 1,250°F by electrical induction with a heat load of 300 kW. Contained in the shell will be a rotating multibladed auger shaft. The solid feed will be fed into the CST through an airlock on top of the shell at the inlet end. Superheated steam (1,000°F) from the CST Steam Superheater (075-HEAT-122) will be fed at the opposite end of the heater. Note that prior to heating the CST, the process will be purged with nitrogen to remove oxygen. This will prevent thermal formation of NO_x and N_2O in the high temperature environment. The steam will act as a reactant and carrier gas, and will be fed at 50 percent excess of stoichiometric reaction needs. The solid feed will transit the length of the heater in approximately 1 hour (set by auger shaft rotation speed and blade pitch). Residual solids will exit the heater through a discharge airlock. The solids will fall out of the airlock into a screw conveyor. The screw conveyor will elevate the solids and drops them into the CST Discharge Classifier (075-CLAS-101). The solids will be a mixture of ash and intact aggregate. The ash will be a mixture of degraded dunnage pulp and disintegrated aggregate. The intact aggregate will be recycled as part of the feedstock. The ash will be containerized in 55-gallon drums and stored in the Residue Handling Area (RHA), pending offsite shipment to a permitted treatment, storage, and disposal facility (TSDF).

Steam and non-condensable gasses will be vented from the CST to CST Effluent Heater (075-HEAT-121). The CST Effluent Heater will heat the vent gas to 1,250°F, destroying any residual chemical agent. A chemical agent analyzer on the discharge of the heater will be used to confirm chemical agent destruction. Effluent heater discharge vent gases will continue on to the CST Quench Tower (075-TOWR-121).

2.2.15 CST Quench Tower (075-TOWR-121); Drawing AAC-50-F-075

The CST Quench Tower will receive the hot vent streams exiting the CST. This vent stream will be fed to the CST Quench Tower through a lower nozzle. The stream will pass through a sparger upon entering the column. Cool water will be sprayed down the column, contacting the hot vapor stream moving up the column. There will be three rows of spray nozzles in the top of the column. The top row of spray nozzles will receive fresh process water. The lower two rows will receive condensate from the CST Condensate Surge Tank (075-TANK-121).

Condensable vapor such as steam will liquefy and fall to the bottom of the column along with the water. The water that will be collected in the bottom of the column is called condensate. Non-condensable gases will continue to flow up the column. They will leave the top of the column, passing through the CST Condenser (075-EXCH-122) on their way to the CST Condensate Surge Tank. The condensate that will collect in the bottom of the column will flow by gravity to the CST Condensate Surge Tank.

The vent stream will be introduced into the top of the Condensate Surge Tank just under a demister. It will pass through the demister and continue on to the CST Offgas Treatment System.

The condensate in the CST Condensate Surge Tank will be neutralized with 18 wt.% NaOH. The condensate will be recycled to the lower two rows of CST Quench Tower spray nozzles after passing through the CST Quench Recirculation Cooler (075-EXCH-123). A condensate purge stream will be transferred to the MPT/CST Condensate Holding Tanks (030-TANK-103/104).

The MPT/CST Condensate Holding Tanks will provide storage capacity for condensate purged from the MPT and CST Condensate Surge Tanks. Each batch of the combined condensate will be collected and sampled for presence of chemical agent. If chemical agent is not detected, the condensate will be blended with material in the Agent Hydrolysate Tank. If chemical agent is detected, the condensate will be processed in the Agent Hydrolysers.

2.2.16 Offgas Treatment; Drawing AAC-01F-080

The PCAPP will use catalytic oxidation as a localized method of process offgas treatment, which involves six systems. These systems will be the offgas treatment systems for the MPTs, CST, and four ICB™ Module process vent gases. The ICB™ units are discussed further in Section 2.2.18.

Trace pollutants in the process vent streams from the MPTs, the CST, reactors and hydrolysate tank vents, the ERD, and the ICB™ Module will be removed by catalytic oxidation. In theory, the reactant molecules [for example, volatile organic compounds (VOCs) and oxygen] will diffuse to the catalyst surface and will be adsorbed onto the catalyst. On the catalyst surface, the reactants will dissociate into fragments and atoms. Following surface reactions, the end products then will desorb from the surface back into the flow stream. Thus, the catalyst will facilitate the reaction by providing a low energy pathway for the reaction to occur (in other words, it will lower the activation energy).

The catalyst will be supported on straight channel, ceramic monolith substrates that provide higher catalytic efficiencies with minimum pressure drop. Typically, the monolith channels will be coated with a high-surface-area inorganic oxide (for example, aluminum oxide) “washcoat” to improve the dispersion and durability of the active component. The active component will be loaded onto the washcoat in an impregnation step.

The catalytic reactor will be designed to operate under external mass transfer rate control. That is, the rate of destruction will be determined by the rate the reactant molecules diffuse from the bulk flow stream to the surface of the catalyst. The actual surface reaction will occur much faster than the diffusion step. In this way, standard mass transport equations and fluid dynamics can be used to design the catalytic reactor to give a desired conversion and pressure drop for given inlet conditions.

In typical operations, the flow inlet will be brought to the desired temperature by heating. This heated air will be brought into the catalytic reactor where the trace pollutants will be destroyed. The reactor will be composed of a series of monolithic catalyst segments to improve mass transfer properties. The outlet air can then be passed through a heat exchanger to recover some of the energy and exhausted to the MDB Ventilation Filtration System.

The proprietary Honeywell catalyst formulation to be used was developed specifically for its resistance to common catalyst poisons such as halogens, sulfur, and phosphorus. This catalyst has been tested extensively against compounds containing common catalyst poisons and chemical agents and has shown high destruction efficiencies and durable performance. (ACWA Engineering Design Study CATOX® chemical agent challenge testing at 10 to 30 milligrams chemical agent per cubic meter of air was concluded successfully in October 2000. The test results and lessons learned will be incorporated in full-scale design pending publication of the test report and recommendations.) The bioreactors will be equipped with their own CATOX® systems. These are not anticipated to ever see chemical agent and are provided solely to deal with any VOCs stripped from the ICB™ feed by the bioreactor aeration or generated by the biota in the reactor. Each bioreactor module (comprising four ICB™ units) will be equipped with a dedicated CATOX® offgas treatment system.

The three CATOX® systems will operate in the same manner. Incoming air streams will be heated electrically to about 800° to 840°F to bring the gas streams within the CATOX® catalyst active temperature. This active temperature can be lowered to about 700°F, if upstream process conditions impose a heavier than anticipated organic (or oxidation) load on the CATOX® unit. The maximum sustained operating temperature at the discharge of the catalyst bed will be 1,050°F. Operation at temperatures above this will result in gradual loss of catalyst activity, a situation that is to be avoided. Process control systems will be in place to maintain the system within the operating limits. The proprietary catalytic matrix will destroy the organic materials.

The bioreactor CATOX® units will discharge directly to the atmosphere. The MPT and CST system will vent CATOX® unit(s) discharge to the MDB Ventilation Filtration System as a precaution. The MDB Ventilation Filtration System will discharge to the atmosphere. The MPT Offgas Reheater (080-HEAT-106) will take incoming gases from the MPT chemical agent condensate surge tank vent, the Agent Hydrolysers, and the chemical agent hydrolysate tank vents and heat the mixed stream electrically (by using electric induction coils) to reduce moisture content and condition the gas streams to the CATOX® operating temperature. The unit will be a manufacturer's standard unit sized for 450 kW with a capacity of 1.2 million British thermal units per hour (MMBtu/hr) and design conditions of 15 psig/full vacuum at 1,000°F.

2.2.16.1 MPT Offgas Treatment: MPT Offgas CATOX Treater (080-CATX-101); Drawing AAC-01-F-080

The MPT Offgas CATOX® Treater (080-CATX-101) will receive the heated gases from the MPT Offgas Reheater (080-HEAT-106) and through the proprietary catalytic matrix, destroying residual VOCs and semivolatile organic compounds (SVOCs). The unit will have a capacity of 1,260 standard cubic feet per minute (scfm), 25-inch water column pressure drop, and dimensions of 2 feet 0 inch diameter by 4 feet 0 inch flange-flange (F/F).

The MPT Offgas Cooler (080-EXCH-102) will receive the heated air stream from the MPT CATOX® Treater (080-EXCH-102) and cools the stream prior to entering the HVAC carbon filters. The cooler will be rated for a duty of 1.2 MMBtu/hr with design conditions of 15 psig/full vacuum at 925°F (tubes). The tubes of the cooler will be constructed of Alloy 20 with a carbon steel shell.

The MPT Offgas Blower (080-BLOW-106) will transfer the cooled CATOX® exhaust and transfer the gas to the HVAC carbon filters. The exhaust blower will provide enough flow and draw to keep the complete system at a pressure slightly less than ambient. The blower will have a capacity of 1,260 scfm and be sized for 72 brake horsepower (BHP), 100 horsepower (HP).

2.2.16.2 CST Offgas Treatment: CST Offgas CATOX Treater (085-CATX-101); Drawing AAC-50-F-085

The CST Offgas Reheater (085-HEAT-106) will take incoming gases from the CST Condensate Surge Tank and heat the stream electrically to reduce moisture content and condition the gas streams to the CATOX® operating temperature. The unit will be a manufacturer's standard unit sized for 450 kW with a capacity of 1.0 MMBtu/hr and design conditions of 15 psig/full vacuum at 1,000°F.

The CST Offgas CATOX® Treaters (085-CATX-101) will receive the heated gases from the CST Offgas Reheater (085-HEAT-106), and through the proprietary catalytic matrix, will destroy residual VOCs and SVOCs. The unit will have a capacity of 1,040 scfm, 25-inch water column pressure drop and dimensions of 2 feet 0 inch diameter by 4 feet 0 inch F/F.

The CST Offgas Cooler (085-EXCH-102) will receive the heated air stream from the CATOX® Treaters and cool the stream prior to entering the HVAC carbon filters. The cooler will be rated for a duty of 1.0 MMBtu/hr with design conditions of 15 psig/full vacuum at 925°F (tubes). The tubes of the cooler will be constructed of 1-1/4 chromium - 1/2 molybdenum with a carbon steel shell.

The CST Offgas Blower (085-BLOW-106) will transfer the cooled CATOX® exhaust and transfer the gas to the HVAC carbon filters. The exhaust blower will provide enough flow and draw to keep the complete system at a pressure slightly less than ambient. The blower will have a capacity of 1,040 scfm and be sized for 60 BHP, 75 HP.

2.2.16.3 ICB™ Offgas Treatment: ICB™ Offgas CATOX Treater (087-CATX-101/102/103/104; Drawing AAC-40-F-087

The ICB™ Offgas Reheaters (087-HEAT-101/102/103/104) will take incoming gases from the ICB™ modules and Brine Reduction Package vents, and heat the stream electrically to reduce moisture content and condition the gas streams to the CATOX® operating temperature. Each of the four heaters will be 2.4 MMBtu/hr, with design conditions of 15 psig at 1,000°F.

The ICB™ Offgas CATOX® Treaters (087-CATX-101/102/103/104) will receive the heated gases from the ICB™ Offgas Reheater, and through the proprietary catalytic matrix, destroy residual VOCs and SVOCs. Four CATOX® Treaters will be required; each unit having a capacity of 6,400 scfm, 25-inch water column pressure drop, and dimensions of 4 feet 6 inch diameter by 4 feet 0 inch F/F.

Four ICB™ Offgas Blowers (087-BLOW-101/102/103/104) will transfer the cooled CATOX® exhaust and transfer the gas to the HVAC carbon filters. The exhaust blowers will provide enough flow and draw to keep the complete system at a pressure slightly less than ambient. Four blowers will be required; each will have a capacity of 6,400 scfm and be sized for 200 BHP, 250 HP.

Four CATOX® Offgas Economizers (087-EXCH-101/102/103/104) will be gas-to-gas heat exchangers used to heat the CATOX® feed with CATOX® effluent. Four exchangers will be required, each rated for 4.3 MMBtu/hr with design conditions of 75 psig at 1,000°F, and constructed of 1-1/4 chromium - 1/2 molybdenum carbon steel exposed.

2.2.17 Agent Holding Tank (030-TANK-101), Agent Surge Tank (030-TANK-102), and Agent Concentrate Tank (030-TANK-110); Drawing AAC-01-F-030

The Agent Holding Tank, Agent Concentrate Tank, and Agent Surge Tank will be located in the Toxic Room of the MDB. These three tanks will vent past a common carbon filter before discharging their vent streams into the Toxic Room.

The Agent Holding Tank will receive drained chemical agent from the WMDM after it passes through the Particle Reducer-Drained Agent. Chemical agent will be stored in this tank for destruction in the Agent Hydrolysers.

The Agent Concentrate Tank will receive chemical agent concentrate that has been separated out in the Agent Settling Tanks after it has passed through the Particle Reducer-Agent Concentrate. Chemical agent concentrate will be stored in this tank for destruction in the Agent Hydrolysers.

The Agent Surge Tank normally will not be used. It will provide overflow capacity for the Agent Holding Tank and Agent Concentrate Tank. It also will provide emergency storage in the event of Toxic Room tank failure. This tank will discharge to the Agent Hydrolysers.

2.2.18 BioTreatment System (Drawing AAC-40-F-060)

The BioTreatment System will consist of 16 Immobilized Cell Bioreactors (060-ICBR-101 to 116) arranged in 4 modules. Each module will be compromised of 4 ICB™ bioreactors, an ICB™ feed tank, an ICB™ Effluent Pump Tank, and an Offgas Treatment System. Each ICB™ bioreactor will have a 40,000-gallon liquid capacity and a residence time of 5 days. Each ICB™ will be fed 1,600 scfm of aeration air from an air blower common to the 4 ICB™ bioreactors in a module. Hydrolysate will be fed to an ICB™ bioreactor, along with nutrients and water. Air will be sparged through the bottom of the ICB™ bioreactor. Microbes in the ICB™ bioreactor will metabolize the organics in the hydrolysate, including the TDG. The waste produced by the microbes will consist of carbon dioxide, water, biomass, and sulfuric acid. Caustic (18 wt.% NaOH) will be added on a control loop to neutralize the sulfuric acid maintaining the pH in the neutral range. The products of the neutralization will be sodium sulfate and water. The ICB™ bioreactor is depicted in **Figure Attachment D-1-8**.

The ICB™ Modules will be located in the BioTreatment Area outside the MDB. Each module will vent excess air, carbon dioxide, and water vapor to the ICB™ Offgas Treatment System.

2.2.19 Water Recovery System (Drawing AAC-44-F-060)

A liquid effluent with dissolved salts (brine) and suspended solids will be produced by each ICB™ bioreactor. Normally in a water treatment process, the next step will be the water recovery. The Water Recovery System will separate the suspended solids from the brine. Testing has shown that the low concentration of suspended solids in the ICB™ bioreactor effluent will allow the water recovery step to be bypassed. The decision to delete the Water Recovery System will be made at a later date, so it is included in this process description.

A conditioning polymer will be injected into the effluent. The stream will pass through a static mixer and will be fed to one of two Clarifiers (060-CLAR-101/102). A clear liquid effluent will be withdrawn from the top of each Clarifier and pumped to the Evaporator Feed Tank (090-TANK-101), where it will be processed in the Brine Reduction Package. The suspended solids will settle to the bottom of the Clarifier. This sludge will be pumped through a static mixer to one of two Thickening Tanks. A preconditioning polymer will be injected into the sludge upstream of the mixer. The sludge/polymer mixture will be pumped through another static mixer to a filter press. A dewatering chemical will be injected into the sludge/polymer upstream of the mixer. The entire mixture will be processed through the Dewatering Filter Press (090-FILT-101/102). The liquid filtrate that will pass through the filter press will be recycled to the Clarifiers. The solids that build up on the filter press will be collected in roll-off containers, stored in the RHA, and sent offsite as solid waste.

2.2.20 Brine Reduction Package (100-PKG-101); Drawing AAC-44-F-100, Sheets 1 and 2

There will be one Brine Reduction Package (100-PKG-101) located in the Process Auxiliary Building (PAB). The Brine Reduction Package will consist of a Brine Concentrator Flash Drum (EVAP-102), an Evaporator/Crystallizer (EVP-101), a Solids Dewatering Unit (FILT-101/102), and related tankage. The Brine Reduction Package will accept the clear effluent from the top of each Clarifier. It will desalinate the water and recycle it to the Process Water Tank. Solids crystallized in the Brine Reduction Package will be dewatered, stored in the RHA, and sent offsite to a permitted TSDF. Dewatered solids leaving the Brine Reduction Package have approximately 30 percent water content and no free liquid. The designed system will produce water with a salt content of less than 250 parts per million (ppm).

To aid in description of the Brine Reduction Package, the package is divided into the Brine Concentrator, Evaporator/Crystallizer, and the Solids Dewatering Unit.

2.2.20.1 Brine Concentrator; Feed Preheater (EXCH-103), **Deaerator** (DEAT-101), **Brine Concentrator Condenser** (COND-102), **Brine Concentrator Flash Drum** (EVAP-102), **Vapor Compressor** (COMP-102); Drawing AAC-44-F-100, Sheet 1

The brine first will be fed to a Caustic Mixing Tank. Caustic (18% NaOH) will be added to adjust the pH of the solution to the neutral range. The solution will pass through a Feed Preheater, where it is heated to 210°F. The heating medium will be hot water recovered from the Brine Concentrator. The feed will pass through a Deaerator, which will be heated by the vent gases from the Condensate Drum. The Deaerator will vent to one of the ICB™ Offgas Treatment Systems. The salt solution will be gravity fed to the Brine Concentrator.

The Brine Concentrator will recover 80 percent of the water from the salt solution. It will consist of a falling film shell and tube condenser called the Brine Concentrator Condenser. The condenser will be mounted on top of a tank called the Brine Concentrator Flash Drum. A demister will be provided between the condenser and flash drum to prevent salt carryover to the Vapor Compressor.

The salt solution will be pumped into the flash drum. A portion of the flash drum bottoms will be pumped to the top of the condenser and discharged into the tubes. Steam will be fed to the top of the condenser, shell side. The salt solution will fall downward through the vertical tubes, absorbing heat from the steam condensing on the tube walls. The hot solution will pass through the demister entering the flash drum.

The condensed steam will flow down the outside of the vertical tubes to the bottom of the tube sheet. The steam condensate will flow to the Condensate Drum exiting the Brine Concentrator.

The flash drum will contain brine. It will be heated by the hot solution flowing down from condenser tubes. This will produce steam inside the flash drum. The steam will rise to the vapor space of the flash drum, past the demister. A compressor will draw steam from the flash drum vapor space. The steam will be discharged from the compressor into the top of the condenser, shell side, where it will join fresh plant steam in heating the solution in the tubes.

The hot water in the Condensate Drum will be a combination of recovered water from the brine and fresh plant steam condensate. The hot water will be pumped from the Condensate Drum through the Feed Preheater, where it will be cooled by the brine feed. This recovered water will continue to the Process Water Tank.

The flash drum will contain brine with a much higher salt concentration than the original Brine Concentrator feed. The flash drum bottoms will be pumped either to the condenser tubes or to the Evaporator/Crystallizer Feed Tank.

2.2.20.2 Evaporator/Crystallizer; Evaporator Feed Heat Exchanger (EXCH-101), **Evaporator/Crystallizer** (EVP-101), **Evaporator Regenerative Heat Exchanger** (EXCH-102); Drawing AAC-44-F-100, Sheet 2

The concentrated brine from the Brine Concentrator unit will be fed to the Evaporator/Crystallizer (EVP-101) via the Evaporator/Crystallizer Feed Tank (TANK-108) to recover the remaining water in the brine and to crystallize the solids for dewatering. Feed to the Evaporator/Crystallizer will be pumped through the Evaporator Feed Heat Exchanger (EXCH-101) to the suction of the Recycle Pump (PUMP-101). In addition to the feed stream from the Brine Concentrator, the filtrate from the Solids Dewatering Unit (FILT-101/102) also will be pumped to the suction of the Recycle Pump (PUMP-101). The Recycle Pump (PUMP-101) will circulate the evaporator bottoms through the Evaporator Regenerative Heat Exchanger (EXCH-102) to exchange heat with the compressed vapors from the Vapor Compressor (COMP-101). The brine will reach the flashpoint of water in the heat exchanger. When the brine is discharged into the Evaporator/Crystallizer (EVP-101) steam will flash off. The steam will be withdrawn from the top of the Evaporator/Crystallizer by the Vapor Compressor (COMP-101). Note that a mist eliminator (or valve tray) will be provided in the top of the Evaporator/Crystallizer to prevent solid salt carryover to the compressor. The Vapor Compressor compresses the steam to approximately 15 psig, superheating it. The superheated steam will be used as the heat transfer medium in the Evaporator Regenerative Heat Exchanger (EXCH-102). In this exchanger the steam will lose its superheat, condense, and through a collecting pipe will be transferred to the Condensate Tank (TANK-101). The tank will be connected to the Vent Condenser (COND-101) that will condense most of the vapor released from the tank and return it to the tank. The remaining vapor that will consist of mainly noncondensable gases will be discharged to the ICB™ CATOX® system.

Once steam flashes off forming the Evaporator/Crystallizer (EVP-101) top product, the salt concentration in the remaining brine is high enough to form salt crystals. This brine slurry falls to the bottom of the Evaporator/Crystallizer (EVP-101). From there it is pumped to the Slurry Tank (TANK-105), where it is stored as feed for the Solids Dewatering Unit (FILT-101/102).

Organics present in the ICB™ effluent will be high boiling point components that are expected to end up in the solid cake produced in the unit. However, the combined vent stream from the Evaporator/Crystallizer unit will be directed to the suction of one of the ICB™ CATOX® units. So that any trace of noncondensable organic compounds present in this stream will be destroyed by the CATOX® prior to discharge to the atmosphere.

2.2.20.3 Solids Dewatering Unit (FILT-101/102); Drawing AAC-44-F-100, Sheet 2

The solid separation unit considered for this process at this stage will be a pressure filter. The Oberlin or an equivalent pressure filter is common in the industry for separation of solids in water treatment facilities. The system will consist of a Slurry Tank (TANK-105), the Solids Dewatering Unit (FILT-101/102), a Filtrate Tank (TANK-102), Filtrate Pump (PUMP-103), and roll-off bin or dump truck for collecting the solids. The slurry will flow from the Slurry Tank (TANK-105) to the filter (FILT-101/102) via the Slurry Pump (PUMP-106). The recovered liquid will be collected and drained out to the Filtrate Tank (TANK-102) and returned to the evaporator column via the Filtrate Pump (PUMP-103). The solids will contain about 30 wt.% moisture as they leave the filter. The solid cake will be conveyed to a roll-off container and stored at the RHA, pending shipment offsite to a permitted TSDF.

2.2.21 Spent Decon Holding Tank System (030-TANK-105/106/107); Drawings APU-01-D-534 and APU-01-D-535

The Spent Decon Holding Tank System consists of three Spent Decon Holding Tanks (030-TANK-105/106/107), three Spent Decon Holding Tank Agitators (030-AGIT-105/106/107), and six Spent Decon Feed Pumps (030-PUMP-105/106/107/115/116/117).

The sumps used to collect the spent decontamination solution will be located in the equipment decontamination/access airlocks, Toxic Room, ANRs, hydrolysate tank room, Munitions Demilitarization Machine area, TMA, ECR, ECR Vestibule (ECV), ENR, MDB Laboratory area, MPT room, MPT Offgas Treatment System, CST room, CST Offgas Treatment System, PRR, UPA, [Hydraulic Equipment Room and compressor], and MPT/CST condensate tank room. Each sump will have an actual capacity of 200 gallons. The spent decontamination solution will be pumped from these sumps by the corresponding sump pumps to the ANR Spent Decon Holding Tanks. In the Toxic Room, the sump also will be pumped to the Agent Surge Tank in case of a chemical agent spillage. The spent decontamination solution will be processed through the chemical agent hydrolysis reactors, as needed.

The Spent Decon Holding Tanks will be aboveground tanks constructed of high density polyethylene (HDPE) plastic and lined with carbon steel. One Spent Decon Holding Tank will be located in each of the three ANRs of the MDB.

3.0 VENTILATION SYSTEM

Each building at the PCAPP will have an HVAC system. Personnel buildings will have standard rooftop or central HVAC units. The design of each HVAC system servicing a process building or room will depend on the hazard category of the building or room. **Table Attachment D-1-1**[2] depicts each PCAPP unit or area discussed in this attachment, its location, and corresponding ventilation category. **Table Attachment D-1-2** depicts the MDB and PAB, their corresponding rooms, and the rooms' ventilation categories.

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[2] All tables are located at the end of this attachment.

The MDB and PAB will be divided into areas defined by hazard categories based on the anticipated type and degree of contamination as follows:

Category A: Areas that have a high probability of contamination, either liquid or vapor agent, negative pressure relative to atmosphere.

Category A/B: Areas with a high probability of agent vapor contamination and under certain process operating conditions assumed to be contaminated with liquid agent, negative pressure relative to atmosphere.

Category B: Areas with a high probability of agent vapor contamination resulting from routine operations, negative pressure relative to atmosphere.

Category C: Areas with a low probability of agent vapor contamination, negative pressure relative to atmosphere.

Category D: Areas that are unlikely to ever have agent contamination, atmospheric pressure.

Category E: Areas kept free from any chance of agent contamination barring a major event, air supply to the building or room is filtered through activated carbon to protect workers in the event of an accidental release of chemical agent, positive pressure relative to atmosphere.

Buildings with areas defined as hazard Category A-C will have ventilation systems for air supply and exhaust. In addition to controlling room temperature, room pressure and air flow, these HVAC systems will confine contaminants to specific areas and minimize contamination spread due to agent leak. These ventilation systems will:

- Collect, treat, and monitor ventilation from the work area that may contain chemical agent vapors prior to being exhausted to the ambient air

- Provide mixing of air that is essential for monitoring work areas with chemical agent detection devices

- Provide a negative pressure within the work areas to eliminate escape of chemical agent vapors.

Carbon adsorption has been the historical method of choice for treating air-contaminated chemical agent vapors. Carbon has a high capacity to adsorb and retain the chemical agent vapors.

3.1 MDB Ventilation Systems

The MDB will have areas ranging from hazard Category A to E. Category A-C areas of the MDB will be kept under negative pressure in such a way that the areas of the highest potential contamination will be at a greater negative pressure than the lower contamination level area. Thus, the air always will flow from cleaner areas (hazard Category C) to the more contaminated areas (hazard Category A). Finally, the air will be collected from the more contaminated areas and pass through a ventilation filter system before being exhausted to the atmosphere. The MPT and CST Offgas Treatment Systems will discharge to rooms that are filtered through the MDB ventilation filtration system. This exhaust stack will be a source of significant emissions.

The walls, floors, and ceilings of the MDB will be sealed to prevent migration of vapor or liquid agent. Contamination spread through doorways will be prevented by the use of airlocks. Category A-C areas will have special coatings applied to building surfaces for protection from agent and subsequent decontamination solution. Area layout will conform to the human factors engineering requirement for personnel in DPE.

MDB hazard Category A-C areas will have air supply and exhaust HVAC systems. Air supply will be taken directly from the outside through an air-tempering hot water coil. The air then will be passed through two particulate filters. Next, the air will be heated by a hot water coil or cooled by chilled water to the temperature desired for discharge to the Mechanical Equipment Room. Air will be supplied to other areas via ductwork.

The exhaust HVAC system will have twelve filtration trains in parallel, 10 in operation at any given time, one assumed to be undergoing maintenance, and one spare on standby. Exhaust air will be ducted from the MDB through a manifold, then to the exhaust filter trains. The first bank of each filter train will remove any gross particulates. The second bank will be a high efficiency particulate air (HEPA) filter. An activated carbon filter bed will be third. The second through sixth activated carbon banks will be backup to avoid agent breakthrough in the event the first carbon bank becomes saturated. The final bank will be a HEPA filter to collect any fine particles that erode from the carbon filters.

Prefilters and HEPA filters will be changed when the pressure drop across the filter element exceeds 10 inches of water column. Automatic Continuous Air Monitoring System (ACAMS) will sample for agent between the first and second banks of carbon filters in each train. When the ACAMS alarm, the carbon filters are changed. Redundant analyzers will be provided at the second, third, fourth, and fifth banks of carbon filters, as well as at the common exhaust discharge stack to warn of agent breakthrough in the event that a filter unit mounted analyzer fails. The MDB ventilation stack will be designed to handle a nominal 156,500 acfm at 5 inches of water column pressure drop across each filtration train.

Category D areas will be provided with independent standard industrial HVAC systems.

Category E area HVAC systems will provide positive pressure to the room or building they service. The air supply will be filtered with activated carbon.

Engineering drawings for the MDB ventilation systems are provided in **Attachment D-3**, Engineering Drawings.

3.2 Chemical Laboratory Ventilation Systems

The Chemical Laboratory (LAB) ventilation air supply and exhaust systems will be similar to the systems provided for the MDB. The MDB process area routinely will be exposed to chemical agents during operations. The carbon filter system for LAB exhausts will undergo only intermittent exposure to low concentrations of chemical agents. The LAB will be an insignificant source of air emissions.

3.3 Personnel and Maintenance Building Ventilation Systems

The Personnel and Maintenance Building will be equipped with particulate and carbon filtration of air supply and exhaust. This filtration will be in place for personnel protection in the event of an agent leak. This building will not be a source of air emissions.

4.0 FILTRATION SYSTEM

Specific areas of the MDB and PAB will be kept under negative pressure in such a way that the areas of the highest potential contamination will be at a greater negative pressure that the lower contamination level area. Thus, the air will always flow from cleaner areas to the more contaminated areas. Finally, the air will be collected from the more contaminated areas and pass through a ventilation filter system before being exhausted to the atmosphere via a stack that will be common to all ventilation filter units. The ventilation filter system will use a series of filter units, with each unit containing a filter train and a motor/blower. The filter train will consist of prefilters; HEPA filters; six banks of activated carbon filters; and finally, a second bank of HEPA filters. Each filter bank will be provided with gauges to indicate pressure drop across the filters. Chemical agent sampling ports will be provided between certain banks of carbon filters and before the exhaust stack. Category E areas will be positive pressure with carbon-filtered supply air. Category D areas will be provided with standard industrial ventilation.

Ventilation flow requirements will vary with each process area. The filter units specified will be a common type for all areas. Air exhausted from the MDB process areas will be collected in a common exhaust duct and will be routed to a bank of parallel filters. The basic filter unit will be a skid-mounted design with welded housing, access doors, interior lighting, and observation and sample ports. This basic unit will be designed to handle a nominal 156,500 acfm at a 5-inch water column pressure drop across each element.

Carbon adsorption has been the historical method of choice for treating air-contaminated chemical agent vapors. The reason for choosing carbon is its high capacity to adsorb and retain the chemical agent vapors.

Pressure drop across each prefilter and HEPA filter element will be measured continuously and inspected daily. Chemical agent monitoring will be performed between the second and third carbon banks, the third and fourth carbon banks, and the fourth and fifth carbon banks. Chemical agent monitoring will be conducted by a single Automatic Continuous Air Monitoring System, connected to a manifold that will sample each location between carbon banks sequentially. The sample locations will be designed to sample the space between carbon banks at 16 points spaced around the frame of the filter housing. This will provide a representative sample of the entire gas stream.

Prefilters and HEPA filters will be changed when the pressure drop across the filter element exceeds a 10-inch water column. Carbon filters will be changed according to the following pattern:

- When chemical agent is detected at the allowable stack concentration between the second and third carbon banks, the first and second carbon banks will be changed within 3 months.

- When chemical agent is detected at the allowable stack concentration between the third and fourth carbon banks, the first three carbon banks will be changed immediately.

5.0 COOLING WATER SYSTEMS

5.1 Process Cooling Water

City water will be used to initially fill the Combinaire Cooling Tower basin and provide makeup water to the cooling tower as needed. The cooling water system will be closed loop through the process, with losses on evaporation. Cooling water will be recirculated from the cooling tower basin to process users and back to the cooling tower at 1,100 gallons per minute (gpm) during normal operation. Cooling water will be supplied to the plant at 60°F and returned to the cooling tower at 101°F.

5.2 Chilled Water

The composition of chilled water will be 40-volume % glycol, balance water. Two chillers will be provided, which will be housed in the PAB. Each chiller will have a heat duty of 0.44 MM BTU/hr. One chiller will be online at a time. During normal operation, 220 gpm of glycol solution will be circulated through the plant users and chiller in a closed loop system. The chillers will be designed to supply 35°F chilled water to the plant with a 45°F return temperature.

5.3 Demineralized Cooling Water System

City water will be demineralized in a package water treatment unit. The demineralized water will be pumped to the two Process Water Tanks for the initial fill and as makeup later on. Among other users, the Process Water Tanks will supply initial fill and makeup water to the Demineralized Water Air Coolers. These cooling towers will supply cooling water to the ERD, BMPT, RMPT, and CST induction coils. The Demineralized Water Air Coolers will be designed to supply 900 gpm cooling water on a closed loop system with a supply temperature of 90°F and return temperature of 100°F.

6.0 PROCESS WATER

Demineralized water will be used as initial fill and makeup water for the Process Water Tanks. During normal operation, the Process Water Tanks will receive water recovered by the Brine Reduction Unit. The two Process Water Tanks will have a capacity of 72,000 nominal gallons each. Process Water will be supplied to:

- Polymer Preconditioning
- Bulk Chemical Storage
- Demineralized Water Air Cooler
- Boiler Feed and Makeup
- Hot Process Water
- Utility Stations
- Decon Hose Stations
- Decon Showers
- Pump Seals
- Gloveboxes.

6.1 Hot Process Water

Process water will be supplied to the Hot Process Water Tank. This 15,650 nominal gallon tank will be equipped with an internal heating coil. The coil will be heated with plant steam. The tank will supply 194°F to the Agent Hydrolysers and the Energetics Neutralization Reactors.

7.0 STEAM SYSTEMS

Two steam boilers will supply saturated steam at 50 psig to the plant. Each boiler will be rated for 16.0 MMBTU/hr duty. They may run simultaneously, depending on plant steam demand. Normally they will be fed natural gas as fuel, with liquefied petroleum gas/air mixture as backup. The boilers will be fed process water, combined with condensate return. The boiler water will be chemically treated with phosphate, sulfite, and amine to control corrosion and scaling. Steam and condensate will circulate through the plant on a closed loop system, with boiler blowdown fed to the Evaporator Feed Tank (090-TANK-101) to be reclaimed in the Brine Reduction Package.

8.0 BULK CHEMICAL STORAGE

Bulk chemical storage will be designed for a minimum of 2 weeks storage capacity for the chemical consumption, based on operation at 80 percent of maximum rate or slightly over 11 days of storage. The Decon Supply Tank will be sized for the full 14 days. Bulk chemical storage will be located in the PAB, and each tank will have a vent that discharges inside the building.

8.1 Sodium Hydroxide

The 50% Sodium Hydroxide Tank (110-TANK-101) will require a working capacity of 10,000 gallons with a design capacity of 12,600 gallons. The tank will be made of stress-relieved carbon steel with design conditions of 3 inches of water column at 225°F.

The 18% Sodium Hydroxide Tank (110-TANK-102) will require a working capacity of 5,600 gallons with a design capacity of 7,050 gallons. The tank will be made of carbon steel with a 5,600-gallon working capacity and design conditions of 3 inches of water column at 225°F. The 18 wt.% solution will be 50 wt.% solution that has been diluted with process water in the Bulk Chemical Storage Area.

8.2 Sodium Hypochlorite

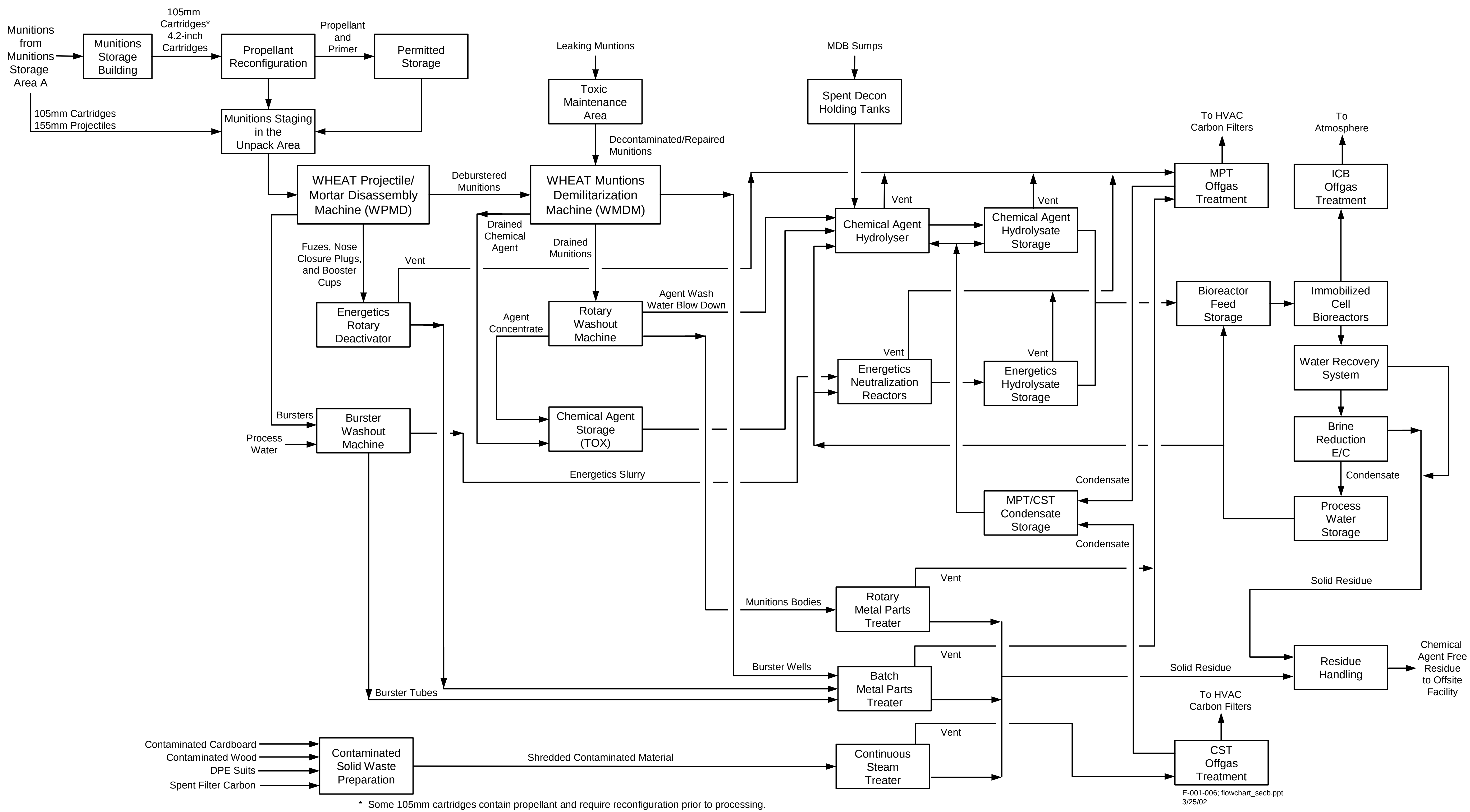
The 12% Sodium Hypochlorite Tank (110-TANK-103) will require a working capacity of 8,000 gallons with a design capacity of 10,000 gallons. The tank will be made of HDPE or fiberglass reinforced plastic with design conditions of 3 inches of water column at 125°F.

8.3 Central Decontamination Supply

The Decontamination Tank (110-TANK-105) [5.5 wt.% sodium hypochlorite (NaOCl)] will require a working capacity of 5,600 gallons with a design capacity of 7,050 gallons. The tank will be made of HDPE with design conditions of 3 inches of water column at 125°F. The 5.5 wt.% NaOCl solution will be 12 wt.% solution that has been diluted with process water in the Bulk Chemical Storage Area.

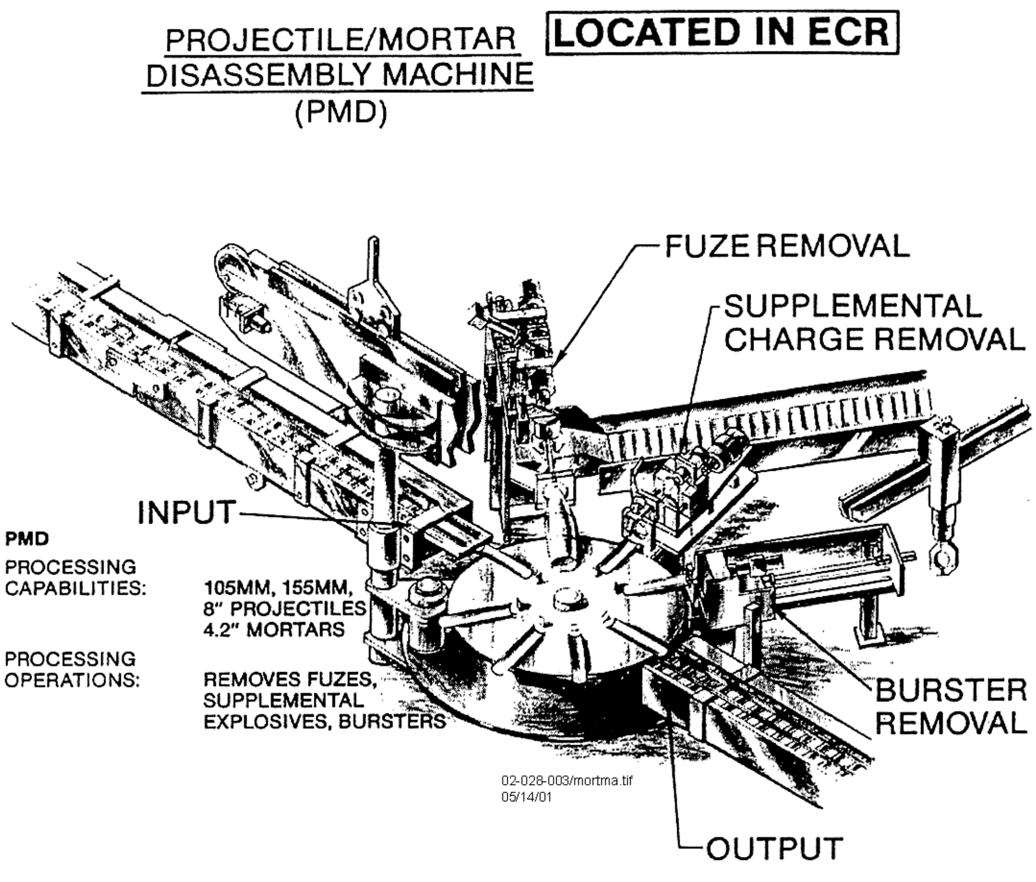
9.0 WASTE STREAMS

For a description of waste streams from the PCAPP system, refer to Section C-1, Waste Characteristics.

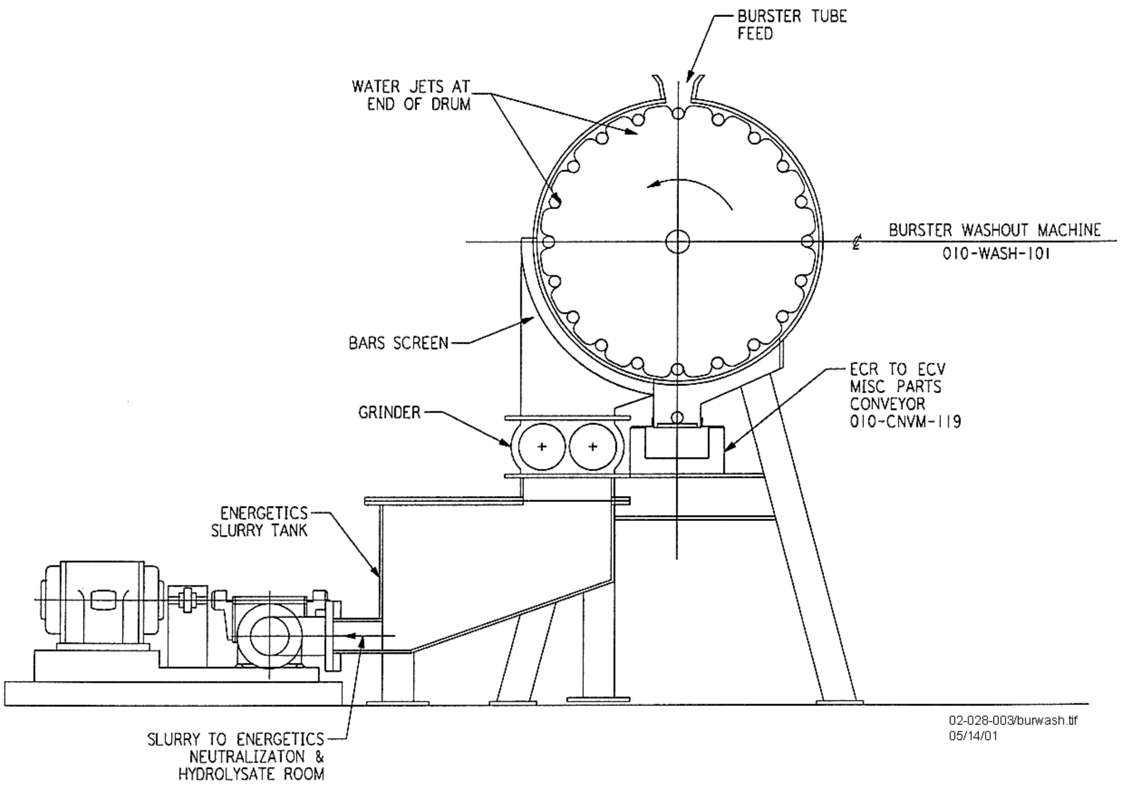


* Some 105mm cartridges contain propellant and require reconfiguration prior to processing.

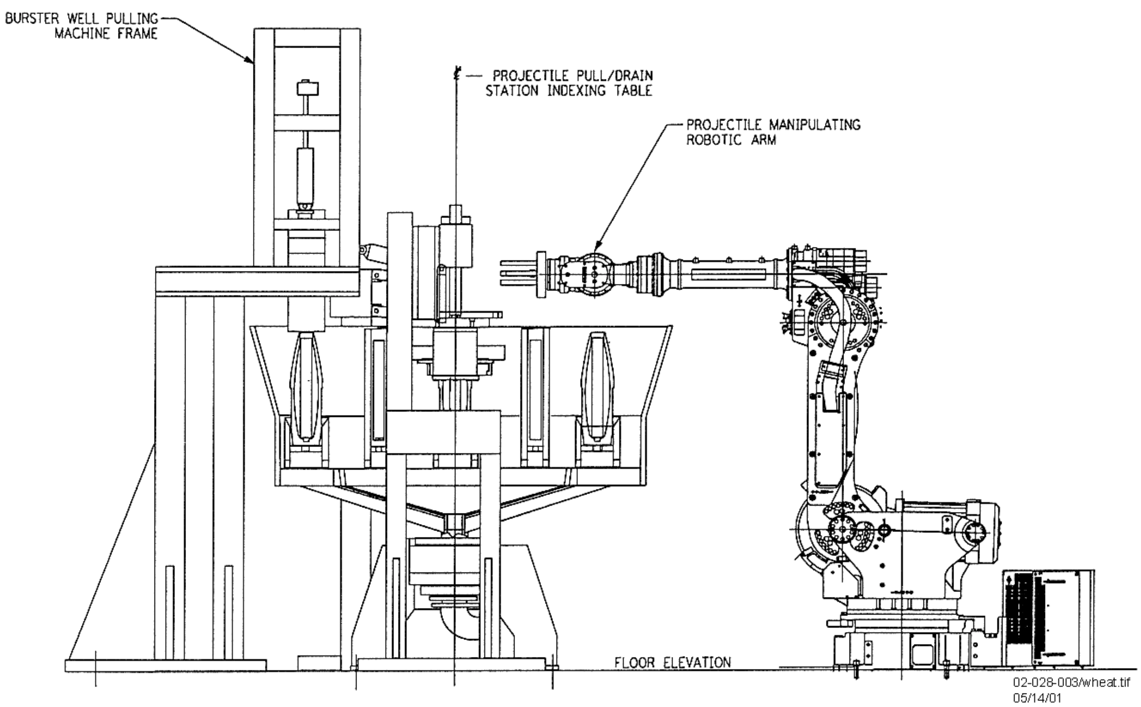
1 Figure Attachment D-1-1. Pueblo Chemical Agent Pilot Plant Process Flow Diagram



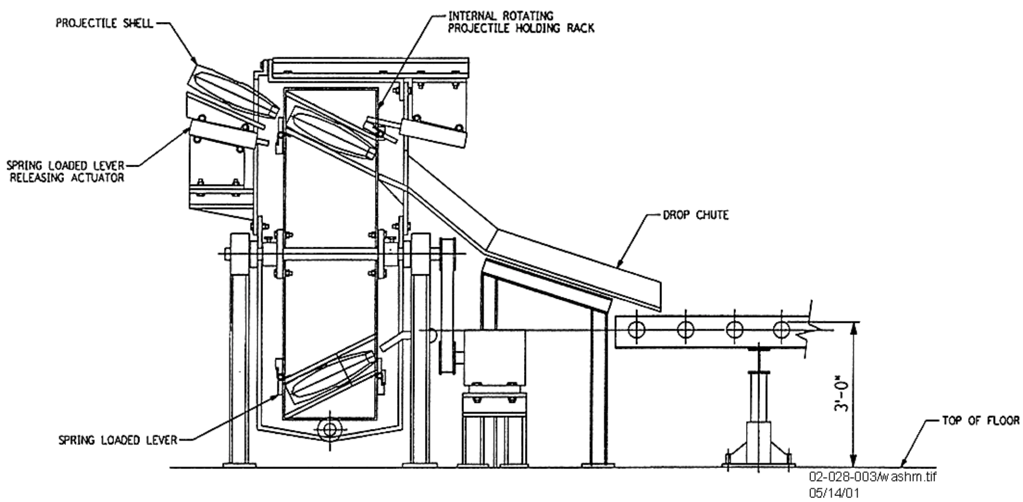
1 Figure Attachment D-1-2. WHEAT Projectile/Mortar Disassembly Machine



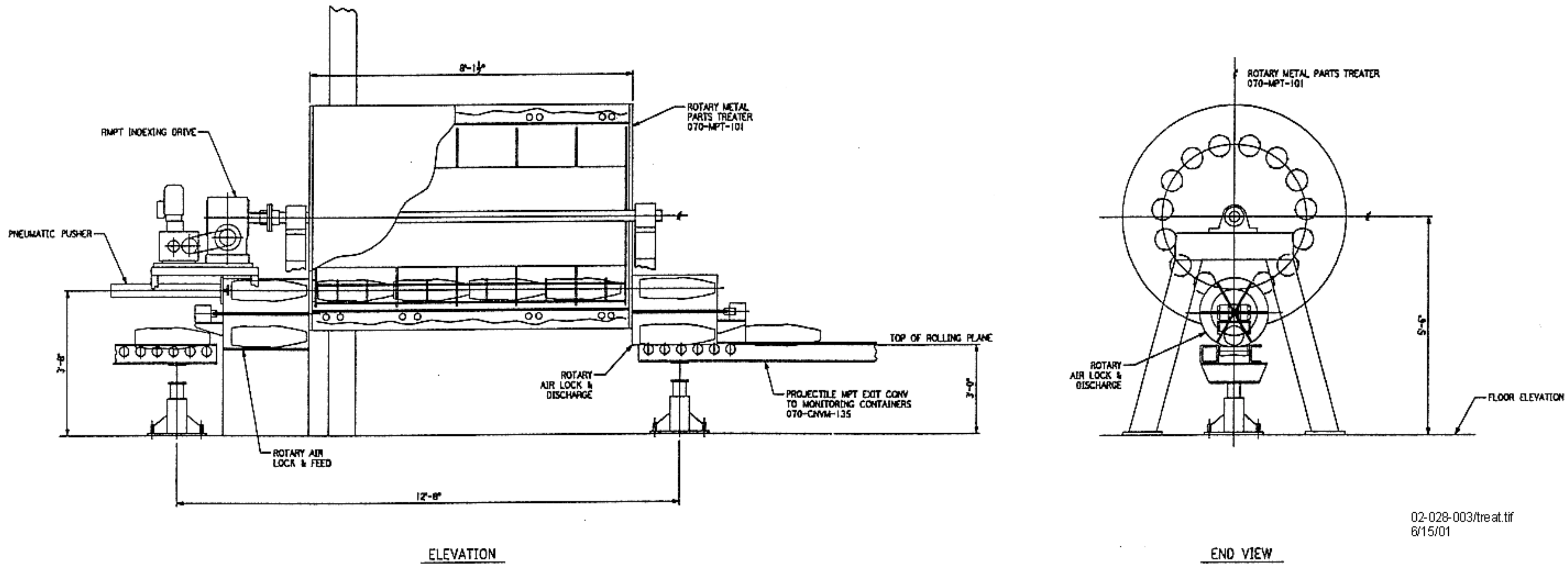
1 Figure Attachment D-1-3. Burster Washout Machine



1 Figure Attachment D-1-4. ACWA WHEAT Munition Demilitarization Machine



1 Figure Attachment D-1-5. Projectile (Rotary) Washout Machine



1 Figure Attachment D-1-6. Rotary Metal Parts Treater

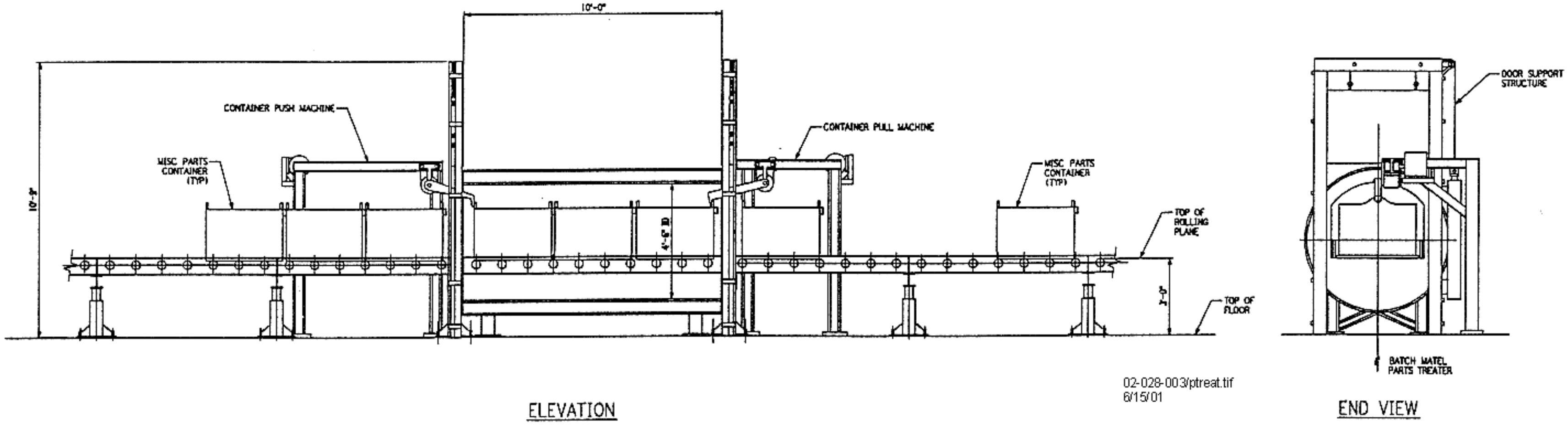
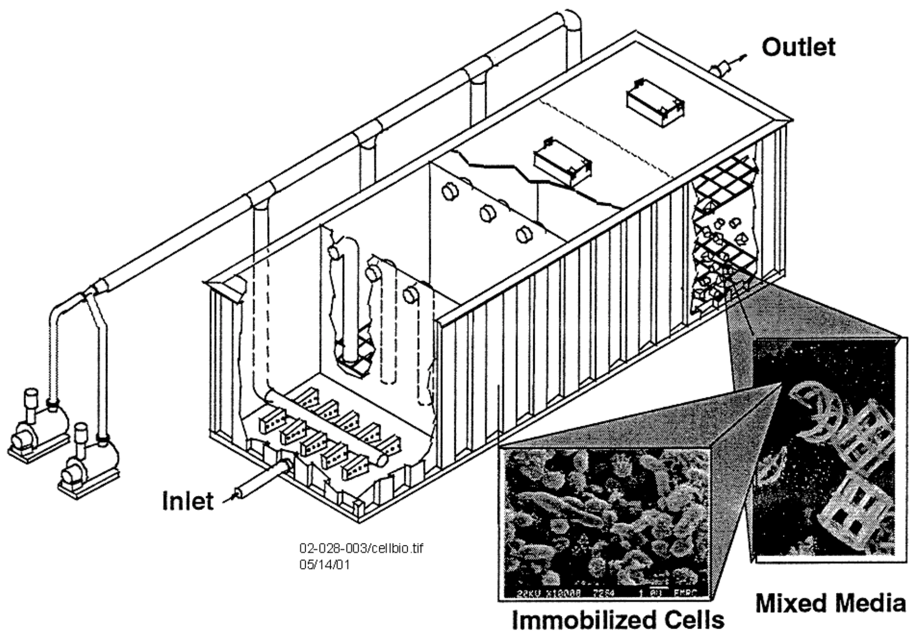


Figure Attachment D-1-7. Batch Metal Parts Treater



1 Figure Attachment D-1-8. Immobilized Cell Bioreactor ICB™

Table Attachment D-1-1. Ventilation Categories

Description	Tag Number	Location		Ventilation Category
		Building	Room	
Unpack Area	--	MDB	UPA	C
Propellant and Primer Removal	--	MDB	PRR	C
WHEAT Projectile/Mortar Disassembly Machine	010-WPMD-101/102	MDB	ECR-1/2	A/B
Energetics Rotary Deactivator	010-ERD-101/102	MDB	ECR-1/2	A/B
Burster Washout Machine	010-WASH-101/102	MDB	ECR-1/2	A/B
Energetics Shredder	010-CRSH-101/102	MDB	ECR-1/2	A/B
Energetics Neutralization Reactors	050-RCTR-101 to 103	MDB	ENR	C
WHEAT Multipurpose Demilitarization Machine	020-WMDM-101/102	MDB	MDMR	A
Rotary Washout Machine	020-RW-101/102	MDB	MDMR	A
Agent Hydrolysers	040-RCTR-101 to 106	MDB	ANR	A
Rotary Metal Parts Treater	070-MPT-101	MDB	MPTR	B
Batch Metal Parts Treater	076-MPT-101	MDB	MPTR	B
MPT Quench Tower	070-TOWR-101	MDB	OTR	C
Plastic Material Shredder	120-SHRD-101	MDB	WSR	B
Wood Material Shredder	120-SHRD-102	MDB	WSR	B
Continuous Steam Treater	075-CST-121	MDB	CST	C
CST Quench Tower	075-TOWR-121	MDB	CST	C
MPT CATOX Treater	080-CATX-101	MDB	OTR	C
CST Offgas CATOX Treater	085-CATX-101	MDB	CST	C
ICB Offgas CATOX Treater	087-CATX-101/102/103/104	BTA	A, B, C, D	
Brine Reduction Package	100-PKG-101	PAB	All	D

Notes:

ANR = Agent Neutralization Room
BTA = BioTreatment Area
CATOX = catalytic oxidation
CST = Continuous Steam Treater
ECR = Explosive Containment Room
ENR = Energetics Neutralization Room
MDB = Munitions Demilitarization Building
MDMR = Munitions Demilitarization Machine Room
MPT = Metal Parts Treater
MPTR = Metal Parts Treater Room
OTR = Offgas Treatment Room
PAB = Process Auxiliary Building
PRR = Projectile Reconfiguration Room
UPA = Unpack Area
WHEAT = Water Hydrolysis of Energetics and Agent Technologies
WSR = Waste Shredding Room

Table Attachment D-1-2. Building and Room Ventilation Categories

Building	Room	Ventilation Category
MDB	Munitions Demilitarization Room	A
MDB	Toxic Room	A
MDB	Agent Neutralization Room	A
MDB	Explosive Containment Room	A
MDB	Toxic Maintenance Area	A
MDB	Agent Neutralization Room	A
MDB	Explosive Containment Vestibule	A/B
MDB	Metal Parts Treater Room	B
MDB	Waste Shredding Room	B
MDB	Loading Area	C
MDB	Unpack Area	C
MDB	Projectile Reconfiguration Room	C
MDB	Hydrolysate Tank Room	C
MDB	Energetics Neutralization Room	C
MDB	Continuous Steam Treater Room	C
MDB	Offgas Treatment Room	C
MDB	Condensate Tank Room	C
MDB	Hydraulic Equipment Room	C
MDB	Observation Corridor	C
MDB	Residue Handling Area	D
MDB	Electrical Rooms	D
MDB	Battery Rooms	D
MDB	Mechanical Equipment Room	D
MDB	Control Room	E
PAB	All Rooms	D

Notes:

MDB = Munitions Demilitarization Building
PAB = Process Auxiliary Building

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