Rotary Metal Parts Treatment System; Rotary Metal Parts Treater (070-MPT-101), **RMPT Effluent Heater** (070-HEAT-101), and **MPT Quench Tower** (070-TOWR-101).

There will be one Rotary Metal Parts Treatment System located in the Metal Parts Treater Room (MPTR) of the MDB. The Rotary Metal Parts Treatment System will receive drained and washed munitions bodies from the RWM (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 (15 minutes at or above 1,000°F) for the munition bodies.

For ease of describing the Rotary Metal Parts Treatment System, the system has been divided into its component parts, the RMPT, the RMPT Effluent Heater, and the MPT Quench Tower.

Rotary Metal Parts Treater (070-MPT-101).

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 mortars and 105mm projectiles will be long enough to hold 10 rounds. Cages for the 155mm projectiles will be long enough to hold seven rounds.

Drained and washed munitions from the RWM (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. The rotation speed for 4.2-inch mortars and 105mm projectiles will be one revolution every 7 minutes and 30 seconds; the rotation speed for 155mm projectiles will be one revolution every 15 minutes. The rotation speed and cage length will set the residence time for each round; 75 minutes for 4.2-inch mortars and 105mm projectiles, 105 minutes for 155mm projectiles.

Munitions leaving the RMPT will pass through one of the Munitions Monitoring Containers (070-MMC-101/102/103) where they will be monitored using a near real-time low-level Automatic Continuous Air Monitoring System (ACAMS) 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 an offsite recycling facility.

A nitrogen purge will remove oxygen from the MPT system, preventing 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 will be fed counter currently to the munitions 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 MPT system: hydrolysis and steam reforming. The hydrolysis reaction forms TDG and HCl,

while the steam reforming reaction forms CO_2, hydrogen chloride, and sulfur dioxide (SO_2) according to the following reaction equations:

(1) Hydrolysis:
$C_4H_8Cl_2S + 2H_2O \rightarrow C_4H_{10}O_2S + 2HCl$

(2) 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 chemical agent destruction and removal efficiency of 99.9999 percent.

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. A chemical agent analyzer downstream of the effluent heater will confirm that the chemical agent has been destroyed. From the RMPT Effluent Heater, the vent stream proceeds to the MPT Quench Tower (070-TOWR-101).

The design throughput for the RMPT will be 120 rounds/hour for 105mm projectiles and 4.2-inch mortars, and 60 rounds/hour for 155mm projectiles. The RMPT uses external induction coils as the primary heat source, with a process heat load of 250 kilowatts (kW) (installed duty 450 kW). The dimensions of the RMPT will be 4 feet 8 inches ID by 15 feet 7 inches with design conditions of 15 psig/full vacuum at 1,500ºF. The RMPT will be constructed of Hastelloy® C-276.

RMPT Effluent Heater (070-HEAT-101).

There will be one RMPT Effluent Heater (070-HEAT-101). It will be located in the MPTR in the MDB. The area category of the MPTR will be B. The secondary containment capacity of the MPTR will be 2,929 gallons.

The RMPT Effluent Heater (070-HEAT-101) will be used to heat the RMPT vent stream to approximately 1,200°F to ensure total destruction of chemical agent present in the vent gas via the steam reforming reaction. The unit will be a manufacturer's standard unit designed for 25 kW, 15 psig/full vacuum at 1,500°F with a capacity of 50,000 British thermal units per hour (Btu/hr) and a residence time of 0.5 second.

MPT Quench Tower (070-TOWR-101).

There will be one MPT Quench Tower (070-TOWR-101), which will be located in the OTR of the MDB. The area classification of the OTR is B.

There will be one MPT Quench Tower (070-TOWR-101). It will be located in the 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 psia), 15 psig/full vacuum at 175°F with tower dimensions of 1 foot 6 inches ID by 12 feet 0 inch T/T.

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.

Batch Metal Parts Treatment System; BMPT (076-MPT-101), and **BMPT Effluent Heater** (076-HEAT-101).

The Batch Metal Parts Treatment System will be located in the MPTR of the MDB. The purpose of the Batch Metal Parts Treatment System will be to accomplish 5X decontamination (1,000°F maintained for 15 minutes) for metal strapping, burster wells, burster tubes, fuzes, booster cups, nose closure plugs, and other miscellaneous parts from projectile disassembly. To aid in

describing the Batch Metal Parts Treatment System, the description has been divided into separate descriptions for the BMPT and the BMPT Effluent Heater.

BMPT (076-MPT-101).

The BMPT will be a horizontal, cylindrical heater with an internal conveyor. The dimensions of the BMPT will be 4 feet 8 inches ID by 11 feet 0 inch with design conditions of 15 psig/full vacuum at 1,500°F. There will be sealed doors on each end. Each batch will process three Energetics Parts Containers, measuring 3 feet by 3 feet by 2 feet. The parts containers will be placed on a roller conveyor and positioned against the inlet door of the BMPT. A push machine will feed the three containers into the heater.

The BMPT will use external induction coils as the primary heat source with a heat load of 450 kW, and superheated (1,000°F) steam as a reactant and carrier gas. Prior to starting the induction coils, the process will be purged with nitrogen to remove oxygen from the system. This will prevent thermal formation of NO_x and N_2O in the high temperature environment. The discharge door will be interlocked with the temperature control system. The interlock will prevent the discharge door from opening if the minimum required temperature (1,000°F) has not been met.

Steam and noncondensable gases will be vented from the BMPT to an effluent heater. The BMPT Effluent Heater will be used to heat the vent gas to 1,250°F, destroying any residual chemical agent via the steam reforming reaction. A chemical agent analyzer on the discharge of the reheater will confirm chemical agent destruction. Effluent heater discharge vent gases will continue on to the MPT Quench Tower (070-TOWR-101).

After processing is complete, the system will be purged with nitrogen. An analyzer on the vent line will measure chemical agent concentration. Once it has been confirmed there is no chemical agent detected, a pull machine will discharge the containers from the BMPT. The parts will be sent offsite to a metal recycling facility.

The BMPT Steam Superheater (076-HEAT-102) will be used to supply 1,000°F superheated steam to the BMPT. The unit will be a packaged, manufacturer's standard unit designed for 50 kW, 15 psig/full vacuum at 1,500°F with a capacity of 138,000 Btu/hr.

BMPT Effluent Heater (076-HEAT-101).

The BMPT Effluent Heater (076-HEAT-101) will be used to heat the BMPT effluent to approximately 1,200°F to ensure total destruction of chemical agent present in the vent gas via the steam reforming reaction. Discharge vent gases will be sent to the MPT Quench Tower. The unit will be a manufacturer's standard unit designed for 50 kW, 15 psig/full vacuum at 1,500°F with a capacity of 94,000 Btu/hr and a residence time of 0.5 second.

MPT and CST Offgas Treatment System;

The MPT and CST Offgas Treatment System will consist of two subsystems, one servicing the MPT and the other servicing the CST.

MPT Offgas Treatment; MPT Offgas Reheater (080-HEAT-106), **MPT Offgas CATOX® Treater** (080-CATX-101), and **MPT Offgas Cooler** (080-EXCH-102);

The MPT Offgas Treatment subsystem will be located in the OTR. The area category of the OTR will be C. The secondary containment capacity of the OTR will be 5,296 gallons.

The MPT Offgas Reheater (080-HEAT-106) will receive incoming gases from the MPT Condensate Surge Tank vent, the Agent Hydrolysers, and the Agent Hydrolysate Holding Tank vents. The reheater will heat the mixed stream electrically (using electric induction coils) to reduce moisture content and condition the gas streams to the CATOX® operating temperature of 800°F to 840°F. 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.

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 Honeywell catalytic matrix destroying residual volatile organic compounds (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 to 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 cool the stream to 150°F before it enters 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 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 BHP, 100 HP.