2.0 HEAT RECOVERY COKE PLANT DESCRIPTION

A total of 100 ovens are planned at MCC. They will be arranged in three batteries – one with 20 ovens and two with 40 ovens each. At design capacity, the facility will carbonize 910,000 tons/year of coal and produce up to 614,000 tons/year of furnace coke.

MCC will use SunCoke Energy's Jewell-Thompson heat recovery type of oven. In coke production from both heat recovery and byproduct ovens, the volatile fraction of the coal is driven off in a reducing atmosphere. Coke is essentially the remaining carbon and ash. With byproduct ovens, the volatiles and combustion products are collected downstream of the oven chamber and refined in a chemical plant to produce coke oven gas and other products such as tar, ammonia, and light oils. In heat recovery ovens, all the coal volatiles are oxidized within the ovens.

Each technology has its own set of design objectives that affect its emissions. Both types of ovens are typically constructed of refractory brick shapes and other materials that, with day-to-day operation, can form small cracks in the refractory and around the removable parts. Byproduct ovens are kept at a positive pressure to avoid oxidizing recoverable products and overheating the ovens. Heat recovery ovens are kept at a negative pressure, adding air from the outside to oxidize volatile matter and release the heat of combustion within the oven system. This opposite operating pressure condition and combustion within the oven system are important design differences between heat recovery ovens and byproduct ovens. Small openings or cracks in byproduct ovens allow raw coke oven gas (and hazardous pollutants) to leak into the atmosphere. The openings or cracks in the heat recovery ovens simply allow additional air to be drawn into the oven.

Figure 2-1 shows a cut-away drawing of a heat recovery oven. Coal is charged onto the oven floor at the beginning of the cycle. Heat from the hot refractory starts the carbonization cycle. Air is first introduced into the oven crown. Partially combusted gases pass into a sole flue system beneath the oven floor where essentially all combustion is completed. The gases then pass into an afterburner tunnel where any remaining uncombusted gases are oxidized. The afterburner tunnel system routes the hot gases to the HRSGs.

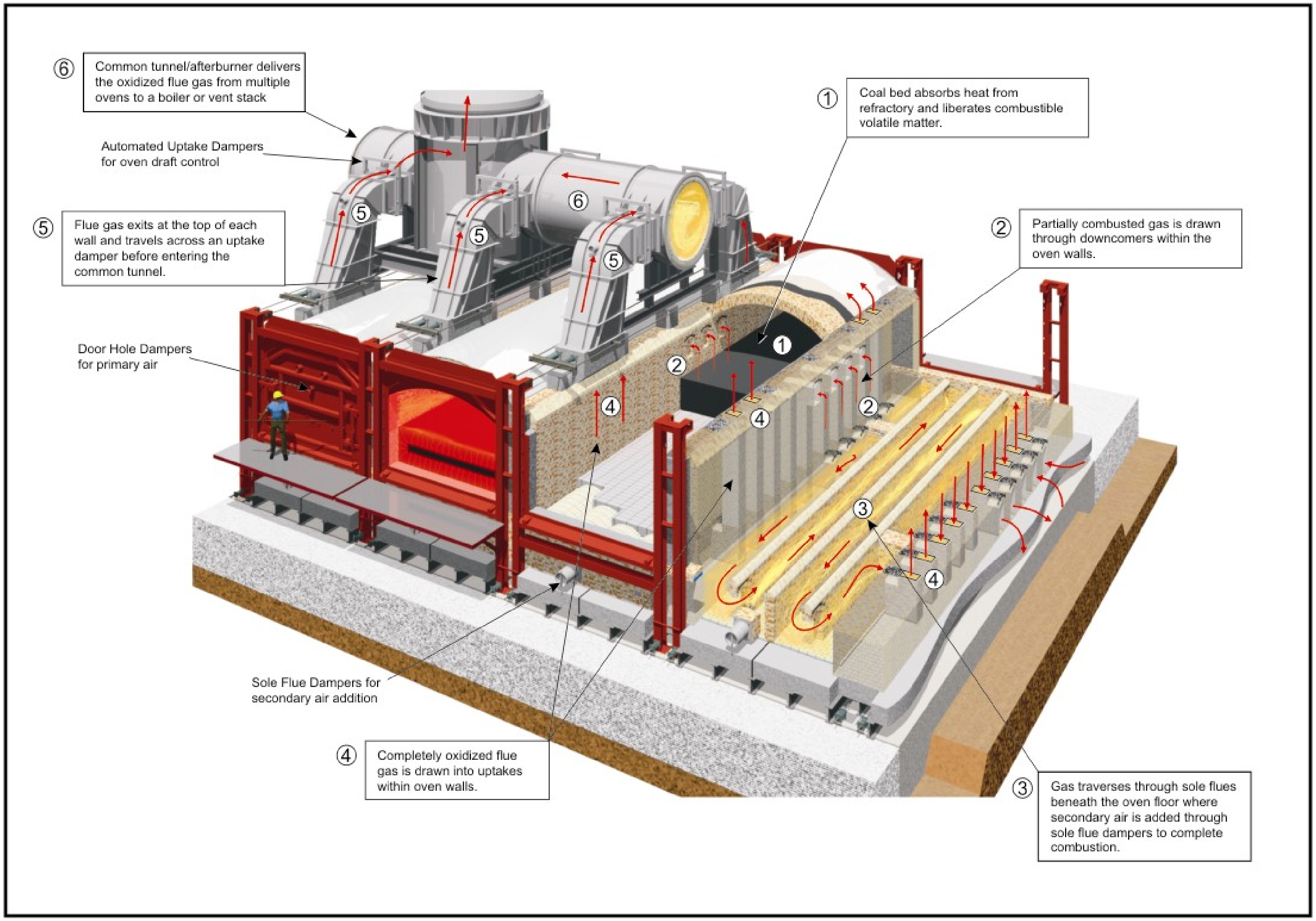


Figure 2-1. Sun Coke Heat Recovery Oven Diagram

Coal will come into the facility by rail. A “thaw shed” will be installed that can heat the coal cars, as needed, on extremely cold days. Coal will be stored in open piles equipped with watering systems to minimize emissions. Emissions from material transfer will be controlled by enclosures except in a few areas where the potential to overheat coal or interfere with dispersion of steam from coke may pose a safety hazard. A traveling hood/baghouse system on the pushing/charging machine will control charging emissions that escape the ovens. HRSGs will recover heat from the oven waste gases and protect the downstream pollution control devices. Particulate matter (PM) and sulfur dioxide (SO_2) will be removed from the oven gases in a lime spray dryer/baghouse system. A mobile flat hot push car with multicyclone will capture pushing emissions. Quenching will be performed in a conventional quench tower with baffles. Quenching emissions will be controlled by using water with total dissolved solids (TDS) levels less than or equal to 1,100 mg/L for quenching and by a unique baffle design. A baghouse will control emissions from the coke screening and crushing facilities. Coke will normally be transferred directly to AK by conveyor, but a system to allow coke to be loaded into rail cars will be installed. Provision will be made to store coke in an open coke pile under emergency situations. Plant roads will be paved to control PM.

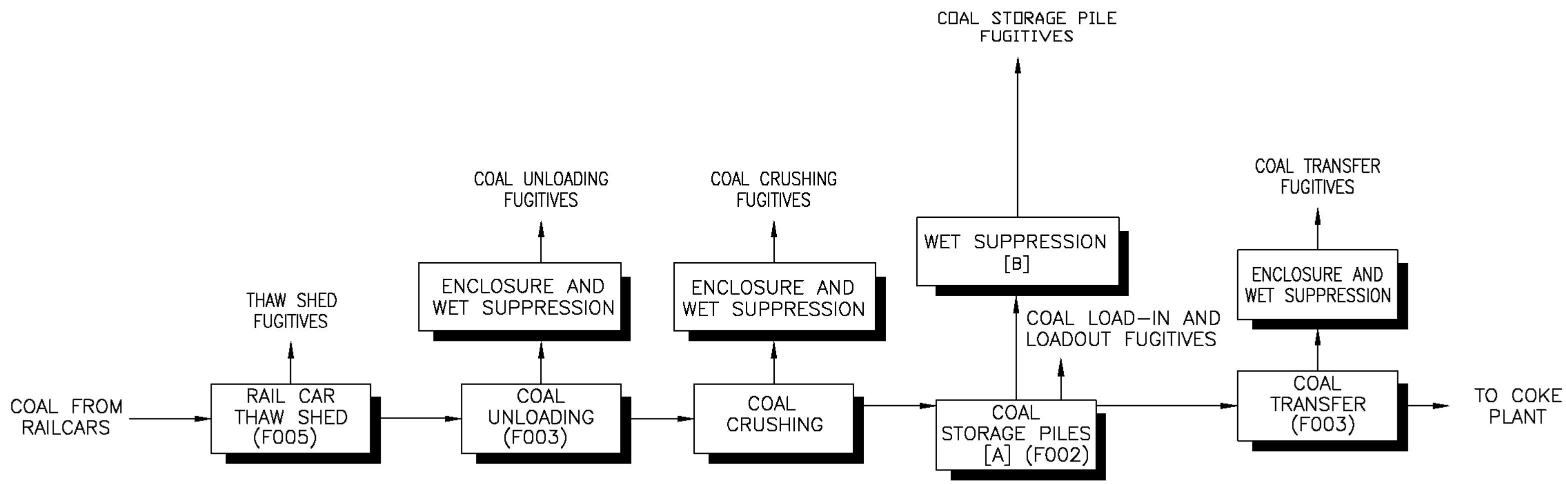
The individual waste heat stacks will be used during annual inspection and maintenance of each HRSG so that these procedures can be performed safely. The maximum time that will be required for maintenance and inspection of each HRSG is 10 days/year. The planned outages will be scheduled so that the HRSGs are brought down one at a time for maintenance and inspection. During the scheduled maintenance, 20 ovens will vent waste gases directly into the atmosphere, bypassing the flue gas desulfurization (FGD)/fabric filter system. These gases will still pass through the common tunnel afterburner system, which will fully combust the gases prior to release into the atmosphere. The remaining 80 ovens will continue to pass through the spray dryer/baghouse. On an annual basis, 96% of the waste gases from the ovens will pass through the spray dryer/baghouse.

The spray dryer/baghouse will be designed so that much of the routine inspection and maintenance can be performed while the system is operating. For example, the rotary atomizers can be exchanged during operation, and external components such as hopper heaters, level detectors, filter bag cleaning system can all be inspected and replaced during normal operation.

The baghouse will have extra compartments so that some can be offline during operation, allowing filter bags and cages to be inspected and replaced when necessary. In addition, there will be three fans so that there will be a spare as well as one offline for inspection and maintenance.

The proposed supplier of this equipment (Hamon Research-Cottrell) recommends an annual internal inspection for spray dryer/baghouse installations at coal-fired power plants. Quick inspections are also needed during unexpected plant forced outages. Recognizing the more challenging service for a heat recovery coking facility, they recommend an aggressive preventive maintenance program for optimum performance that will promote the maximum effective service life of all components. As such, MCC proposes 5 days/year for inspection/maintenance of the spray dryer/baghouse. This work will be performed using good work practices and scheduling the work to be performed in the shortest possible time. The five waste heat stacks will be open during these 5 days so that the work can be performed safely and the ovens will remain hot and the oven pressures will remain negative.

The process is illustrated schematically in Figures 2-2 through 2-4. Figure 2-2 shows the coal processing, Figure 2-3 shows the coke plant, and Figure 2-4 shows the coke processing. Figure 2-5 shows the plant layout.

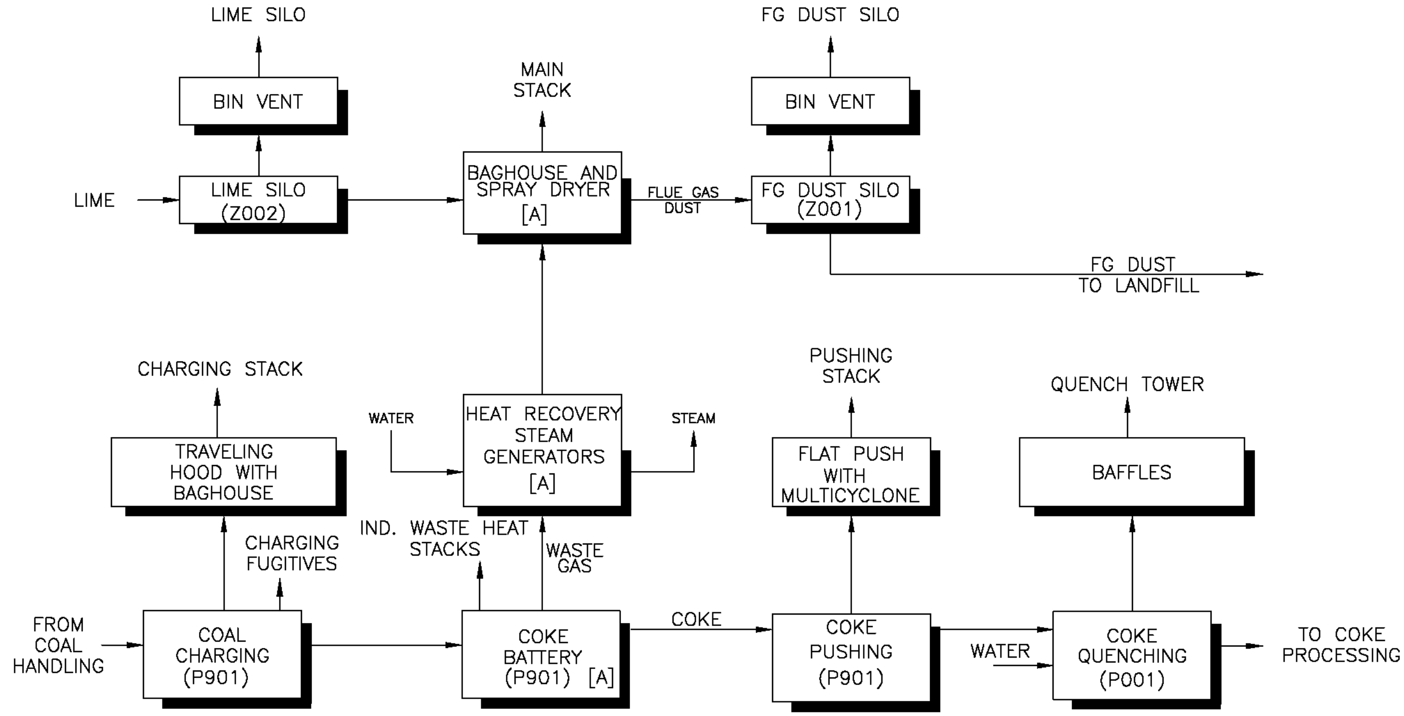


NOTE:

[A] COAL STORAGE PILE INCLUDES COAL LOAD-IN FUGITIVES, COAL PILE FUGITIVES, AND COAL LOADOUT FUGITIVES.

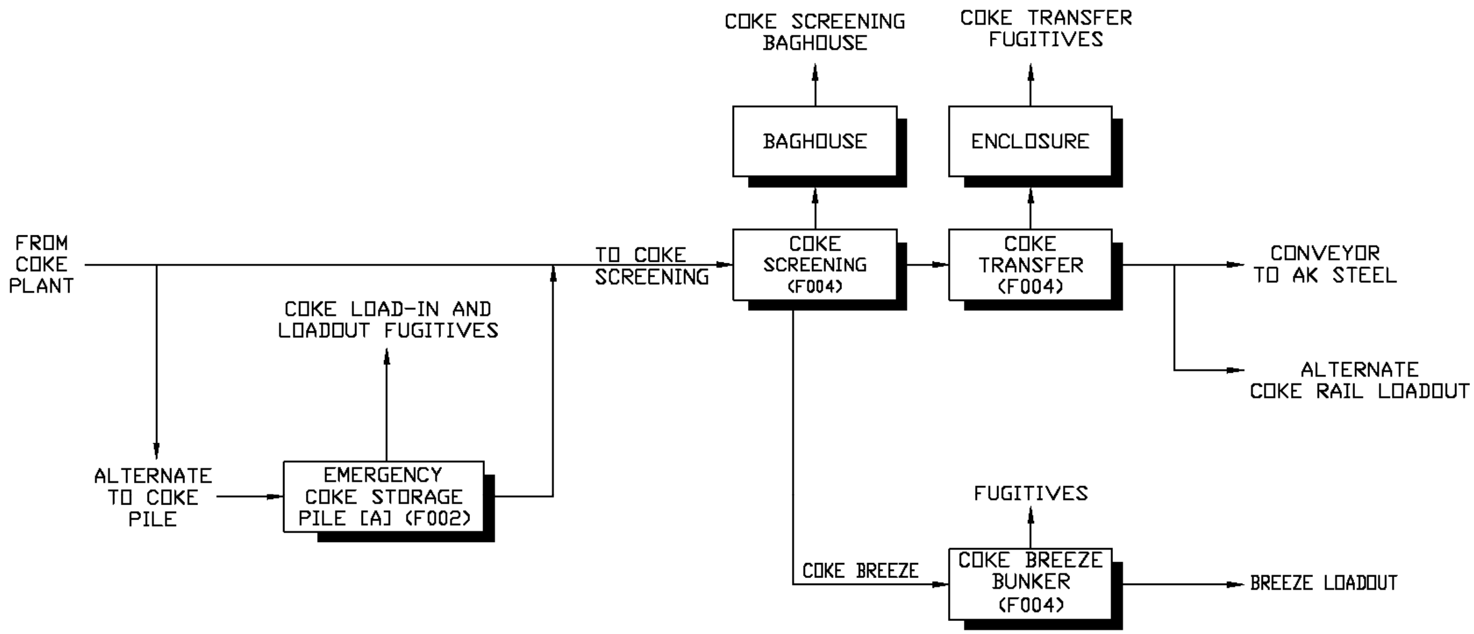
[B] OPEN PILE WITH WET SUPPRESSION.

URS 1093 Commerce Park Drive, Suite 100 Oak Ridge, Tennessee, 37830	Figure 2–2 Coal Processing Flow Diagram Middletown, OH	REVISION: 0 DATE: 08/23/07	DRAWN BY: E.ROTHFELDT CHECKED BY: J. CARSON



[A] 96% of waste gas to spray dryer/baghouse, 4% of waste gas vented.

URS 1093 Commerce Park Drive, Suite 100 Oak Ridge, Tennessee, 37830	Figure 2–3 Coke Plant Flow Diagram Middletown, OH	REVISION: 0 DATE; 08/23/07	DRAWN BY: E.ROTHFELDT CHECKED BY: J. CARSON



NOTE:
[A] = COKE STORAGE PILE INCLUDES COKE LOAD-IN FUGITIVES, PILE FUGITIVES, AND COKE LOADOUT FUGITIVES.

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Figure 2–4 Coke Processing Flow Diagram
Middletown, OH

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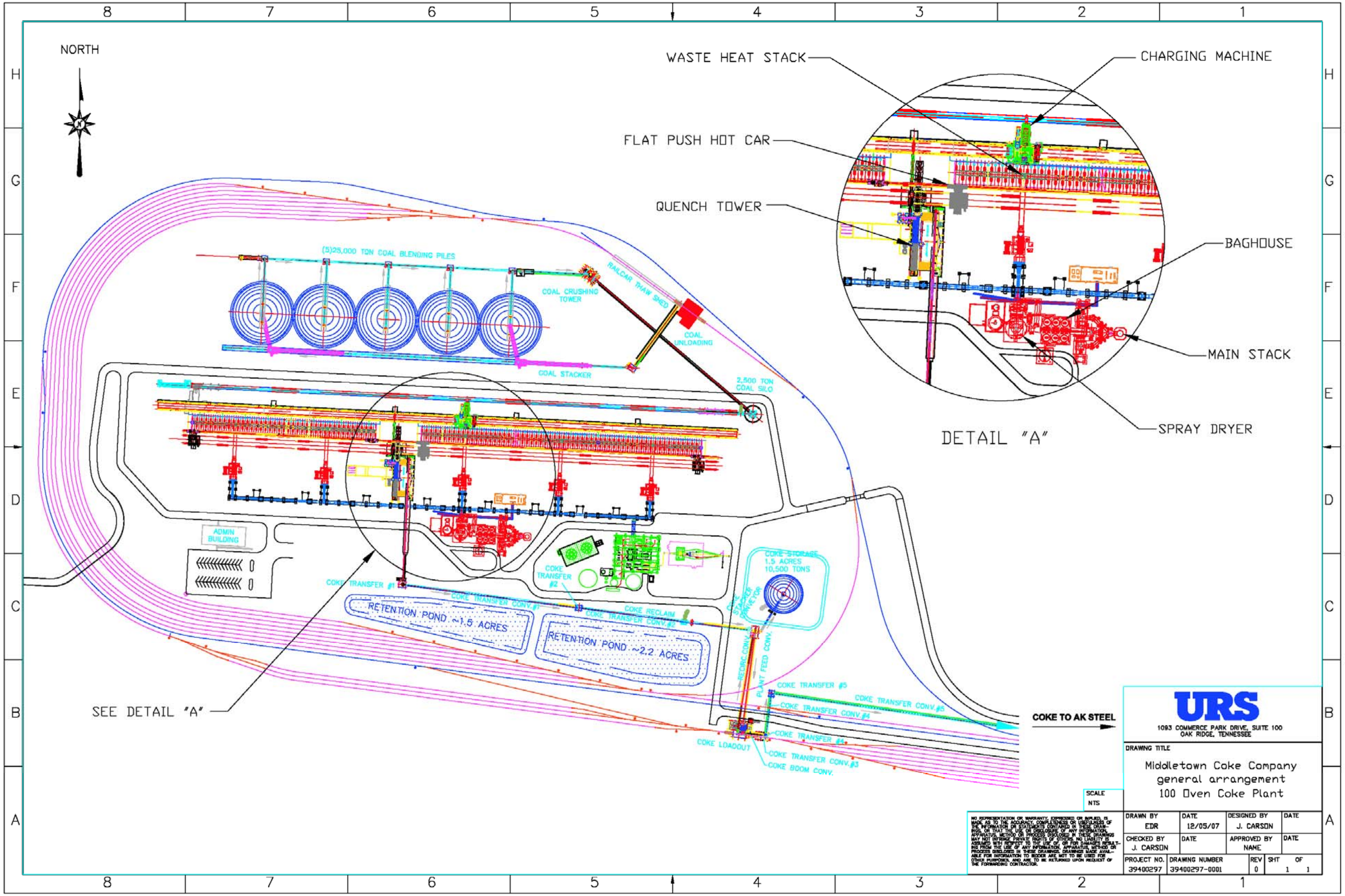

Figure 2-5. MCC 100 Oven Coke Plant