1060

NPS Form 10-900
(Rev. 10-90)

OMB No. 1024-0018

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JUL 31 1995

INTERAGENCY RESOURCES DIVISION
NATIONAL PARK SERVICE

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM

1. Name of Property

historic name Thomas By-Product Coke Works Historic District

other names/site number Republic Steel Corporation's Thomas Works

2. Location

street & number Roughly bounded by RR tracks on N, (see page 2.1) not for publication N/A
city or town Birmingham vicinity N/A
state Alabama code AL county Jefferson code 073 zip code 35208

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant ___ nationally ___ statewide X locally. (___ See continuation sheet for additional comments.)

[signature] July 25, 1995
Signature of certifying official Date

Alabama Historical Commission (State Historic Preservation Office)
State or Federal agency and bureau

In my opinion, the property ___ meets ___ does not meet the National Register criteria. (___ See continuation sheet for additional comments.)

Signature of commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is:
✓ entered in the National Register [signature] 9-13-95
___ See continuation sheet.
___ determined eligible for the National Register
___ See continuation sheet.
___ determined not eligible for the National Register
___ removed from the National Register
___ other (explain): ___

Signature of Keeper Date of Action

5. Classification

Ownership of Property (Check as many boxes as apply.)

- X private
- ___ public-local
- ___ public-State
- ___ public-Federal

Category of Property (Check only one box.)

- ___ building(s)
- X district
- ___ site
- ___ structure
- ___ object

Number of Resources within Property (Does Not Include Previously Listed Resources)

Contributing	Noncontributing	
16	2	buildings
0	0	sites
12	0	structures
0	0	objects
28	2	Total

Number of contributing resources previously listed in the National Register N/A

Name of related multiple property listing (Enter "N/A" if property is not part of a multiple property listing.)
N/A

6. Function or Use

Historic Functions (Enter categories from instructions)
Cat: Industry/Processing/Extract Sub: manufacturing facility

Current Functions (Enter categories from instructions)
Cat: Vacant/Not in Use Sub:

7. Description

Architectural Classification (Enter categories from instructions)
No Style

Materials (Enter categories from instructions)
- foundation concrete
- roof steel
- walls brick
- concrete
- other

Narrative Description (Describe the historic and current condition on continuation sheet/s.)

8. Statement of Significance

Applicable National Register Criteria (Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

X A Property is associated with events that have made a significant contribution to the broad patterns of our history.
__ B Property is associated with the lives of persons significant in our past.
X C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
__ D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations (Mark "X" in all the boxes that apply.)

__ A owned by a religious institution or used for religious purposes.
__ B removed from its original location.
__ C a birthplace or a grave.
__ D a cemetery.
__ E a reconstructed building, object, or structure.
__ F a commemorative property.
X G less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance (Enter categories from instructions)
Industry
Engineering

Period of Significance c. 1900-1952

Significant Dates c. 1900 1924 1952

Significant Person (Complete if Criterion B is marked above) N/A

Cultural Affiliation N/A

Architect/Builder unknown

Narrative Statement of Significance (Explain significance on continuation sheet/s.)

9. Major Bibliographical References

(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS)
___ preliminary determination of individual listing (36 CFR 67) has been requested.
___ previously listed in the National Register
___ previously determined eligible by the National Register
___ designated a National Historic Landmark
___ recorded by Historic American Buildings Survey # ______
_X_ recorded by Historic American Engineering Record # AL-14

Primary Location of Additional Data
_X_ State Historic Preservation Office
___ Other State agency
___ Federal agency
___ Local government
___ University
___ Other
Name of repository: ____________________

10. Geographical Data

Acreage of Property approx. 35 acres

UTM References (Place additional UTM references on a continuation sheet)

	Zone	Easting	Northing		Zone	Easting	Northing
1	16	512775	3709550	3	16	513280	3709390
2	16	513035	3709560	4	16	513035	3709180

_X_ See continuation sheet.

Verbal Boundary Description (Describe the boundaries of the property on a continuation sheet.)

Boundary Justification (Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Jack R. Bergstresser Sr., Ph.D, J. Lewis Shannon, HAER Historian & Susan Enzweiler

organization N/A date March 15, 1995

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the mill village on the east, Wade Sand and Gravel Company on the south and the western edge of the Coke Plant, the Toilets Building and the Coke Plant Office on the west.

7. Physical Description

Materials Continued

walls: tin
wood
asbestos

Narrative Description

The Thomas By-Product Coke Works Historic District was developed in the late nineteenth century on a tract of land situated approximately four miles west of Birmingham's city center. The tract contained seams of coal, iron and limestone. A geological rarity, the coal and ore deposits were located only 150 yards apart. The topography is gently rolling. The proposed historic district is bounded on the north and east by the Thomas Historic District (NRHP, listed 1989), on the south by the Wade Sand and Gravel Company and the Village Creek and on the west by the western edge of the industrial complex as delineated by the Coke Plant, the Toilets Building and the Coke Plant Office.

The 18 buildings and 12 structures included in the Thomas By-Product Coke Works Historic District comprise the surviving remnants of the Republic Steel Corporation's Thomas Works. Originally the Thomas Works consisted of a blast furnace plant and by-product coke works, but the blast furnaces have been torn down leaving a power house, boiler house, a battery of Koppers by-product coke ovens, and a Koppers by-product recovery and processing plant, all in generally good condition. The full magnitude of the iron making operation has been diminished somewhat by the demolition of the blast furnaces, but the surviving buildings and structures, particularly the coke works, are imposing in their own right. Most of the machinery, equipment and appliances have survived making it possible to see how these ancillary facilities operated.

The Coke Works:

The coke works, which occupies an area approximately 850 feet long by 550 feet wide, and stands at the north end of the property is the best preserved component of the site. The plant was "mothballed" by Republic Steel in 1984 so that it could be reactivated with minimal preparation. With the exception of a few minor, nonextant structures that had to be removed as part of the environmental cleanup of the site, the plant has remained just as it was while it was operational. This high state of preservation of structures and buildings is enhanced by the fact that many of the plant's paper records have survived including engineering drawings, operating records, trade catalogues, correspondences and other written information regarding the design and operation of the plant, its workers, customers, and products.

The coke ovens and by-product plant were documented by the National Park Service's Historic American Engineering Record during the summer of 1992. The drawings and written report produced by the HAER team show that the coke plant was divided into three distinct subsystems: the coal feed system which delivered coal from railroad cars to the coke ovens; the coke ovens where coal was converted to coke; and the by-product plant where the gas produced during coking was processed into a variety of by-products. The coal feed system including coal crusher, conveyor belts, storage bins, and other elements is a part of the original Koppers plant built for the Republic Steel Corporation by a variety of subcontractors, including the Virginia Bridge Company, in 1924. The Koppers cross-regenerative coke ovens were built in 1952 to replace the original Koppers-Beckers ovens. The new ovens were so arranged that they could make use of the original coal feed system, coal storage bin, coke wharf, coke loading system, and other ancillary equipment of the 1924 plant. The by-product plant was also updated at the time that the new ovens were installed. As with the coke plant, this upgrade had a relatively minor impact on the overall integrity of the by-product plant. The basic layout of the materials routing system was retained along with the major buildings and structures including the by-product building, benzol building, primary washers, and exhausters.

Approximately 250 feet south of the coke works stands the brick boiler house with its corrugated steel roof, brick exhaust stacks, and structural steel coal feed and ash removal system. It predates the by-product coke plant having been installed around the turn of the century. The plant was designed to produce steam, from a variety of fuels, that could be used to power steam engines around the blast furnace plant and to drive electrical generating equipment in the power house.

In keeping with its plan calling for the use of a variety of fuels the boiler house was equipped, as early as 1935, with nine boilers consisting of:

BOILER TYPE	**FUEL**
1 2700 HP Erie Boiler	Coke Oven Gas & Pulverized Coal
4 784 HP Heinie Boilers	Coke Oven Gas
2 779 HP Babcock & Wilcox Boilers	Stoker Coal & Coke Oven Gas
2 602 HP Stirling Boilers	Coke Oven Gas

These boilers are still in place along with most of their fuel feed equipment and related machinery.

The Power House:

Approximately one hundred feet south of the Boiler Plant stands the Electrical Power Plant that also contains much of its original equipment. Also dating to around the turn of the century, this large brick building contains a 1250 CFM Laidlaw steam driven air compressor, a 3000 KW turbo generator, major components of 2 1500 KW turbo generators and an array of ancillary equipment and control panels which constitute a nearly intact power house.

Alterations/Deterioration:

As with virtually every industrial site that was in operation for over 100 years, the Thomas site has been altered numerous times. The original battery of by-product coke ovens built in 1924 were replaced in 1952, but this replacement left the entire coal feed system intact. The by-product recovery and processing plant was also modified at the same time, but only a few structures were replaced including the original detarrers which were replaced by electrostatic precipitators, and the original ammonia saturators which were replaced with more modern ammonia absorbers. Another significant alteration occurred in the by-product building where a turbine-driven exhauster was added alongside the two original steam driven exhausters. Otherwise such important equipment and structures such as the primary coolers, final cooler, and light oil scrubbers were left intact. A few ancillary structures were removed during the environmental clean up of the site which was conducted in the mid 1980s.

The boiler house has also been altered having undergone at least one major enlargement when an eighth boiler was added shortly before the close of the plant.

Deterioration has been relatively minor with the most extensive having occurred around the older steam boilers. In some places, such as along the eastern wall of the by-product building cracks have appeared in the wall as a result of foundation settling. Most deterioration, however has been rather cosmetic such as broken windows and superficial rust formation and paint peeling on the metal structures. In general the structures and buildings on the site have survived as well, if not better, than most industrial complexes of similar age.

The following additional descriptive and historical information about the properties included in the proposed historic district is extracted from the survey of the property conducted prior to submission of the nomination:

1) THE POWER HOUSE (c. 1900, C) Building

This red brick, gable-end building measures 203′ x 65′, oriented along an east-west axis. The exterior surfaces consist of recessed brick panels, divided by brick structural piers, and topped with corbelled headers. The most stylistic feature of this structure is the entry facade, which faces west. The four panels are pierced with an entry and three large window openings, all of similar height and topped with segmented arches, but the original millwork has been replaced with rectangular iron frames. Above the two central openings are circular window openings, which have been covered with corrugated iron. Along the top of the gable end, the corbelled header follows the roofline in echelon fashion, in a series of horizontal segmental steps.

It is evident that the eastern end of the building, constituting about 75′ of the total length, is of a later date than the rest of the structure. This construction is characterized by brick of a lighter hue, rectangular window openings, and less deeply recessed panels.

The roof of the structure is supported by steel trusses and purlins. Plank decking is fastened to the purlins, which is in turn covered with corrugated iron roofing. The ridge line of the roof is broken by three clerestory ridge vents. The ridge is also shifted at the eastern end of the building by dropping the north side of the roof several feet while maintaining the same pitch, thus offsetting the ridge to the south. Structurally, this transition is accomplished by an asymmetrical truss.

The height of the building corresponds roughly to that of a three-story building, even though historic records describe it as a one-story structure, as the interior is not divided into discrete floors.

A wing, measuring 42' x 40', is on the south side of the building at the southwest corner. This wing is of brick construction, with a monopitch roof of corrugated iron.

The building contains a 1250 CFM Laidlaw steam driven air compressor, a 3000 KW turbo-generator, major components of 2 1500 KW turbo-generators and an array of ancillary equipment and control panels which constitute a nearly intact house.

It is difficult to determine the exact date of construction of the house, but it appears to have been built around the turn of the century during a period of major modernization of the blast furnace plant. The major equipment on the interior as well as the general layout of the building as it appears today dates at least as far back as 1927 as indicated by a drawing in the Thomas Collection in the possession of Wade Sand and Gravel.

2) BOILER HOUSE (c. 1900, C) Building

The asymmetrical boiler plant building, built on a poured concrete foundation, is a steel frame structure. The siding and roofing are of corrugated steel. Overall dimensions of the building are roughly 130' x 120', the greater dimension being along the east-west axis. The roof design is a modified gable end, with the ridge also running east-west, but with a step down in the south plane of the roof, creating a clerestory vent. The north and south side walls intersect the brick draught stacks for the boilers. These stacks have a diameter of 20' at their bases, and heights of 225' and 150', respectively. At the southwest corner of the structure is an iron standpipe, 125' high and 15' in diameter.

The boiler plant was apparently constructed around the turn of the century as part of a major plant renovation which included the replacement of the original blast furnaces. The boilers that are currently standing were added some time before 1935. The plant was enlarged, probably some time during the 1970s when an additional boiler was installed in the northeast corner of the building.

3) COAL PHYSICAL LABORATORY (1924, C) Building

This gable front, one story building measures 43' x 20', and is oriented along an east-west axis. It is constructed of red brick, and is roofed with corrugated iron. Design features include corbelled brick work in the gables, and rectangular window and door openings.

The coal physical lab was built in 1924. It was used to analyze samples of incoming coal. The lab continued to function in this capacity for the lifetime of the coke works.

4) SUBSTATION (c. 1952, C) Building

This windowless one story building measures 52' x 19', with the longer dimension running east-west. It is constructed of brick and has a flat roof.

This building was apparently added in c. 1952.

5) SUPPLY HOUSE (1924, C) Building

This gable front, one story building measures 133' x 50'. It is oriented along a north-south axis, facing south. The siding and roof are of corrugated iron, as is the awning which extends halfway across the front of the building and partially down the east (side) elevation.

The front of this building served as a supply house throughout the history of the coke plant. The back of the building, however, first served as the "colored bath house." Later, presumably after the federally mandated desegregation of industrial workplaces, the rear of the building was converted to a small machine shop and repair facility. A small room in the front of the building served as an office for the supply department and still contains the trade catalogues and other records maintained by the department.

6) COKE WORKS SHOP/BY-PRODUCTS PLANT OFFICE (1924, C) Building

This gable front, one story building is constructed of red brick and is roofed with corrugated iron. Measuring 33' x 18', it is oriented along a north-south axis. Exterior surfaces display corbelled headers, with the corbelling in the gables running parallel to the roofline. The south end of the building features large, rectangular window openings surmounted by awnings of lapped sheet metal.

This small building originally served as the coke works shop. A small room in the south end was serving as the by-product plant office at the time that the plant was shut down and the records of the by-product plant turn foreman are still in place, although scattered around.

7) BATH HOUSE (1924, C) Building

This gable end, one story building is constructed of red brick and is roofed with corrugated iron. Measuring 145' x 30', it is oriented with its long axis running north-south and with the entrances along the east side. The roof features three large exhaust vents near the ridge.

Apparently this building served solely as a bathhouse throughout most of its history. A 1924 drawing shows that it was subdivided into a foreman's bathhouse, a colored bathhouse and a white bathhouse.

8) OLD BENZOL BUILDING (1924, C) Building

This gable-end structure is constructed of red brick and is roofed with corrugated iron. The building measures 32' x 27', with the longer axis running east-west. The height corresponds roughly to that of a three-story building, even though historic records describe it as a one-story structure, as the interior is not divided into discrete floors. Wall surfaces are relieved into recessed panels with corbelled headers and large rectangular iron-framed windows. The gable ends, facing east and west, display corbelled parapets which parallel the roofline except at the corners where the parapets are squared off. The corbeling on the parapets is parallel to the roofline.

The old benzol building originally housed a 6,000-gallon benzol agitator and 12,000-gallon boiler still. When the plant was modernized in 1952, these two pieces of equipment were replaced by more modern versions of the same equipment. The installation of this new equipment, which is still in place in the building, did not alter the architectural integrity of the building.

9) BY-PRODUCTS BUILDING (1924, C) Building

This gable-end, red brick structure measures 190' x 57', oriented along an east-west axis. Structurally, this building is divided into two major sections of different heights, with the transition being accomplished by a gabled dividing wall. The eastern section, approximately 90 feet in length, compares in height to a three-story building, while the western section is lower, comparable to a two-story building. Historic drawings describe the building as a single-story structure, as the interior is not divided into discrete floors. All door and window openings are rectangular, and the roofing material is corrugated iron.

Exterior surfaces are divided into recessed brick panels, surmounted by corbeled brick headers. The gable ends display corbeled parapets which follow the roofline except at the corners, where they are squared off. The corbeling on the parapets is parallel to the roofline.

Some failure is evident in the masonry along the eastern end of this structure, which was reinforced during the operation of the plant. Exposed iron tie-bars were installed between the northeast corner column and the second column in the north wall.

The by-product building was altered from its original 1924 design. The first alteration occurred soon after the plant was built and consisted of the addition of a steam powered booster engine added to the far western end of the building in order to send coke oven gas into the commercial natural gas line that passed near the north boundary of the plant. During the 1952 modernization a new turbine exhauster was installed in the western end of the building to augment the two original steam engine-driven exhausters. In the east end of the building the old light oil stills were replaced by ammonia stills that were placed next to the south end of the building to work in conjunction with the new ammonia absorber being installed just outside the building along the south wall. Other minor alterations were made to the ammonium sulphate handling facility. The by-product building continued in operation in this altered state until the plant was closed.

10) PUMP HOUSE (1924, C) Building

This gable-end, single-story structure measures 68' x 28', oriented along an east-west axis. Construction is of red brick, with corrugated iron roofing. Ornamentation includes corbeled headers and gable parapets. The coping of the parapets is parallel to the roofline except at the corners where the parapets are squared off. Corbeling on the parapets is parallel to the roofline. All window and door openings are rectangular.

This building changed during the history of the plant. Structurally it was never altered, but the series of pumps used to circulate water and other liquids throughout the plant were frequently changed.

11) TOILETS (1952, C) Building

This single-story, concrete-block structure measures 17′ x 8′, with the greater dimension running east-west. Of note is the signage painted on the exterior of the building, designating one end of the structure as "colored" and the other as "white."

Little is known of the history of this nondescript little concrete block structure except for the fact that the entrances to its twin bathrooms preserve the only vestiges, in the form of signage marked "white" and "colored," of the rigid racial divisions that once ruled the Southern industrial workplace.

12) COKE PLANT OFFICE (1952, C) Building

This single-story, four-room frame structure measures 42′ x 40′, facing south. It has an eave-oriented gable roof, a single-leaf entrance and paired windows.

This small building served as the coke plant office from 1952 until the close of the plant.

13) WOMEN'S BATHHOUSE (c. 1980, NC) Building

This single story, concrete block structure measures 22′ x 22′. It has a flat roof.

The women's bathhouse is probably of fairly recent origins. Because of its relatively recent construction it is being counted as a noncontributing resource. Nevertheless, it does mark the federally mandated introduction of women into the industrial work place during the 1980s. Along with the earlier bathhouses marked "colored" and "white," it is material evidence of changing social relations in the American industrial work force.

14) AMMONIA ABSORBER (1952, C) Structure

The ammonia absorber is a cylindrical steel structure approximately 12 feet in diameter by 20 feet high. It stands directly against the southeast corner of the by-product building. Coke oven gas was pumped into the absorber through a large pipe and brought into contact with an acid spray to form ammonium sulphate crystals. The gas then exited through another pipe on top of the absorber.

The ammonia absorber was one of the structures added during the 1952 modernization of the Thomas Coke Works. It replaced the two ammonia saturators from the original plant that stood on the same spot.

15) COKE QUENCHING STATION (c. 1952, C) Structure

The Coke quenching station is an approximately 50 x 25 foot structural steel structure used to spray water onto rail car loads of red hot coke. The quenching station was open on both ends to accommodate the rail cars and open at the top to allow billowing clouds of steam to escape when a load of hot coke was sprayed.

The exact date of the quenching station could not be determined but it was presumably installed around the time of the 1952 renovation to replace the original. It may be of earlier construction, however, because it is located in the same place as the original quenching station.

16) PIPE SHOP (1924, C) Building

The pipe shop is a small one-story brick structure measuring approximately 18 x 20 feet. Its side elevations are marked by tall, plain, brick parapets. The building also features large, multi-light windows and a single-leaf entrance crowned by an overdoor.

The pipe shop served as one of the plant's ancillary facilities for minor maintenance work including the cutting and fitting of pipe used in the repair and upkeep of the by-product processing equipment.

17) LABORATORY (1924, C) Building

The laboratory is a small one-story building measuring approximately 14 x 16 feet. Of brick construction, the building has a steeply pitched shed roof clad in corrugated metal, a single-leaf entrance and large, square windows, at least one of which is boarded up. It contains wooden shelving and tables upon which by-products from the plant were analyzed.

Apparently constructed in 1924, this small building served as a laboratory for the analysis of by-products produced in the plant.

18) PUMP HOUSE (1924, C) Building

This pump house is a small, one-story brick building that measures approximately 16 x 12 feet. Entrance in gable end. Gable roof of corrugated metal.

While the original function of this building is difficult to determine, it appears to have been used as a storage facility during the latter days of the plant's operation.

19) VAC PAC BUILDING (1952, C) Structure

The vac pac building is a small 12 x 10 foot brick structure used as a protective shell for the electrical equipment that controlled the operation of the electrostatic precipitator. The structure has a double-leaf entrance with a soldier course, brick arch. The corners of the structure are marked by piers. Corrugated metal gable roof.

The vac pac building enjoyed an uneventful history of operation from 1952 until the close of the coke works in 1984.

20) FAN CONTROL BUILDING (1924, C) Building

The fan control building is a 35' x 15', one-story brick structure. It features brick piers interspaced with large, recessed brick panels with corbelling across their tops. Brick parapet. Flat roof.

The fan control building once contained the panels and circuitry that regulated the fans used in the now dismantled ammonia coolers.

21) COAL UNLOADING STATION (1924, C) Structure

The coal unloading station is a 70 x 55 foot structure constructed of structural steel and corrugated steel siding with a roof which contained a bottom dumping arrangement for incoming coal cars, a coal crusher, and conveying equipment. Coal was transported from the structure's track hoppers via an enclosed conveyor system to the storage bin atop the coke ovens.

The coal unloading station was constructed in 1924 and modified in 1952. Apparently these modifications were rather minor because the entire system of conveyors as well as the coal bin atop the original ovens were retained when the new battery of coke ovens were added. The new ovens were simply built directly under the 1924 coal bin in the place where the old ovens had stood, the major differences being that the replacements faced to the west while their predecessors had faced to the east.

22) COKE WHARF (1924, C) Structure

The approximately 125 x 30 foot coke wharf served as a collecting bin for freshly quenched coke. Extending along an east-west axis, the north side of this structure consists of a concrete-lined trench that slopes away from the coke ovens on about a 45 degree angle. The base of this trench is about 20 feet below ground level. It contains a long conveyor enclosed by a series of gates. The coke was admitted from the trench onto the conveyor by an operator who walked along a catwalk above the trench and raised or lowered the gates as needed. The catwalk is covered by an enclosure constructed of structural steel and corrugated steel siding and roof.

The coke wharf was constructed in 1924 when the original coke ovens were installed. Apparently the company had plans from the start of the project to add another battery of ovens so the coke wharf was situated to the west of the Koppers-Becker ovens to better accommodate the entire plant once it was expanded. For this reason the wharf is essentially the same today as it was in 1924.

23) COKE SCREENING/LOADING STATION (1924, C) Structure

The coke screening and loading station consists of a drag conveyor, structural steel and corrugated steel building, and a series of screens, trough and conveyor belts. The drag conveyor extends from the coke wharf into the building which is located at the southwest end of the coke ovens. The screens, troughs, and conveyor belts are located in the building which is mounted on steel I-beams. The building is raised high enough to accommodate railroad cars that were spotted on track below its southern end to be loaded with coke. The building was also equipped with a feed system that could convey the coke directly to the blast furnaces.

The coke screening and loading station was built in 1924 and altered at some time not long before the plant was closed. Like the coke wharf, it was located west of the original coke ovens in anticipation of a future expansion. The post-1952 alteration consisted of the removal of the conveyor system that carried coke to the blast furnaces. This component was removed when the blast furnaces were shut down, after which the coke plant continued to make and ship coke to outside sources, particularly the Republic Steel Corporation's Gadsden blast furnaces.

24) COKE OVENS (1952, C) Structure

The centerpiece of the Thomas Coke Works is the 400 x 150 foot battery of 54 Koppers Cross-Regenerative by-product coke ovens. The ovens are a series of vertical, rectangular chambers enclosed in an elaborate system of over 3 million construction and refractory bricks. This block-like structure is bordered at one end by the control room and reversing engine room where the engine that regulated the flow of air and heating gas around the oven chambers is located. The other end of the oven block is bordered by the repair shop, where the oven doors were regularly refurbished, and by a large exhaust chimney that has a ten-foot interior diameter and is over 250 feet high. The coke pusher which pushed finished coke out of the south end of the coke chambers into the serving, rail-mounted coke cars, is standing in place at about the midpoint along the north side of the ovens. The east end of the coke oven battery is straddled by the large coal loading bin which, along with the exhaust stack at the opposite end of the ovens, imparts a distinctive silhouette that is unique to a Koppers by-product coke plant. The preservation is so complete that the final series of coke oven log books including the last partially completed log, which cryptically records the final minutes of the plant's operation, is still laying on top of a desk in the control room.

The coke ovens were built in 1952 to replace the original 1924 battery. The original battery had been Koppers Becker ovens, which at the time of their introduction a few years prior to the construction of the Thomas plant, were the most advanced model available. Apparently some, as yet undocumented, characteristics of local coal led the operators of the plant to revert back to the older Koppers design when the new battery was added. Although its overall design followed the classic Koppers prototype, the new battery featured many improvements and added accessories. This was generally the case with every new generation of by-product ovens so that a model from any particular decade represented the latest thinking at the time of installation. Oftentimes these once modern additions were later replaced by subsequent improvements. One example is the spotting system mounted to the coke pusher and coke guide. Spotting devices were added to address the old problem of making sure that the pusher and guide were positioned at the same oven chamber from which the coke was to be pushed. Since the pusher was on one side of the ovens and the guide on the opposite, visual contact was not possible and catastrophic results could incur if the pusher began to ram the red hot coke through a chamber that had not been opened on the other side. The spotting devices on the 1952 Koppers oven pusher and guide contained radioactive pellets whose signal passed through the chamber ensuring that the proper alignment of pusher and guide was maintained. The coke ovens operated, with occasional shutdowns for overhauls, until 1984. The records of this operation including the names of the crew members, production rates, and maintenance activities have been preserved so that it will be possible, with detailed research, to reconstruct virtually every aspect of the history of the plant. This reconstruction will provide insight into important aspects of labor as well as technological history. For instance the women's bathhouse (Inventory #13) is material evidence that women were eventually added to the coke plant work force. The crew records and incident reports of the plant will help to document when and how this milestone in American industrial labor history was played out at one particular plant.

25) OLD REVERSING ENGINE ROOM (1924, C) Structure

The old reversing engine room is part of a reinforced concrete and brick structure that was once attached to the east end of the original Koppers-Becker ovens installed in 1924. The integrity of this structure was badly compromised at the time that the coke ovens were demolished. Walls were removed and the stairs to the second story, where the reversing engine was located, have been taken down. However, while most of the components of the engine have been removed, probably when the old ovens were dismantled in 1952, several have survived in the inaccessible second floor of the structure. These components are very rare since it is unlikely that many coke oven reversing engines from the 1920s have survived anywhere in the United States.

This structure served a variety of functions for the original battery of ovens. It probably served as a turn foreman's office and as facilities for crew. Its most important function, however, was to house the reversing engine located on the second floor. This engine was attached to a series of mechanical arms and cables that controlled the valves and other devices which regulated the flow of air and coke oven gas around the coke chambers.

26) PRIMARY COOLERS (1924, C) Structure

The primary coolers are a matched pair of steel cylinders approximately 12 feet in diameter and 25 feet tall. Coke oven gas was pulled through these coolers through a large steel pipe. The cylinders are equipped with stairs, cat walks, and hand rails in addition to a variety of valves and access hatches. The primary coolers employed a condensation process to remove entrained tar and water from the gas.

The primary coolers were installed when the original coke plant was constructed in 1924. They were retained after the remodeling of 1952 and continued in operation throughout the lifetime of the coke plant.

27) FINAL COOLER/BENZOL SCRUBBERS (1924, C) Structure

The final cooler and benzol scrubbers consist of three tall steel cylinders that are approximately 18 feet in diameter and 40 feet tall. The benzol washers are the two westernmost of the three structures, and are attached by stairs that extend to the top of the cylinders. A catwalk spans the gap between the washers and the final cooler. As the coke oven gas passed through the final cooler, its temperature was lowered after having risen during passage through the ammonia absorbers. The benzol washers conducted the final cleaning process on the gas by removing the primary light oil which was then routed to the benzol plant for processing.

The final cooler and benzol washers are original equipment having been installed when the plant was constructed in 1924. They were kept in operation until the plant was closed.

28) LIGHT OIL PLANT (1952, C) Structure

The light oil building and plant (also called the New Benzol Building) is a relatively small but complex structure. It consists of an approximately 35 x 25 reinforced concrete structure called a building but essentially a housing for a series of pumps, condensers, and other equipment designed to perform the initial processing of the primary light oil as it was received from the benzol washers. A series of cylindrical structures on the south end of the structure continued this process.

The new benzol building was installed as part of the 1952 modernization of the plant. Of all the standardized features of the plant this facility was perhaps the most standardized. It represents the basic process followed by the Republic Steel Corporation at all of its by-product plants from 1950 through the 1970s. In its latter days, various pieces of equipment were gradually taken off line and bypassed as the number of by-products processed at the plant were reduced to a bare minimum.

29) DETARRERS (1952, C) Structure

The detarrers are an assemblage of two cylindrical structures, each approximately 10 feet in diameter, and related piping that served the purpose of removing the final vestiges of tar from the coke oven gas before it was routed to the benzol washers and final coolers.

The detarrers were installed in 1952 to replace the original tar removers.

30) LOCOMOTIVE REPAIR SHOP (c. 1965, NC) Building

The locomotive repair shop is a structural steel frame building covered with corrugated steel siding. It is built atop a concrete slab containing railroad tracks.

Archeological Component

Although no formal archeological survey has been made of the proposed Thomas By-Product Coke Works Historic District, the potential for subsurface remains may be high. Buried portions may contain significant information that may be useful in interpreting the entire property.

Statement of Significance:

The group of structures and buildings included in the Thomas By-Product Coke Works Historic District are significant under Criteria A and C with the period of significance being c. 1900-1952. Located in Birmingham, Alabama, the historic district encompasses a typical example of the by-product coke plants which made the coke that fueled American blast furnaces and foundries from the early to mid-twentieth century. The Thomas By-Product Coke Works Historic District has possibly the finest intact early twentieth century by-product coke works available for interpretation in the country. The construction of the Koppers-Becker coke ovens at Thomas in 1924 marked the end in the process to convert from beehive coking ovens to by-product recovery coking in the Birmingham Industrial District. Thus, the site represents the modern method of extracting by-products from the coking process and using them to make industrial chemicals such as coal gas, tar, ammonia, light oil and napthalene. The coke was used to fuel the Thomas Company's blast furnaces. The history of the Thomas plant therefore incorporates most of the important technological features of the Koppers coke oven and by-product recovery process developed between World War I and the early 1950s, a period that might be considered the golden age of American by-product coke practice.

Individually, the power house, the boiler house, and especially the by-product coke works are important because they embody the distinctive characteristics of industrial processes developed to support the manufacturing of iron and steel. Industrial workers in the boiler house used its well preserved assemblage of boilers, fuel feed systems, and other equipment to provide steam that drove a variety of engines throughout the blast furnace plant and coke works. The power house crew relied upon its assemblage of turbines, generators, and air compressors that are equally well preserved to provide enough electricity and compressed air to ensure that the iron- making operation remained completely independent of outside sources. Best preserved of the three components, the coke works produced more than enough coke to supply the fuel requirements of the Thomas blast furnaces while processing by-products that were sold to the makers of military explosives, fertilizer, automobile fuel, and a variety of other products. Some components of the coke plant, principally the coke ovens and probably the coke quenching station, were replaced in 1952 so they do not meet the age criteria; however, they are integral parts of the proposed historic district and the ovens themselves have exceptional significance within the context of our industrial history.

The power house and boiler house were both built around the turn of the century, and their architectural features are representative of industrial design of the era. Both buildings were expanded on numerous occasions, but these expansions did not significantly alter the overall layout of either operation. The fact that several alterations have occurred does not greatly diminish the significance of the plants, however, because the various generations of boilers, generators, and other equipment that have been added are significant in their own right. With the exception of the last boiler added, probably some time in the 1970s, all of the major capital equipment is over fifty years old and each piece is a typical example of standard industrial design. The Erie, Heinie, Babcock and Wilcox, and Stirling boilers provide the student of the history of steam power with the opportunity to inspect good examples of nearly every major American boiler design of the early twentieth century. Some of the equipment in the power house would qualify as museum pieces in their own right but their true importance, as with the collections of steam boilers, lies in the fact that they are in their original setting. This integrity of location makes it possible to show the process of steam making and power generation within the setting of a blast furnace plant.

The Thomas boiler and power houses provide a complement to their counterparts at Sloss Furnaces National Historic Landmark. Together the two sites contain a wide range of different equipment and appliances. It is remarkable that two blast furnace plants located so close together and producing similar products could be so different, but these differences provide the Birmingham District with the opportunity to preserve a rich diversity of boiler and power house equipment.

More significant than the power and boiler houses, however, is the coke plant. By-product coke ovens were fundamentally important to the American iron and steel industry because they provided the fuel for its blast furnaces and foundries. By-product ovens were perhaps the most important technological achievement that made it possible for industrial districts like Birmingham, which possessed relatively inferior grades of coal to compete effectively with the Pittsburgh District which had the unsurpassed coking coal of the Connellsville District at its disposal.

Several designs of by-product coking operations were introduced into the United States from Europe prior to the turn of the century. But after 1907, when the United States Steel Corporation built the prototype plant at Joliet, the Koppers oven became the leading design in America.

The Thomas Coke Works are significant because they contain nearly every feature of what had evolved into a standard, small Koppers operation by the end of World War I. Built in 1924, the Thomas plant featured the classic layout of a Koppers coke making operation which differed from the second leading design, the Semet-Solvay ovens in important respects such as the coal feed system, and oven heating design. In addition, the Thomas plant included the equipment and appliances required to process coke oven gas into all the major by-products including tar, ammonium sulphate, light oil, and benzol. Like the coke ovens and their ancillary equipment, most of these components were original, patented Koppers designs.

The coke plant was modernized in 1952 and several components of the original 1924 plant, as listed in section 7, were replaced. Though less than 50 years old, these once new components have, in turn, become rather scarce because technological improvements and strenuous environmental regulations have led to their replacement in plants that are still operating. These newer components are significant because they represent typical features of a 1950s era plant, a model that is rapidly disappearing from the industrial landscape. Also, once installed they functioned as integral components of the original plant.

The most significant feature of the Thomas Coke Works is the overall integrity of its layout. The plant is so well preserved that every major building, structure, and machine required for the very elaborate process of coke making and by-product processing is still in place. The more recent components do not greatly detract from this integrity since they performed the same function as their predecessors and were essentially a step forward in the evolution of design in such equipment. In fact, since most of the engineering drawings from both the 1924 and 1952 plants have also been retained on site, the significance of the plant is enhanced. With these drawings and other historical documentation that is available, the Thomas Coke Works can become an important setting in which to study and explain the differences between two generations of the Koppers system of coke making and by-product recovery.

An additional factor that makes the site important is that it is available for preservation and interpretation. As far as the writer knows only one other Koppers plant in the United States, the prototype operation in Joliet, is even remotely in a position to be preserved, and the Joliet site has a much lower level of integrity since all of its equipment has been removed and the outer walls of the coke ovens have been torn away. The rapidly rising cost of federally mandated environmental abatement for such sites has risen to the point that few conservation groups would be financially capable of preserving another example, even if one were available. This costly cleanup work has already been performed at Thomas.

The Thomas Coke Works are also a major link in the chain of facilities, from mines to raw material processing plants to blast furnaces, that were required to produce pig iron. The Birmingham District already possesses the only coke blast furnace plant in the United States that has been preserved as a historic site, and the preservation of a by-product plant would greatly enhance the State's leadership in the preservation of the monumental artifacts of the American iron and steel industry.

HISTORICAL SUMMARY

The by-product recovery plant installed at Thomas was typical of the pattern among U.S. plants following World War I. The feature that distinguished it, and other plants of this period, was newly developed benzol recovery systems that had not been common before the war. Military demands for light oil derivatives consisting of benzine, toluene, and zylene led to the installation of systems that could remove the light oil from the coke-oven gas and distill it into these homologues.

While the Thomas coke works was the smallest of Republic Steel's coke works, it was built in 1924 as the coking industry passed something of a milestone. The Koppers Company of Pittsburgh had just come into ascendancy as the leading designer of American coke ovens and by-product recovery plants. At the behest of the United States Steel Corporation, German-born Heinrich Koppers came to the United States in 1908 to build a plant at Joliet, Illinois, that would utilize his patented cross-regenerative, by-producting coking system. In so doing, the Koppers Company ushered in the modern era of American by-product coke ovens.

The Semet-Solvay horizontal-flue by-product oven with its reputation for durability had dominated the industry since the 1890s. After its introduction, the Koppers cross-regenerative oven with vertical heating flues soon took over the lead. By 1959, 70 percent or 11,280 of the 15,993 by-product coke ovens in the United States were either Koppers or Koppers-Becker ovens.

Koppers set records for productivity that far exceeded earlier U.S. and European standards. When the stimulus of World War I further encouraged coke oven construction and more extensive by-product recovery, Koppers built the largest coke plant in the world at Clairton on the Mongahalia River just below Pittsburgh. If the Clairton works represented the climax of a massive building boom, the introduction in 1922 of the Koppers-Becker oven represented a climax in the efforts to produce the most efficient coke oven to date. When the Thomas plant was built two years later in 1924, it embodied most of the latest design features that Koppers had so recently developed including the Koppers-Becker oven. When Republic modernized the plant in 1952, it installed many of the latest features of this next generation of coke plant. The history of the Thomas plant, therefore, incorporates most of the important technological features of the Koppers coke oven and by-product recovery process developed between

World War I and the early 1950s, a period that might be considered the golden age of American by-product coke practice.

Blast Furnace Coke in the United States

The first coke made in the United States in retort ovens was not called by-product coke, nor was it used as blast furnace fuel. Instead, the coke itself was the by-product of a process that produced coal gas. Bright and clean burning, this gas was used for illumination in street lights and interior lighting. The coal gas was so much more valuable that the coke was considered a secondary product to be disposed of in any way possible. It was sold for domestic and industrial heating but was not suited for metallurgical purposes.

This kind of retort coke production which served as an adjunct to the city gas industry, began in 1812 when Frederick A. Winsor established the Gas Light and Coke Company of London, England.

City gas was introduced into the U.S. at Baltimore in 1816, Boston in 1822, and New York in 1825. Since the anthracite coal-fired blast furnaces of Eastern Pennsylvania dominated the pig-iron industry--providing an inexpensive, readily available fuel source--there was very little impetus to even consider the use of retort coke for blast furnace fuel.

The situation began to change following the Civil War as demand within the Pittsburgh district--which had been steadily building a rolling mill industry for the preceding three of four decades--began to outgrow the productive capacity of its charcoal blast furnaces (scattered across the region). Numerous attempts had been made to produce coke pig iron prior to the war, but it was not until the advent of large-batch steel production made possible by the Bessemer converter that correspondingly high volume blast furnaces came into demand; blast was not achievable through the Bessemer process with either charcoal or anthracite as fuel. It would soon be shown by the remarkable high tonnage achieved at the Lucy and Isabella furnaces along the Allegheny River in Pittsburgh in the 1870s that coke was to be the fuel of a new generation of American blast furnaces.

The Prejudice Favoring Connellsville Beehive Coke

Although the first few decades following the development of the Bessemer Converter resulted in incredible growth in the number and size of coke blast furnaces, it did not result in the immediate introduction of by-product metallurgical coke making. All the metallurgical coke produced before 1895 was made either in open mounds, in beehive ovens, or some other form of non-by-product coke oven.

Considering its many advantages, it would seem that by-product coke making should have been adopted immediately. But for one important reason, it was not. Less than 50 miles to the southeast of Pittsburgh lay the Connellsville region and the Pittsburgh coal seam which contained immense reserves of the best coking coal in the United States, if not the world. Coal from a very well defined subdistrict of the Connellsville region, known to geologists as the Latrobe and Mt. Pleasant synclines and to iron makers and miners as the Old Basin, could be coked in beehive ovens just as it came from the mine. When mined, Old Basin coal broke up into small pieces just the right size for charging into beehive ovens. It contained no more than 7.5 to five percent ash which was so low that it did not materially affect the porosity and strength of the coke. Able to produce excellent coke in ovens that could be built very cheaply and easily taken off line during economic down turns, Pittsburgh iron makers had very little inducement to explore more elaborate and costly alternatives. Compounding this inclination was the fact that little market existed for the few by-products produced at that time by by-product ovens.

Attitudes began to change during the last decade of the 19th century as the reserves of the best Connellsville coal began to dwindle, new markets for coke by-products emerged and regions blessed with lesser coal sought ways to make coke from their coal that would not coke effectively in beehive ovens.

By-product Coke Ovens

There are two thermal processes that were widely used to produce coke; one is partial combustion, the other is distillation. Partial combustion is most effectively conducted in dome-shaped beehive coke ovens. The top inch or so of a 18" to 2' layer of coal in the beehive oven is allowed to burn to provide the heat that bakes the remaining coal into coke. As the coal is coked, its volatile material burns in the top of the oven producing vast clouds of flame and smoke that escape, wastefully and with immense pollution, into the atmosphere. On the other hand, the distillation process is conducted in the airtight coking chambers of a by-product coke oven. Since no air is present, neither the coal nor its volatile matter can burn. Heat is produced externally by burning gas traveling around the coking chamber in flues until the coal becomes so hot that most of its gas and impurities are driven off.

The Advantages of By-product Coke Ovens

The gas driven from the coal is a valuable fuel. It can be used to heat the coke ovens, to fire boilers, or for a variety of other industrial and domestic uses. But the gas is also laden with other by-products such as tar, ammonia, and light oil. To recover these by-products, gas is drawn off the coking chambers through gooseneck pipes into a collecting main by a vacuum created by large gas pumps called exhausters. It is then pumped through a by-product recovery plant where the gas is cleaned and the by-products are removed.

Since the coal in a by-product oven cannot expand as freely as in a beehive oven, it produces a harder coke that is both stronger and capable of more efficient combustion in a blast furnace or foundry cupola. Since none of the coke is allowed to burn away, a higher percentage of coke is produced per ton of coal. In 1917, for instance, the average yield from all the beehive coke produced in the United States was 63.5 percent while the yield was 71.2 percent for by-product coke. Considering that 52,246,612 tons of coal was coked in beehive ovens at the lower percentage of yield, this means that over four million tons of coal was wasted in beehive ovens, not to mention the by-products that also went up in smoke.

Perhaps the most significant factor favoring the expansion of the blast furnace industry, however, was the fact that coals from various sources could be gathered together at a large, centrally located by-product plant and mixed together to produce better coke oven charge. The Chicago district for instance could import Pocahontas coal from West Virginia or Connellsville coal and mix it with inferior Illinois coal to produce excellent coke. Used separately, the Illinois coal could not produce an acceptable blast furnace fuel.

Otto-Hoffman and Semet-Solvay By-product Ovens

Two separate efforts to introduce by-product coking to the blast furnace industry occurred almost simultaneously in the first half of the 1890s. The first was the work of John Fulton during his tenure as General Mining Engineer with the Cambria Steel Company of Johnstown, Pennsylvania. The second was the work of the Semet-Solvay Company which built the first by-product coke works in the United States at a chemical plant at Syracuse, New York, in 1892.

Fulton's work, which would eventually lead to the construction of the first by-product coke plant specifically designed to make blast furnace fuel, began in 1875. Fulton's pioneering experiments in the use of physical analysis to determine the quality of metallurgical coke led him to Germany in 1893 to determine if the Cambria Steel Company's coal could be coked in by-product ovens. Fulton's tests on about 18 tons of coal showed that less by-product coke was required to produce a ton of pig iron. This savings in coke was achieved at the same time that the capacity of the blast furnace was materially increased. The company was so impressed that it built two batteries of 30 Otto-Hoffman ovens in 1894. These were the first by-product coke ovens in the United States built specifically to produce blast furnace coke.

At about the same time the Semet-Solvay Company shipped coal made in its beehive ovens to Buffalo, New York, to use in tests in competition with beehive coke from various sources. The tests were conducted by Frank Baird at the Buffalo Union Furnace and showed the superiority of by-product over beehive coke. This was the first by-product coke used in a blast furnace in the United States and its success prompted the operators of the Dunbar Furnaces of the American Manganese Manufacturing Company, located along the eastern edge of the Connellsville field, to install two batteries of 25 Semet-Solvay ovens each in 1895.

Built within a year of each other, Cambria and Dunbar's coke plants established the Otto-Hoffman and Semet-Solvay as the first by-product coke plants to become part of the integrated operation of blast furnace plants. Along with the United-Otto oven, which was a modification of the Otto-Hoffman design, these ovens dominated the United States by-product coke industry until the introduction of the Koppers oven. Of the 16 by-product coke plants built at blast furnaces prior to the first Koppers plant built in 1908, nine were Semet-Solvay, four were United-Otto, and three were Otto-Hoffman.

The key difference between what came to be standard Semet-Solvay and its two early competitors was the arrangement of their respective heating flues. The Semet Solvay oven was heated by flues that ran parallel to the coking chambers while the Otto-Hoffman and United-Otto ovens employed vertical heating flues. The Semet-Solvay remained the only major by-product coke oven design in the United States to employ horizontal flues while every subsequent by-product oven in the country employed one version or another of the vertical flue.

It was not their heating flue arrangements, however, that put these earlier by-product ovens at a disadvantage when the Koppers oven was introduced. Instead, it was their regenerative chambers which ran longitudinally below the coking chambers along the entire length of the battery. Regeneration chambers heated the air that was used to aid the combustion of the coke-oven gas that heated the coking chambers. Based upon the Seimens principle, regenerative chambers were mazes of brick checker-work that were heated by the spent coke-oven gas as it exited the heating flues. The remaining heat in the exiting gas was transferred to the bricks. Once the bricks reached the desired temperature, flow of spent gas was stopped and air was drawn over the bricks in the opposite direction. The heat trapped in the bricks was thus transferred to the air which was then mixed with the coke-oven gas and ignited. There were several problems with longitudinal regenerators but the worst was the fact that it was impossible to vary the heat on individual coking chambers.

This problem was never overcome and ultimately the concept embodied in the Koppers cross-regenerative design proved to be the only solution. In the cross-regenerative design the regenerative chambers ran in the same direction as the coking chambers, across the width of the oven battery rather than along its length. This enabled each coking oven to be serviced by its own regenerative chamber with a subsequent increase in the ability to regulate the heat of each coking chamber individually.

When Heinrich Koppers built his first coke ovens at Joliet, Illinois, in 1908 he was able to maintain his patent on the cross-regenerative concept for ten years. After the patent expired in 1918, however, every major by-product oven builder in the United States adopted Koppers' idea. From that point on, one of the major preoccupations of coke oven designers was in improving the cross-regenerative system and developing techniques for increasing control over the flow of air and gas used to heat the coking chambers.

The Koppers Cross-Regenerative Oven

Heinrich Koppers came to the United States in 1908 at the invitation of the United States Steel Corporation to build his first plant at the Joliet Works of the Illinois Steel Company. The cross-regenerative concept was not the only feature that influenced the United States Steel Corporation to recruit Koppers to build its first by-product coke works. Other factors included the decision by USS in 1906 to finally address the question of its future coke supply in light of the dwindling supplies of prime Old Basin coke and the inevitable decline of beehive coke production, and the decision to use silica, rather than clay, brick in the ovens.

The success of Koppers's patented process at the Joliet Works was immediate, achieving both economy in coke production and increased blast furnace capacity and efficiency, making beehive coke production obsolete. USS immediately began to install Koppers plants in regions where their operations relied on lesser coals. This included TCI's Fairfield Works in the Birmingham district. A local iron maker, the Woodward Iron Company, also installed a smaller Koppers plant. Therefore, two of the first four U.S. Koppers plants were built in the Birmingham district. Clearly, the Birmingham district was playing a prominent role in the shift to by-product coke, laying the groundwork for the Koppers-Becker ovens that would be built at Thomas 14 years later.

The decision to use silica brick in place of the clay brick used in European by-product ovens also contributed to the success of the by-product coke works. In tandem with the more uniform heating system of the cross-regenerative vertical-flued Koppers oven, the better insulating silica brick brought about dramatic improvements in coke production. These two innovations made it possible for coke makers to maintain much higher heat and consequently much greater coking velocities. Not only was the yield of individual ovens greatly increased but the coking time per oven was cut almost in half.

The USA had become the world leader in modern by-product coking. Further advances were made, however, when Joseph Becker patented his Koppers-Becker oven c. 1920. A battery of these ovens were installed at the Thomas Furnaces four years later. The Koppers-Becker design improved the structural strength of the coke ovens making it possible to build a higher coking chamber while simultaneously providing for more uniform heating over this larger surface.

This new design initiated a trend toward higher, longer ovens. It was at this point that the coke ovens at Thomas were built. After the first step toward a major increase in height when the Columbia Steel Company of Provo, Utah, built a battery of 13′ high ovens in 1924, Republic installed 13′-6" ovens at Thomas. This trend toward higher ovens climaxed when USS built four batteries of ovens at Clairton in 1928 that were 14′ high.

By-product Coke Making in the Birmingham District

Unlike Pittsburgh, iron makers of the Birmingham district were very much predisposed to accept the new technology of by-product coke ovens when the opportunity presented itself. The reason was not an inherent infatuation with innovative technology but the fact that by-product ovens offered several advantages that could partially offset, if not completely overcome, specific limitations of local coal reserves. The first of these limitations was the narrow, heavily faulted nature of the Pratt seam, the Warrior coal field's most important metallurgical coal seam. Not only was the Pratt seam narrow and riddled with faults, it was also banded with layers of impurities. These disadvantages combined to make coal mining less productive. The mines of the Pratt seam were smaller than optimum size and they produced fewer tons per miner than the national average.

Mining engineers had worked diligently to overcome lower mining productivity and the subsequently higher cost of fuel at the blast furnace but the by-product coke oven offered the first opportunity to significantly offset the problem. This was because by-product coke offered several advantages that greatly reduced the amount of coal that had to be mined to produce a ton of pig iron. For one thing, by-product ovens were much more productive. Their yield of coke per ton of coal was five to ten percent higher, a significant increase in a high volume operation like a coke plant. In Alabama in 1925 for instance beehive ovens yielded 64.4 percent coal as coke while by-product ovens yielded 70.3 percent. Secondly, less by-product coke was required in the blast furnace to produce a ton of pig iron. And finally the by-product coke increased the capacity of a blast furnace.

A second limitation of local coal that could be overcome with by-product coking was its softness or "tenderness." While most of the district's coal produced a suitable metallurgical coal once it had been washed, much of it did not. Soft coal had a greater tendency to crumble and break down into very fine pieces, called breeze, during handling and loading into a furnace. By-product ovens produced stronger less friable coke.

An additional advantage of by-product ovens was their central location which made it possible to bring together different sources of coal and mix it before coking to produce a better product. This was another boon for Birmingham iron makers as they expanded their mining operations to bring in coal from localities that would not coke as effectively unless it was mixed with other coal.

These advantages, along with the ability to capture and process valuable by-products, provided an economic incentive. While the cost of installing a by-product plant was much greater than beehive ovens, the expense was worth it because of the significant reduction in fuel costs for a blast furnace company. The Birmingham district was willing to accept the equation and began the conversion to by-product coking in 1898 when TCI built 120 Semet-Solvay ovens and a well-equipped by-product recovery plant. This battery of ovens and a battery of 60 Semet-Solvay ovens at the National Tube Company of Wheeling, West Virginia, were simultaneously the second batteries of Semet-Solvay ovens installed at blast furnaces in the United States.

The conversion in the Birmingham district was completed in 1924 with the construction of Republic's Koppers-Becker ovens at Thomas. The Thomas works was the eighth by-product plant built in the district. These eight plants consisted of 796 Koppers and Koppers-Becker ovens, 420 Semet-Solvay ovens, and 60 Wilputte ovens, which amounted to a total of 1,276 ovens. Their combined production was 4,583,153 tons of coke which amounted to a little over 11 percent of the national total of 39,912,159 tons. Alabama became the fourth largest producer of by-product coke in the U.S., a position which it retained until the present. It enjoyed a rate of growth that was generally equal to the national average.

Not only was the conversion to by-product coking more complete than in most districts, it also led to better coke yields than most districts could obtain. In 1925 for instance, after Republic brought its Thomas ovens on line and closed its 910 beehive ovens, the percentage of coke made in beehive ovens in the district dropped to only 1.9 percent while the national average remained at about 22 percent. At the same time the yield of coke rose slightly above the average for the first time amounting to 70.3 percent compared to the national average of 69.9 percent. Prior to the firing of the Thomas ovens, Alabama had always lagged behind the national average, perhaps because of its disproportionately larger share of Semet-Solvay ovens which usually gave a smaller yield than Koppers ovens. From that time on, Alabama never failed to exceed the national average yield. With the exception of a limited amount that was made at Lewisburg and perhaps a few other ovens, during World War II, no more beehive coke was made in the district after that year.

The Birmingham district gained a reputation for being very receptive to the latest by-product coking technology which was carried on when Republic installed the Koppers-Beckers ovens at Thomas. Since its introduction three years earlier, the Koppers-Becker oven had proven itself capable of supporting taller coking chambers than had previously been possible. Beginning with a battery of 13' tall coking chambers built at Provo, Utah, Koppers began experimenting to determine how high coking chambers could go before reaching an optimum height. The Provo ovens were 13' high compared with previous ovens which averaged around 11'. The Thomas ovens were 13-1/2' tall. The highest ovens, built at Clairton the following year, were 14' tall. After that, Koppers withdrew slightly back to about 12' which still allowed a substantial increase in capacity over previous designs.

Republic Steel's Thomas Blast Furnaces and Coke Works

The Republic Steel Corporation's Thomas By-product Coke Works was located at the rear of the company's blast furnace plant at Thomas, a company-built town that was later incorporated into the city of Birmingham, Alabama. The company town and original blast furnace plant were built in 1888 by Samuel Thomas, son of David Thomas who first introduced anthracite blast furnaces into the United States. Based on the plan for Hokendauqua, Pennsylvania, the community at Thomas featured brick houses, schools, churches, and other facilities. Most of the community is still in existence. For more information on the mill community, please see the nomination for the Thomas Historic District (NRHP, 1989).

The Pioneer furnaces, which were built by the Thomas family, were purchased by the Republic Iron and Steel Company in October 1899 and eventually came to be called the Thomas furnaces. Republic modernized the plant in 1902 by adding a third furnace that was 90′ x 18-1/2′ and enlarging the old furnaces to the same dimensions. The combined annual capacity of the plant was 270,000 tons of foundry and mill pig iron.

Republic updated the plant on a regular basis. To provide basic pig iron to their steel mill at Gadsden, they installed one of the District's first Uehling pig casting machines sometime before 1906. They also installed the District's first Dwight-Lloyd sintering plant, on a site adjacent to the blast furnace stock bins, in 1936.

Like other major blast furnace companies in the Birmingham District, the Pioneer Mining and Manufacturing Company took advantage of the close proximity of raw materials in the Birmingham District. The furnaces were built atop extensive seams of limestone and dolomite. These materials, which were used as fluxing agents, could be quarried and loaded directly into the furnaces at minimum cost. The deposits are so extensive that they are still being mined by the Wade Sand and Gravel Company which operates one of the largest and deepest quarries in the eastern United States.

Ore was procured either from open-pit brown ore mines located about 15 miles to the southwest or from underground red ore mines on and near Red Mountain about eight miles to the south. Its red ore came from Shannon mine, a steep slope mine in Shades Valley, and the Spaulding and Raimund mine slopes located along the northeastern slopes of Red Mountain.

The majority of the coal coked at the Thomas ovens came from Republic's Sayerton mine which was only two miles from the coke plant. Additional local coal was supplied by the Risco and Warner, Virginia and Republic mines, none of which were over 20 miles from the coke plant.

Until 1925 the coke which fueled the Thomas Blast Furnaces was made exclusively in beehive ovens. Most of this coke came either from a battery of 100 beehive ovens at the Republic mine or 910 ovens located behind the blast furnace plant.

The coke works were built in 1925 and modernized in 1952. The original plant featured a battery of 57 Koppers-Becker by-product ovens which were replaced in 1952 by a battery of 65 Koppers ovens. The plant layout and equipment was based on designs developed by German-born Heinrich Koppers. In addition to many pieces of equipment that were designed and built by the Koppers Company, the plant also contained several standard features designed and built by outside suppliers. The original ovens had a capacity of 623 cubic feet each. The coking chambers were 42′-2 1/2" long x 13′-1/2" tall. The chamber tapered from 13" on the pusher side to 15" on the coke side. The 1952 battery consisted of gun-flue type Koppers ovens. The coking chambers were 40′-9 1/2" long x 12′-8" high. The average width of the coking chamber when hot was 16-5/8". The capacity of each chamber was 657.88 cubic feet.

When the plant was modernized in 1952, the original battery was torn down, but the loading hopper and other coal handling facilities were left in place. One end of the replacement battery was under the coal loading bins and extended to the west of the original battery. The foundation of the old battery and building which housed the air and gas reversing engine was left standing. The old quenching tower was also retained. Once in operation the new battery was serviced by the original coal handling system and quenching tower.

The original by-product recovery plant was also selectively modernized. All of the important original buildings were retained but their interiors were significantly altered by the removal of old equipment and the addition of new equipment. The contents of the by-product building were significantly altered. The two original Connersville exhausters which pulled gas out of the coke ovens and pumped it through the by-product recovery systems were kept along with their horizontal steam engines. They were augmented, however, by the addition of a steam turbine-driven exhauster. At some point prior to the 1952 modernization, an additional Ingersol-Rand gas pump (booster) and horizontal steam engine was added at the western end of the building to supply coke-oven gas to an adjacent city gas main and subsequent interstate natural gas line. Other changes were made in the eastern end of the building. Originally that part of the building had contained some of the preliminary processing equipment for the light oil recovery system alongside the ammonia stills and ammonium sulphate processing and storage facilities. During modernization the light oil recovery equipment was all removed to the benzol plant at the west end of the by-product building. Equipment in the brick building at the benzol plant was also altered but to a lesser extent. The main alteration consisted of removing the pure still tank from directly under the rectifying column and replacing it with a larger tank which was located outside the building.

Three major pieces of equipment were removed and replaced by more modern equivalents. The old flushing liquor tank was replaced along with most of its ancillary equipment. The original Pelouze and Audouin tar extractor was replaced with an electrostatic precipitator. And the old acid saturators were replaced by a newly designed spray-type ammonia absorber. To accommodate these major and several minor alterations, considerable changes were made in the piping which carried ammonia liquor, tar, water, steam, and coke-oven gas.

While substantial, these alterations did not significantly alter the general appearance of the plant. The major buildings remained unchanged and the general material flow was unaltered. The line of by-products remained the same. They consisted of tar, ammonium sulphate, light oil which was further refined into benzol, toluol and xylene, and napthalene which was recovered at both the final cooler and in the benzol plant.

Plant Operation

The best way to discuss the structures and equipment at the Thomas Coke Works is by describing the flow material on the site showing how each component functioned. The Thomas Coke Works was actually two plants, a coke plant and a by-product plant. Since the principal function of the coke works was to provide coke for fuel in the adjacent blast furnaces, the coke plant was the most important part of the site.

The coke plant was made up of a coal handling system, the coke ovens themselves, a coke handling system, and a gas collecting main. The coal handling system transferred coal from incoming railroad cars into large storage bins directly atop one end of the coke ovens where it could be loaded into the ovens as needed. The coke handling system took coke from the ovens and either moved it by conveyors to the blast furnace stock bins or loaded it onto railroad cars for shipment to other Republic Steel Corporation blast furnaces and to outside customers. The gas collecting main pulled gas from the individual coke ovens, via gooseneck pipes, and sent it to the by-product plant.

The purpose of the by-product plant was twofold. Primarily it was intended to clean the coke-oven gas, the most valuable by-product produced. Secondarily, it was intended to remove as many other marketable by-products from the coke-oven gas as economically feasible. To achieve these purposes the coke-oven gas was routed, via a gas pipe line, past a series of sub systems, each of which processed the gas in a specific way.

In the absence of adequate documentation, it is difficult to establish the exact number of workers required to operate the 1952 coke works. A brief report written in 1937 listing the crew required to the old plant provides some clue, however, because the labor force for both operations would have been roughly equivalent. The 1937 report set forth a list of workers needed if the plant were to operate on a 108-oven or a 66-oven schedule. These numbers referred to the number of times that the 57 ovens would be pushed in a 24-hour period.

Such pushing schedules were a legacy of the systematic control of coking operations that became a hallmark of American coking practice after the introduction of the Koppers oven into the United States by USS. These schedules were based upon precise calculations and stood in stark contrast to the old European rule-of-thumb method. They were based upon the fact that every feature of the coke ovens and by-product recovery plant was effected by the pushing of an individual oven. The 108-oven schedule required a crew of 76 workers while the 66-oven schedule required a crew of 50.

Section 9, Bibliography

Bergstresser, Jack R. "The Koppers Byproduct Coke Works at Thomas, Alabama."

Unpublished research report, Washington D.C.: National Park Service, HABS

HAER Division, 1992.

Section 10, UTMs continued

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Verbal Boundary Description

Tax Parcel Number 22-28-3-7-13 located in Birmingham, Jefferson County, Alabama

Boundary Justification

The boundaries were drawn to include the greatest number of contributing resources and the least number of noncontributing resources associated with the Thomas By-Product Coke Works. The proposed historic district is bordered on the north and east by residential areas, on the south by a sand and gravel quarry and on the west by an open area dissected by railroad tracks.

Photographs

The following information applies to all the photographs:

1. Thomas By-Product Coke Works Historic District
2. Birmingham, Jefferson County, Alabama
3. Photographer: David Diesing
4. Summer 1992
5. Historic American Engineering Record, National Park Service, Department of the Interior

Information on Each Individual Photograph

1) Coke Ovens
Camera facing SW

2) By-Product & Coke Works
Camera facing W

3) By-Product Plant
Camera facing SE

4) By-Product Plant, Ammonia Absorber & Water Pump House
Camera facing NE

5) Tar Precipitators
Camera facing S

6) Primary Coolers
Camera facing NE

7) Benzol Building
Camera facing NW

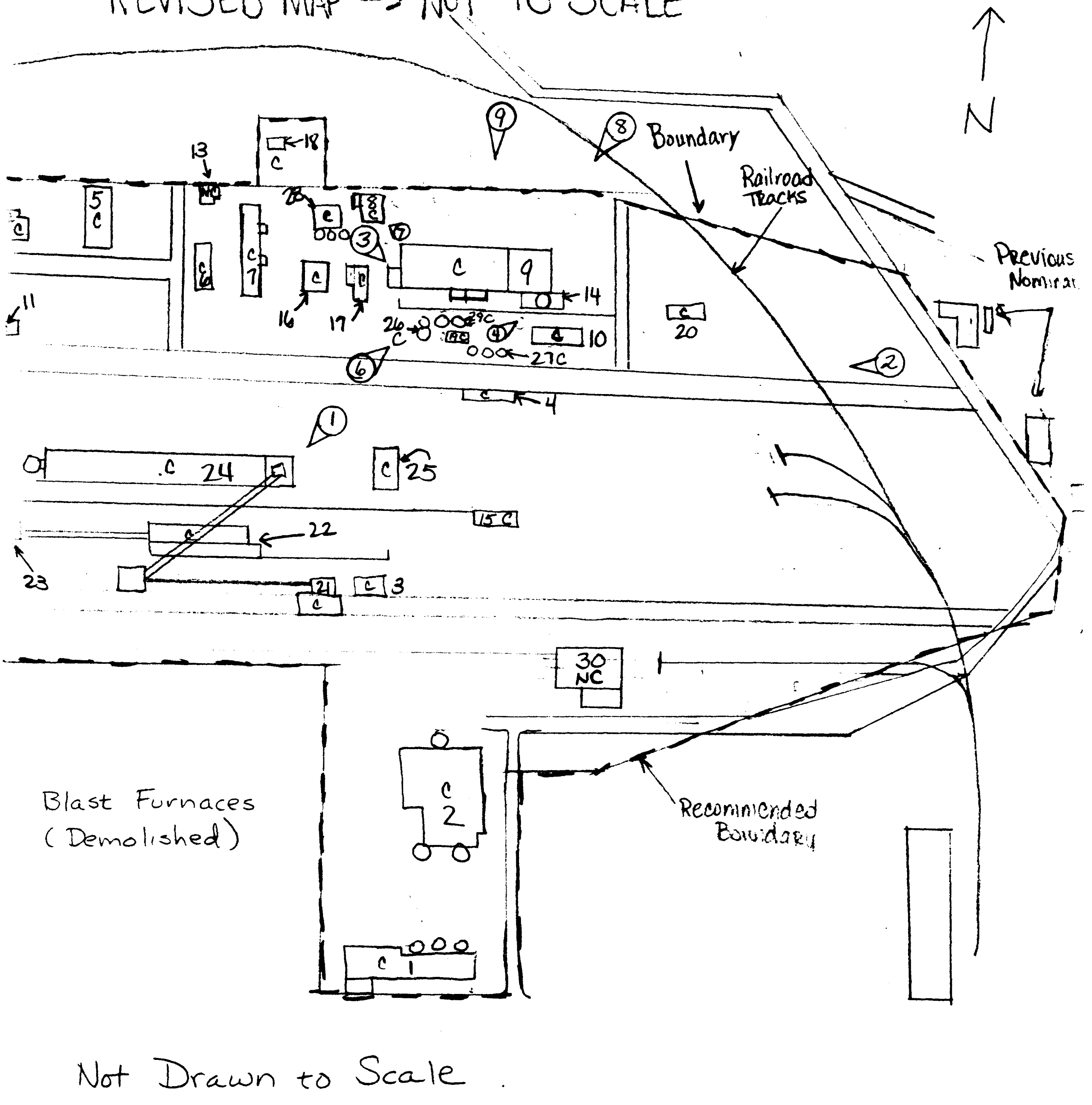
8) Aerial View of Plant
Camera facing S

9) Aerial View of Plant
Camera facing S

REPUBLIC STEEL CORPORATION

THOMAS WORKS EXISTING CONDITIONS, 1993

REVISED MAP → NOT TO SCALE



Not Drawn to Scale

= Photo Key