

Acme Coke
11236 S. Torrence Ave.
Chicago IL 60617

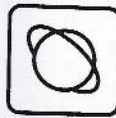


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HKC Emission System Repairs
Dated: 1997

Recovered from site on Jan 30 2021



January 13, 1997

ORBITAL ENGINEERING,® INC.
3800 179th Street • Hammond, IN 46323
Tel: (219) 989-3300 • Fax: (219) 989-3310

Mr. M. T. McCarthy
Manager of Project Engineering
Acme Steel Company
135th & Perry Avenue
Riverdale, IL 60627

Attention: Mr. R. Martello

Subject: **ACME STEEL - CHICAGO PLANT**
Coke Batteries No. 1 and No. 2
Pushing Emissions Central System
Emissions Duct and Support Structure
Inspection Services

PROJECT NO. 05-7672-01
Acme P.O. X19098196

Gentlemen:

In reference to the above subject we are submitting this letter report to present the results of the Pushing Emissions Duct inspection. The inspection was conducted on December 16 and 17 of 1996, in cooperation with the Acme Coke Plant Maintenance Department.

INTENT SCOPE OF WORK

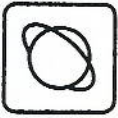
The intent of this project was to search out and define any readily accessible deficiencies and to provide recommendations for repair.

The scope of work for this project included:

- ▶ Detailed inspection of the emission duct bottom saddle supports as well as the shell plate within the immediate saddle area, which also included ultrasonic thickness testing.
- ▶ Visual inspection (general condition) of the remaining structural supports of the emissions duct, including the side brackets, walkway platforms and the rail support brackets of the duct.

HISTORY/GENERAL DESCRIPTION

The Pushing Emissions Duct was installed in the late 1970's and was designed to capture the emissions during the oven pushing process. The duct is 6'-0" in diameter with a length of 835'-0"± ranging from Column Lines 1 thru 15. The duct is constructed of 1/4" plates making up 60'-0" sections with field splices occurring 1'-0" north of the main support saddle lines.



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Page Two

HISTORY/GENERAL DESCRIPTION (continued)

It should be noted that this particular design has a transition car which runs on rails on top of the duct. The top cover of the duct is made out of conveyor belting material which is spooled through the drums on the transition car.

Reference Drawings

C-5304 to C-5308

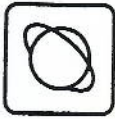
SUMMARY OF INSPECTION

The following is a list of summarized inspection findings for the deficiencies which were encountered during the two (2) day inspection of the Pushing Emissions Duct. For the locations and descriptions of the Findings encountered by this inspection, refer to the inspection drawings 7672-1 and 7672-2, located in Attachment "1". Also, added for location and reference purposes are the field sketches numbered FS-1 through FS-15, which are located in Attachment "2".

- ▶ An 18" by 100'-0"± long area of the emission duct shell plate which was found to be buckled and rusted thin and/or through.
- ▶ The shell plate has buckled (yielded) at 25 of 29 bottom saddle supports. The depth of buckling ranges from 1/4"± to 2 1/2"±. Subsequently it is assumed that the entire duct has dropped in elevation.

The condition of the shell plate adjacent to the bottom saddle supports are as follow:

- ▶ The shell plate is rusted thin and through at 8 saddle locations.
- ▶ The shell plate is rusted thin from 36% to 56% section loss at 14 saddle locations in which cracking has occurred at two (2) of these locations.
- ▶ The remainder of the ultrasonic thickness readings, taken on the duct adjacent to the saddles, ranged from .17 to .25 (0% to 32% section loss).
- ▶ The splice band to duct welds were found to be cracked at four (4) locations, along with additional cracking and rusted thin and through areas at those locations.



SUMMARY OF INSPECTION (continued)

The condition of the bottom saddle support assemblies are as follows:

- ▶ The lower 3"± of the vertical saddle plates are thinned to 3/16"± (approximately 63% section loss).
- ▶ All of the bottom saddle supports appear to be frozen, with no visible signs of movement. The majority of the saddles are rust layered and rust packed with a range of 10% to 25% section loss.
- ▶ At eight (8) locations, the guide plates have been modified/moved 1" to 2" apparently due to the buckling of the main.

Various deficiencies to the remaining structural supports are as follows:

- ▶ Four (4) of twenty-nine (29) emission duct side brackets were found to have significant deficiencies and the remainder appeared to be frozen and rusted to various degrees.
- ▶ The duct's shell plate was typically found to be cracked at the west rail support plates. The rail support plates and the duct shell immediately adjacent to the support plates are deteriorated to various degrees.
- ▶ Walkway support brackets, grating panels and toe plates were found to be deficient at various locations.
- ▶ The accessible concrete piers are experiencing cracking, spalling and steel casings are rusted thin and through typically throughout.

OVERVIEW

The overall general condition of the Pushing Emission Duct is judged to be "Fair" to "Poor". This judgement is based on the severe deterioration which is largely located at main supporting points throughout the duct.

In general, it is believed that basic recommendations, such as; cladding, air arc gouging/rewelding of cracks, stiffening and/or replacement "in-kind" of deficient members, be avoided at this time until an overall engineering rehabilitation program can be prepared.



OVERVIEW (continued)

In light of the aforementioned, it is recommended that the results of this limited inspection be reviewed by the Acme Steel Engineering Department and that a remedial course of action be established and implemented. It is our opinion, that the following recommended courses of action be considered for implementation:

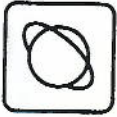
- ▶ Conduct additional inspections at the lower west 90° area of the duct which was inaccessible, along with all other suspected thin areas and incorporate ultrasonic thickness testing to assess the entire shell plate of the Pushing Emissions Duct.

This may require one (1) or more of the following actions to gain access:

- Field cutting/removal of duct support structures' cover plates, as required, for one (1) man access hole.
 - Remove hatches and gain access from the interior of the duct, during scheduled outages, in accordance with Acme's and OSHA's "confined space permit required" procedures.
- ▶ Conduct a structural analysis, after all data from the inspections are gathered, to establish the repair/replacement criteria best suited to reinstate structural integrity.

This analysis may include, but is not limited to, the following:

- Code search to determine applicable loading requirements.
 - Determine adequacy of the existing saddle supports throughout the main.
 - Determine the adequacy of the existing duct shell plate throughout the main.
 - Investigate the expansion and contraction criteria of the main.
 - Determine if re-establishing the ducts elevational position is required from an operational stand-point.
- ▶ Prepare conceptual design repairs of the Pushing Emission Duct System, based on the outcome of the analysis of the existing system.



OVERVIEW (continued)

It is our opinion that the following options for repair/replacement be considered for implementation.

Note: This may require one or more of the repair scenarios given below to reinstate integrity.

- Rehabilitate the Pushing Emission Duct System utilizing "in-kind" replacement and reinforcing plates.
 - Rehabilitate the Pushing Emission Duct system utilizing new design criteria, especially at the saddle support locations, and other "in-kind" replacement and reinforcing plates.
 - Prepare partial replacement cut lines of the Pushing Emission Duct System and rehabilitate the remainder of the duct.
 - Prepare complete replacement drawings of the entire Pushing Emission Duct with any upgrades of the existing or with one of a new design.
- Prepare construction cost estimates for rehabilitation, partial replacement/rehabilitation, and/or complete replacement of the entire Pushing Emission Duct System. This will allow Acme Steel to scrutinize the costs associated with the system and appropriate capital funding based on the overall life expectancy of the Coke Batteries and their Emissions requirements.

To reiterate, the severe deterioration which is largely located at main supporting points throughout the duct, should not be (arbitrarily) clad with plates to cover the holes in the system. The buckles and thin and/or through areas of the duct shell plate, especially around and including the bottom saddle supports, have created a "serious" structural integrity problem and should not be taken lightly.

Therefore, in conclusion, the results of this inspection and the recommended courses of action previously mentioned should be scrutinized by the Acme Steel Engineering and Maintenance Departments, so that, a comprehensive repair program can be developed and implemented in the near future. For specific locations and descriptions of the deficiencies, refer to the inspection drawings and field sketches located in Attachment "1" and "2" respectively.



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Project No. 05-7672-01
January 13, 1997

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Should you have any questions or comments concerning this report, or should you require any additional information, please call our office.

Sincerely,



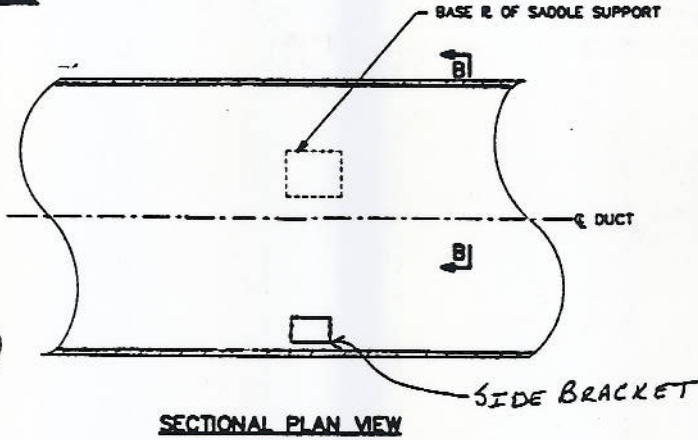
Michael T. McCullough
Project Leader, OEI

List of Attachments

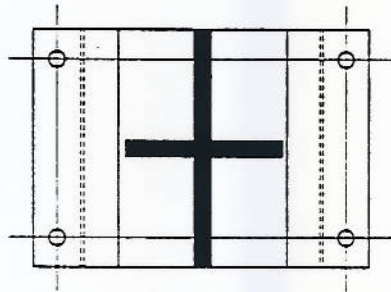
Attachment "1": *Inspection Drawing 7672-1 & 2*
Attachment "2": *Field Sketches FS-1 thru 15*



U.T. READINGS
.19 TO .23
(TYPICALLY
~10 TAKEN
@ EACH
SUPPORT)

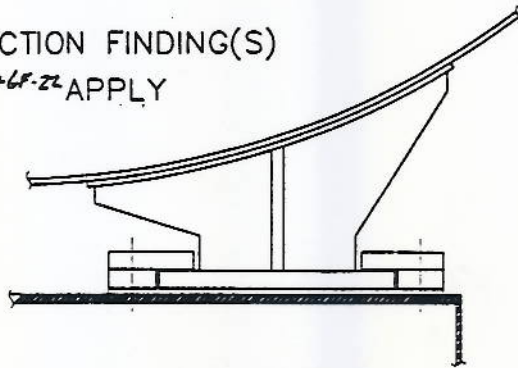


NO NOTICEABLE
BUCKLE IN MAIN



PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)
GF-19, GF-21, + GF-22 APPLY

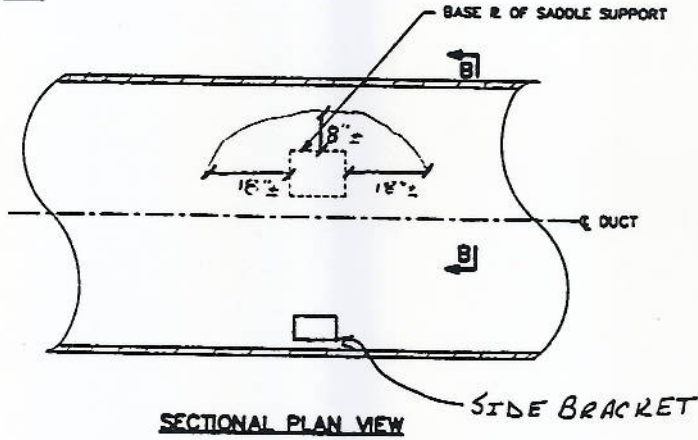


SECTION "B-B"

SADDLE LINE |

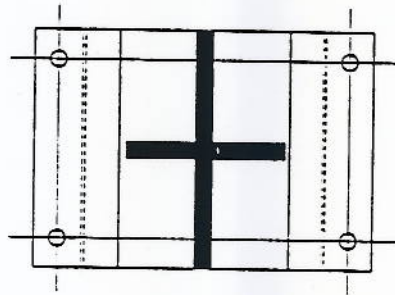
ACME-CCP
05-7672-01
12-16+17-96
VEE/6A61AN

SHT FS-1



1" ± DEEP
BUCKLE

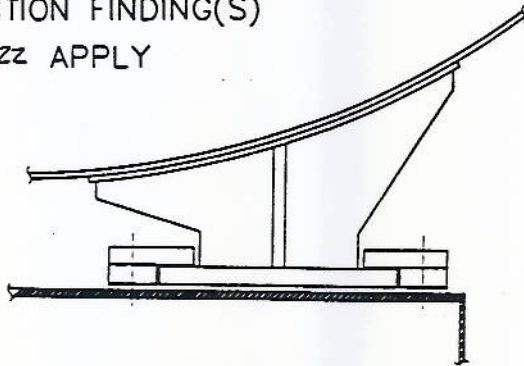
(SUPPORT WAS INACCESSIBLE DUE TO ITS LOCATION - DEPTH AND AREA OF BUCKLE WERE ESTIMATED FROM GRADE)



PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)

GF-99 THRU GF-22 APPLY



SECTION "B-B"

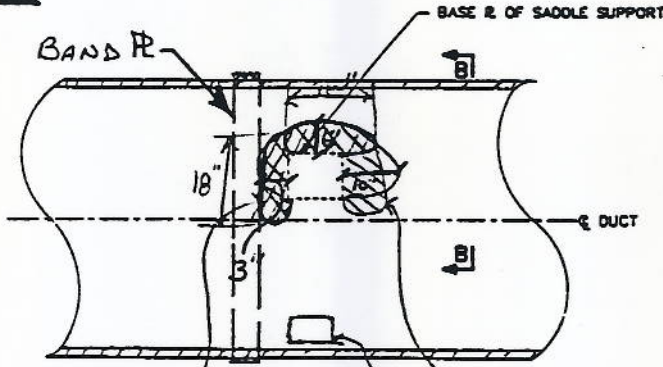
SADDLE LINE 1.5
(INACCESSIBLE)

ACME-CCP
05-7672-01
12-16+17-96
VEE 16A61A

SHT FS-1.



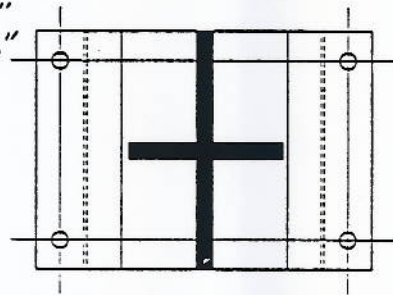
UT READINGS
.19 TO .24
(U.N.O.)



1/4" DEEP MAX
BUCKLE

U.T. READINGS
.15 TO .19
SIDE BRACKET

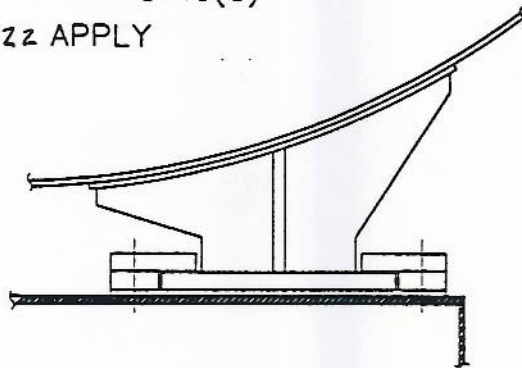
RIT
Z AREAS
18" x 13"
6" x 16"



PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)

GF-19 THRU GF-22 APPLY



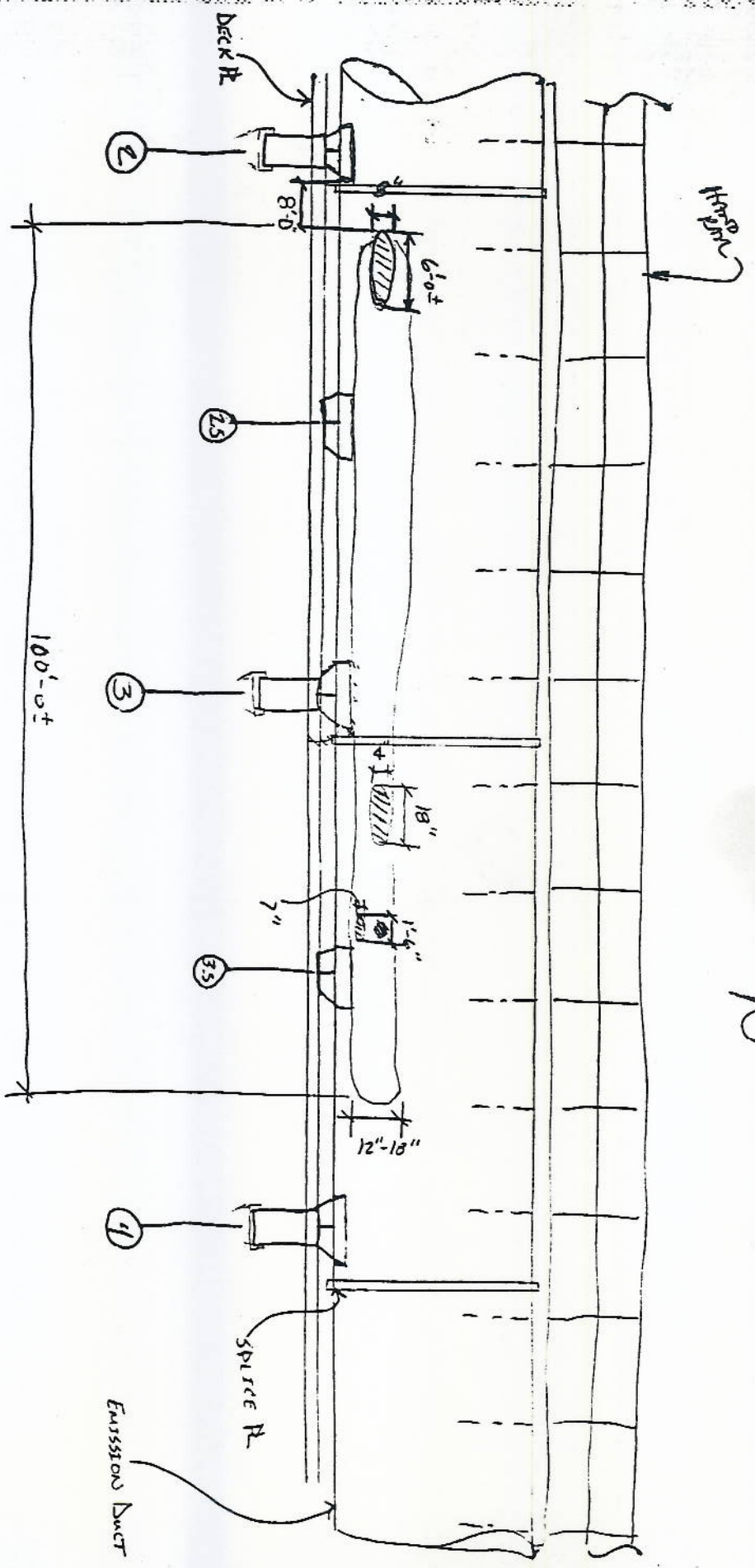
SECTION "B-B"

SADDLE LINE 2

ACME - CCP
05-7672-01
12-16+17-96
VEE/6A61A

SHT FS-2

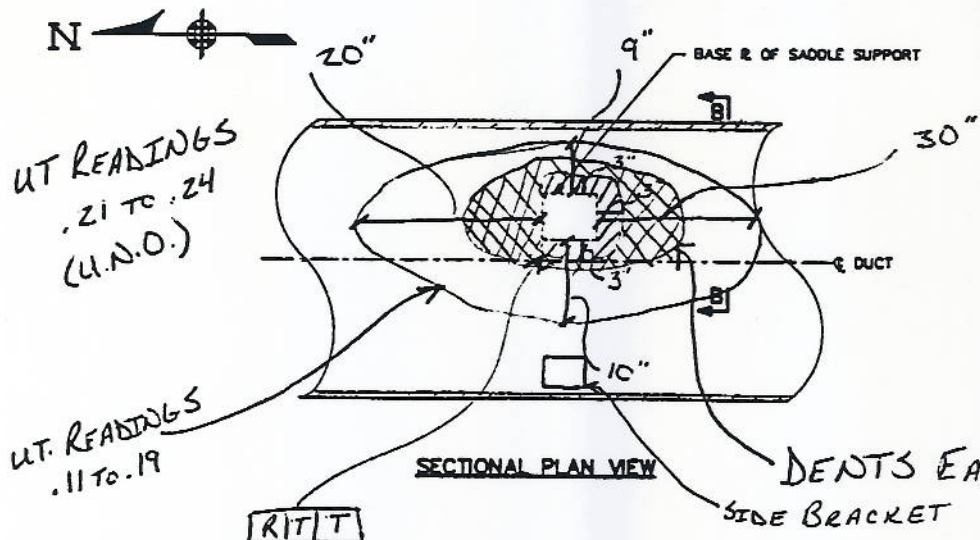
WELD = NEWM STAINLESS
 O = AMEN STAINLESS [RTI] 8/10a THRU
 (DENTS EASY WITH STRIKE)



"PRESTAL"
 EAST ELEVATION
 LRG WEST
 (WOODEN WAL & REAR)

SHT FS-ZA

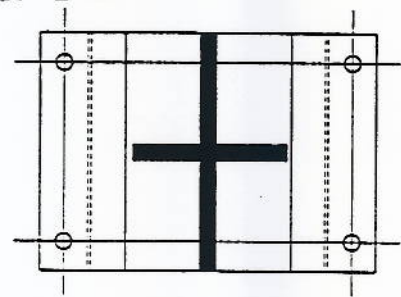
OS-7672-01
 NEE/AM516A6
 12-16+17-96



2 1/2" DEEP M. BUCKLE

DENTS EASILY WHEN STRUCK

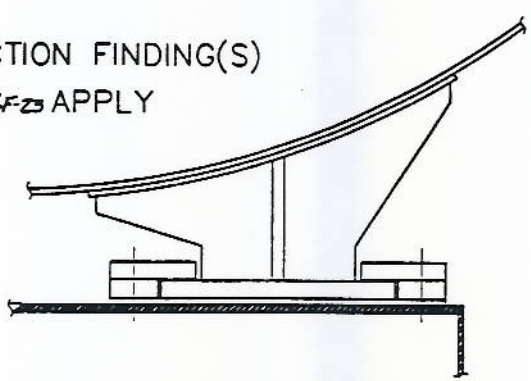
RIT
3" @ 3 SIDES OF SADDLE



INDENT IS CONTINUOUS FROM AROUND SADDLE LINE 3.5 TO ~8'-0" OF SADDLE LINE 2. (ENTIRE AREA ^{OF INDENT} IS RUSTED THROUGH)

PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)
GF-19, GF-20, GF-21, + GF-23 APPLY



SECTION "B-B"

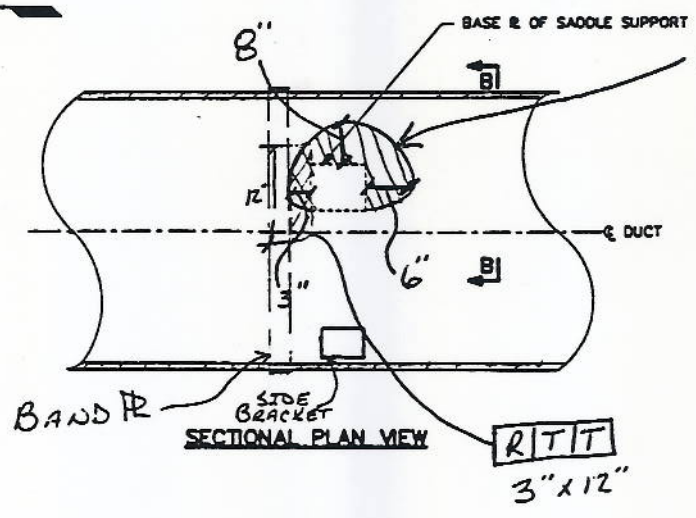
SADDLE LINE 2.5

ACME - CCP
05-7672-01
12-16+17-96
VEE/6A6/AN

SHT FS-2.5

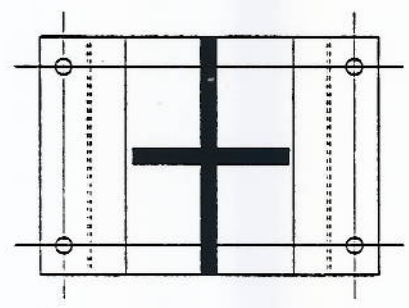


U.T. READINGS
-19 TO -21
(U.N.O.)



U.T. READINGS
.11 TO .16

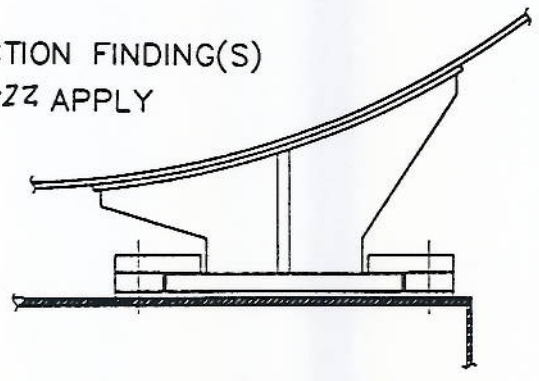
1 1/2" DEEP MAX
BUCKLE



PLAN - BASE PLATE AND KEEPER BARS

INDENT IS CONTINUOUS
FROM AROUND SADDLE LINES TO
~8'-0" N. OF SADDLE
LINE 2.
ENTIRE AREA OF INDENT IS
RUSTED THIN &/OR THROUGH,

GENERAL INSPECTION FINDING(S)
GF-19 THROUGH GF-22 APPLY



SECTION "B-B"

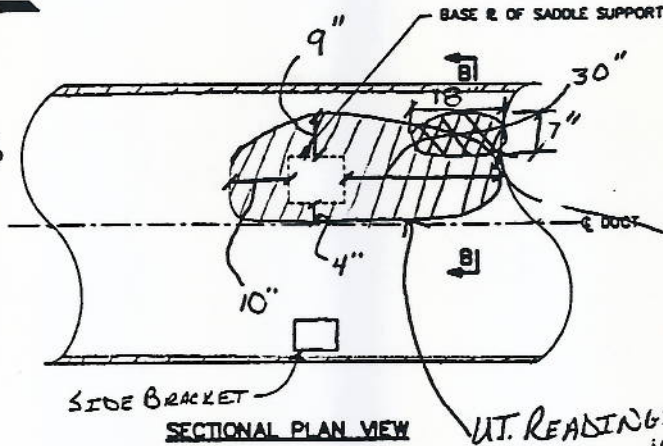
SADDLE LINE 3

ACME - CCP
05-7672-01
12-16+17-96
VEE/6A6/AM

SHT FS-3



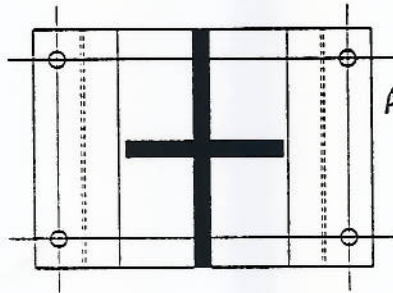
U.T. READINGS
.20 TO .24
(U.N.O.)



RT 4/CR T
18" x 7"

U.T. READINGS
.13 TO .19

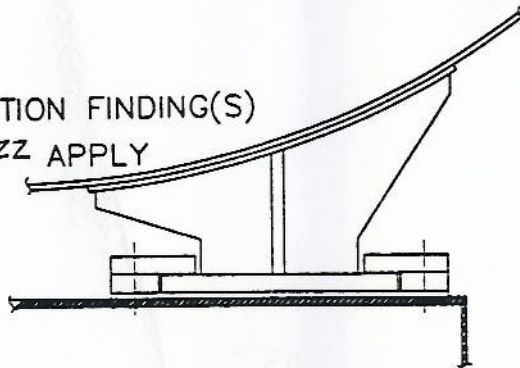
2' Z" DEEP MAX
BUCKLE



INDENT IS CONTINUOUS FROM
AROUND SADDLE LINE 3.5 TO ~8'-0"
OF SADDLE LINE Z.
(ENTIRE AREA OF INDENT IS
RUSTED THIN & /OR THROUGH)

PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)
6F-19 THRU 6F-22 APPLY



SECTION "B-B"

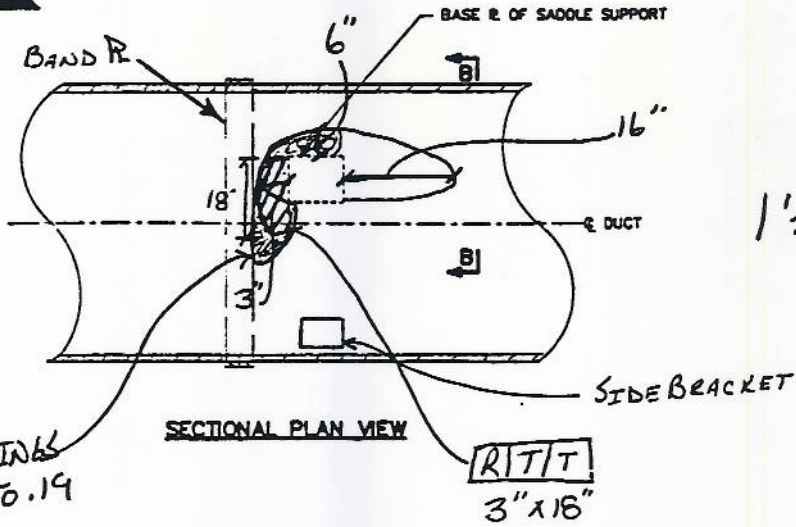
SADDLE LINE 3.5

ACME-CCP
05-7672-01
12-16&17-96
VEE/6A61AN

BHT FS-3.5



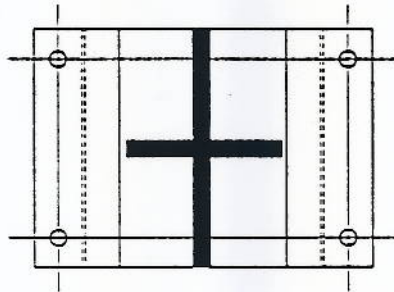
UT READINGS
.21 TO .24
(U.N.O.)



1 1/2" DEEP MAX
BUCKLE

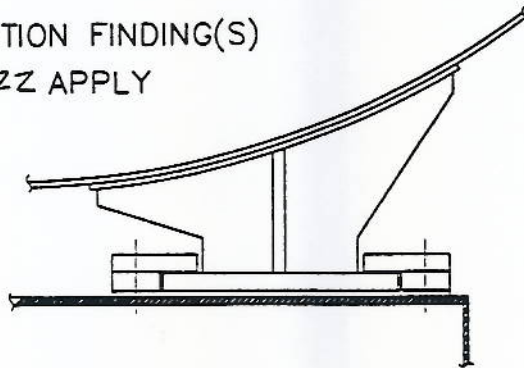
UT READINGS
.13 TO .19

RIT
3" x 18"



PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)
GF-19 THRU GF-22 APPLY



SECTION "B-B"

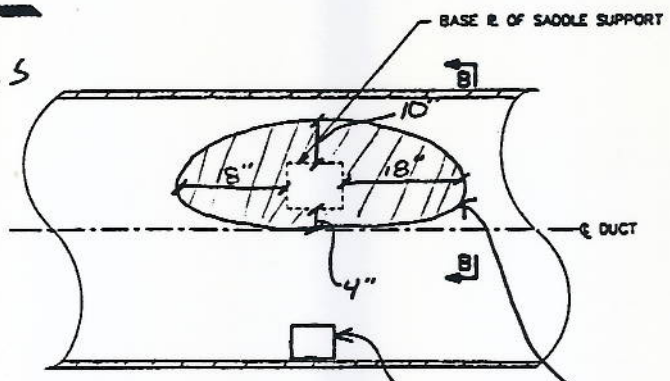
SADDLE LINE 4

ACME-CCP
05-7672-01
12-16+17-96
VEE/6A61A

BHT FS-4



U.T. READINGS
.20 TO .24
(U.N.O)

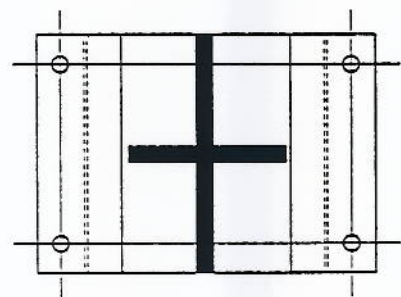


2" DEEP MAX
BUCKLE

U.T. READINGS
.13 TO .19

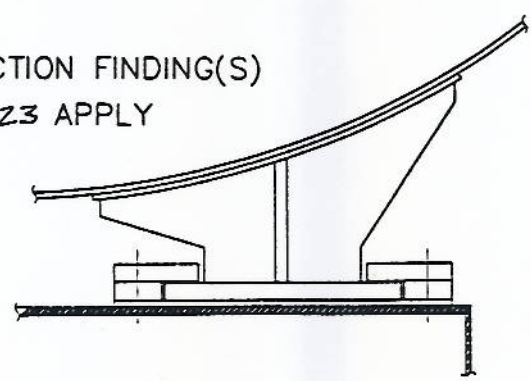
SIDE BRACKET

SECTIONAL PLAN VIEW



PLAN - BASE PLATE AND KEEPER BARS

GENERAL INSPECTION FINDING(S)
GF-19 THRU GF-23 APPLY



SECTION "B-B"

SADDLE LINE 4.5

ACME-CCP
05-7672-01
12-16+17-96
VEE/6A61A

3HT FS-4.5

INTEROFFICE
CORRESPONDENCE

Date: January 17, 1997

Copies to:

M. Maravich
M. McCarthy
R. O'Hearn
D. Podgorny

To: J. Garzella
From: R. Martello *RM*
Subject: Inspect HKC Duct
Reference:

In accordance with your request, the Coke Side Emission Control Duct (HKC) was inspected in order to determine the structural integrity of the duct. This request was made because the Ovens area personnel observed buckled areas on the duct.

The inspection was performed by Orbital Engineering and the results are contained in the attached report dated January 14, 1997.

The overall general condition of the duct is judged as "fair" to "poor" based on the severe deterioration which is mostly located at the support points.

A plan of action for rehabilitating the duct needs to be developed which would include a structural analysis. However, the lower west 90 deg of the duct is currently inaccessible for inspection and therefore its condition in this area is not known. Orbital and Acme are currently investigating options to gain access to this area of the duct.

I will keep you informed of progress.

Project No. _____

ACME STEEL COMPANY

IRON AND COKE OPERATIONS - CHICAGO

EMERGENCY MAJOR REPAIR PROJECT AUTHORIZATION

Repair HKC Fan

Cost Center: C-2925

Expense: \$35,000

This project provides for the repair of the HKC emission control system's fan. The 1979-vintage HKC system (CC-7744) uses a moveable hood that is positioned over the quench car to collect particulate-laden gases. The suction required to pull the gases from the hood car is provided by a 100,000 CFM electrically-driven fan. On July 8, this system was rendered inoperable due to the failure of the fan's motor bearings. Upon disassembly, an inspection of internal components revealed excessive wear including the scouring of the fan's shaft and bearings. Additionally, on the fan's east side, the blades were cracked and worn to the extent that they were paper thin. This project provides for the repair of all damaged components including the removal and replacement of all worn blades at a contractor's repair shop and the repair of the fan bearings. It is expected that the HKC system will be returned to operation by August 8, 1997. Acme's Environmental Services Department has informed the appropriate EPA agencies as to the duration of the outage. This is the first time that this fan has required major repairs since the start-up of the system in 1979.

Approved:

Vice President - Primary Operations,
Finishing and Technical Services

July 29, 1997