UTILITIES AND OFFSITES DESIGN BASELINE

May 25, 1984
Date Revised

Work Performed Under Contract No. AC05-78OR03054

The Rust Engineering Company
Birmingham, Alabama

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International Coal Refining Company

UTILITIES AND OFFSITES
DESIGN BASELINE

OUTSIDE BATTERY LIMITS FACILITY
6000 TPD SRC-I
DEMONSTRATION PLANT

FOR
U.S. DEPARTMENT OF ENERGY

VOLUME II

Prepared By

The Rust Engineering Company
Birmingham, Alabama
REVISED MAY 25, 1984
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## VOLUME IV

(Continued)

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## VOLUME V

Wastewater Treatment System and Solid Wastes Landfill for 6,000 TPD SRC-I Demonstration Plant (DOE/OR/03054-71)

## VOLUME VI

3.1.3 Wastewater Treatment (Confidential Version) | 3.1-13 |

<table>
<thead>
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<th>Page</th>
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<td>3.1.3.3 Material Balance</td>
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ix  Rev. 5-25-84
2.2.4  Cooling Water System

2.2.4.1  System Description (Refer to Process Flow Diagrams No. 00-16-01014D and 00-16-01015D)

2.2.4.1.1  General

The cooling water system includes two cooling tower systems, cooling tower No. 1 and cooling tower No. 2. Each cooling tower system consists of a distribution header, a collection header, the cooling tower, and cooling tower associated equipment.

2.2.4.1.2  Cooling Tower No. 1

2.2.4.1.2.1  The cooling tower (CT-16601) will be cross-flow design. The hot water enters the distribution basin in the top of the tower and falls by gravity through the cooling tower fill into a cold water basin. The cooling water supply pumps (P-16603A through F) are located in a sump at the end of the cold water basin. Removable screens are provided to prevent large solids from entering the pump suctions. The vertical turbine cooling water supply pumps will maintain a constant pressure on the distribution header. The cooling tower fans (C-16601 A-K) can be started or shutdown to provide the proper water temperature for the distribution system header. The cooling water from all areas together with the blowdowns from boilers will be collected in a central header and returned to the cooling tower.

2.2.4.1.2.2  A cooling tower chlorinator (X-16603) is provided to prevent microbiological growth in the tower or in the cooling water system. An inhibitor feed system (X-16601) will meter inhibitor into the cooling water system to provide corrosion control. The cooling tower blowdown stream will flow to the wastewater treatment area through interconnecting piping systems. A sulfuric acid feed system (X-16602) will meter acid into the
cooling water system to maintain the proper pH level. Makeup water to the cooling tower will be supplied from the process water distribution system to maintain level in the cold water basin. Other makeup water sources include evaporator condensate, treated wastewater and boiler blowdowns.

2.2.4.1.3 Cooling Tower No. 2

2.2.4.1.3.1 The cooling tower (CT-16610) will be cross-flow design. The hot water enters the distribution basin in the top of the tower and falls by gravity through the cooling tower fill into a cold water basin. The cooling water supply pumps (P-16612 A-E) are located in a sump at the end of the cold water basin. Removable screens are provided to prevent large solids from entering the pump suction. The vertical turbine cooling water supply pumps will maintain a constant pressure on the distribution header. The cooling tower fans (C-16610 A-C) can be started or shutdown to provide the proper water temperature for the distribution system header. The cooling water from all areas will be collected in a central header and returned to the cooling tower.

2.2.4.1.3.2 A cooling tower chlorinator (X-16612) is provided to prevent microbiological growth in the tower or in the cooling water system. An inhibitor feed system (X-16610) will meter inhibitor into the cooling water system to provide corrosion control. The cooling tower blowdown stream will flow to the wastewater treatment area. A sulfuric acid feed system (X-16611) will meter acid into the cooling water system to maintain the proper pH level. Makeup water to the cooling tower will be supplied from the process water distribution system to maintain level in the cold water basin.
2.2.4.2 Utility Flow Diagrams

The following utility flow diagrams are included after this page:

00-16-01014D  Cooling Water System Process and Control Diagram (Sheet 1)
00-16-01015D  Cooling Water System Process and Control Diagram (Sheet 2)
2.2.4.3 Utility Summary

The utility summary for the cooling water system follows this page.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CT.16604 Cooling Tower NO.1</td>
<td>7635 psi</td>
<td>SEE</td>
<td>MOTOR</td>
<td></td>
<td>389</td>
<td>50</td>
<td>50</td>
<td>373</td>
<td></td>
<td></td>
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<tr>
<td>CT.16610 Cooling Tower NO.2</td>
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<td></td>
<td></td>
<td>54</td>
<td>50</td>
<td>50</td>
<td>349</td>
<td></td>
<td></td>
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</table>

**TOTAL**

| Work | 13,774 | 8,408 | 463 | 76 | 105 | 742 |

**NOTES:**

- [Image of the form with the data filled in]
2.2.4.4 Motor List

The motor list for the cooling water system follows this page.
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<th>Equipment No.</th>
<th>Description</th>
<th>Installed Hp</th>
<th>Operating KW</th>
<th>Hours/Day</th>
<th>KWH/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-16601A</td>
<td>Cooling Tower Fan</td>
<td>250</td>
<td>150</td>
<td>24</td>
<td>3,600</td>
</tr>
<tr>
<td>C-16601B</td>
<td>Cooling Tower Fan</td>
<td>250</td>
<td>150</td>
<td>24</td>
<td>3,600</td>
</tr>
<tr>
<td>C-16601C</td>
<td>Cooling Tower Fan</td>
<td>250</td>
<td>150</td>
<td>24</td>
<td>3,600</td>
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<td>C-16601E</td>
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<td>250</td>
<td>150</td>
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<td>3,600</td>
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<td>150</td>
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<td>150</td>
<td>24</td>
<td>3,600</td>
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<tr>
<td>C-16601I</td>
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<td>150</td>
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<td>0.3</td>
<td>24</td>
<td>7</td>
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<tr>
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<td>0</td>
<td>0</td>
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<tr>
<td>P-16602A</td>
<td>Sulfuric Acid Pump</td>
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<td>0.3</td>
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<td>7</td>
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<td>0.3</td>
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<tr>
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<td>0</td>
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<td>Equipment No.</td>
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<td>220</td>
<td>24</td>
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<tr>
<td>P-16612C</td>
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<td>220</td>
<td>24</td>
<td>5,280</td>
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<tr>
<td>P-16612D</td>
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<tr>
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2.2.4.5 Equipment List/Summary

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<th>P.O.</th>
<th>QTY</th>
<th>VENDOR ENG</th>
<th>DELV</th>
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<th>PURCH</th>
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<td>C-16601</td>
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<td>Fan, cooling tower</td>
<td>250hp S 11-82</td>
<td>S 1-83 inc</td>
<td>S 9-83 inc</td>
<td>CMC</td>
<td>FF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A thru K</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>CT-16601</td>
<td>1</td>
<td>Cooling tower, 100,000 gpm, cooling range 20°F, 10°F approach, wet bulb 78°F</td>
<td>S 11-82</td>
<td>S 1-83</td>
<td>227.7</td>
<td>S 9-83</td>
<td>1,297.5</td>
<td>CMC</td>
<td>FF</td>
<td></td>
<td></td>
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<td></td>
<td>4</td>
<td></td>
<td>Filter, side stream, ca, 720 gpm, flat top, 24&quot; sand filter depth, top section for water storage; bottom section for sand filter, T = 88°F</td>
<td>12.5' dia x 15.75' high</td>
<td>P 10-82</td>
<td>S 12-82 5.4 ea</td>
<td>S 5-83</td>
<td>45.8 ea</td>
<td>CMC</td>
<td>SF</td>
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</tr>
<tr>
<td></td>
<td>A thru D</td>
<td></td>
<td>Ejector, chlorine, 230 lb/hour (included with chlorinator)</td>
<td>P 10-82</td>
<td>S 11-82 inc</td>
<td>S 3-83 inc</td>
<td>RUST</td>
<td>SF</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>P-16601</td>
<td>2</td>
<td>Pump, corrosion inhibitor, centrifugal, 15 gpm, 30 tdp, 110°F max, sp gr 1.84, Hastelloy C, with motor</td>
<td>1 hp</td>
<td>1,800 rpm</td>
<td>P 10-82</td>
<td>S 11-82 0.6 ea</td>
<td>S 2-83</td>
<td>4.7 ea</td>
<td>RUST</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A and B</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>P-16602</td>
<td>2</td>
<td>Pump, sulfuric acid, centrifugal, 15 gpm, 30 tdp, 110°F max, sp gr 1.84, Hastelloy C, with motor</td>
<td>1 hp</td>
<td>1,800 rpm</td>
<td>P 10-82</td>
<td>S 11-82 0.6 ea</td>
<td>S 2-83</td>
<td>4.7 ea</td>
<td>RUST</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A and B</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>P-16603</td>
<td>6</td>
<td>Pump, cooling water supply, vertical turbine, ca, 20,000 gpm, 221 tdp, 108°F, with motor</td>
<td>1,500 hp ea.</td>
<td>rpm</td>
<td>P 10-82</td>
<td>S 11-82 30.3 ea</td>
<td>S 2-83</td>
<td>117.7 ea</td>
<td>RUST</td>
<td>SF</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB job site with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks.
RUST: Rust Engineering  S: Scheduled  FL: Field Labor  N/A: Not Applicable
CNC: Stone & Webster  P: Projected  M: Material for field fab equipment
A: Actual  SF: Shop Fabricated  FF: Field Fabricated
### Equipment List/Summary

**WBS Element:** 1.4.1.2  
**ICRC Area:** 16  
**Cooling Water—Cooling Tower 1**  
**Rev.:** 4  
**Date:** 03-26-82  
**Page 2 of 3**

<table>
<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST</th>
<th>QTY</th>
<th>EQUIPMENT NO</th>
<th>DESCRIPTION</th>
<th>P.O. NUMBER</th>
<th>SIZE/WEIGHT</th>
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<th>NEED DATE</th>
<th>COST</th>
<th>DELV DATE</th>
<th>EQUIP</th>
<th>PURCH BY</th>
<th>TYPE</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>TX-16601</td>
<td>Tank, inhibitor storage, fiberglass, 1,000 gal capacity, covered flat top, 0 psig, 90°F max</td>
<td>6' dia x 4.5' high</td>
<td>S 10-82</td>
<td>S 12-82</td>
<td>0.4</td>
<td>S 6-83</td>
<td>3.1</td>
<td>CMC</td>
<td>SF</td>
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<td>TX-16602</td>
<td>Tank, sulfuric acid, ca, 10,000 gal capacity, horizontal, 0 psig, 110°F max</td>
<td>12' dia x 12' TT</td>
<td>S 10-82</td>
<td>S 12-82</td>
<td>1.6</td>
<td>S 4-83</td>
<td>13.4</td>
<td>CMC</td>
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<td>W-16601</td>
<td>Scale, chlorine, ton cylinder, 3,600 lb load, tank size 6.67' x 2.5' diameter</td>
<td></td>
<td>S 10-82</td>
<td>S 11-82</td>
<td>0.7 ea</td>
<td>S 3-83</td>
<td>6.0 ea</td>
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<tr>
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<td>X-16601</td>
<td>Chemical feed system, inhibitor, inc vertical tank, 316 SS, 100 gal capacity, open top</td>
<td>2.58' dia x 3.1' high</td>
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<td>S 12-82</td>
<td>0.8</td>
<td>S 4-83</td>
<td>7.0</td>
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<td>X-16602</td>
<td>Chemical feed system, sulfuric acid, inc vertical tank, 316 SS, 100 gal capacity, open top</td>
<td>2.58' dia x 3.1' high</td>
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<td>S 12-82</td>
<td>0.6</td>
<td>S 4-83</td>
<td>4.5</td>
<td>RUST</td>
<td>SF</td>
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</table>

**NOTES:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.  
   **RUST:** Rust Engineering  
   **SF:** Shop Fabricated  
   **FL:** Field Labor  
   **M:** Material for field fab equipment  
   **N/A:** Not Applicable  
   **S:** Scheduled  
   **A:** Actual  
   **P:** Projected  
   **X:** Actual  
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.  
   **CMC:** Stone & Webster  
3. This equipment is Appendix C Bulks.
## Equipment List/Summary

**WBS Element:** 1.4.1.2  
**ICRC Area:** 16  
**COOLING WATER—COOLING TOWER 1**  
**Rev:** 4  
**03-26-82**  
**Page 3 of 3**

<table>
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<th>NEED DATE</th>
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<tr>
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<td>X-16603</td>
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<td>Chiller, cooling tower, 6,000 lb/day max</td>
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<td>S 11-82</td>
<td>2.8</td>
<td>S 3-83</td>
<td>28.1</td>
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<td>SF</td>
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### Notes:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.  
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.  
3. This equipment is Appendix C Bulks.

**RUST:** Rust Engineering  
**M/C:** Stone & Webster  
**S:** Scheduled  
**P:** Projected  
**A:** Actual  
**FL:** Field Labor  
**N/A:** Not Applicable  
**M:** Material for field fab equipment  
**SF:** Shop Fabricated  
**FF:** Field Fabricated
## Equipment List/Summary

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<th>REV.</th>
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<th>Size/Weight</th>
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<th>Cost</th>
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<tr>
<td>C-16610</td>
<td>3 A thru C</td>
<td>Fan, Cooling tower</td>
<td>125 hp</td>
<td>S 11-82</td>
<td>P 1-83</td>
<td>Inc 9-83</td>
<td>Inc with</td>
<td>CT-16610</td>
<td>FF</td>
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<tr>
<td>CT-16610</td>
<td>5</td>
<td>Cooling tower, 16,000 gpm, cooling range 20°F, 10°F approach, wet bulb 78°F</td>
<td>B 11-82</td>
<td>P 39.1</td>
<td>B 9-83</td>
<td>374.8</td>
<td>CHC</td>
<td>FF</td>
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<tr>
<td>FL-16610</td>
<td>2 A and B</td>
<td>Filter, side stream, ca, 278 gpm, flat top, 24&quot; sand filter depth, top section for water storage; bottom section for sand filter, T = 98°F</td>
<td>8' dia x 15.75' high</td>
<td>S 10-82</td>
<td>P 12-82</td>
<td>3.3 ea</td>
<td>B 5-83</td>
<td>12.5 ea</td>
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<td>SF</td>
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<td>J-16610</td>
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<td>Ejector, chlorine (included with chlorinator)</td>
<td>S 10-82</td>
<td>P 11-82</td>
<td>Inc 3-83</td>
<td>Inc with</td>
<td>RUST</td>
<td>SF</td>
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<tr>
<td>P-16610</td>
<td>2 A and B</td>
<td>Pump, corrosion inhibitor, centrifugal, 15 gpm, 30 tdbh, 90°F max, sp gr 1.1, Hastalloy C, with motor</td>
<td>1 hp</td>
<td>1,800 rpm</td>
<td>P 10-82</td>
<td>0.6 ea</td>
<td>S 2-83</td>
<td>4.7 ea</td>
<td>RUST</td>
<td>SF</td>
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<tr>
<td>P-16611</td>
<td>2 A and B</td>
<td>Pump, sulfuric acid, centrifugal, 15 gpm, 30 tdbh, 110°F max, sp gr 1.84, Hastalloy C, with motor</td>
<td>1 hp</td>
<td>1,800 rpm</td>
<td>P 10-82</td>
<td>0.6 ea</td>
<td>S 2-83</td>
<td>4.7 ea</td>
<td>RUST</td>
<td>SF</td>
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<td></td>
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<tr>
<td>P-16612</td>
<td>5 A thru E</td>
<td>Pump, cooling water supply, vertical turbine, ca, 4,000 gpm, 221 tdbh, 108°F, sp gr 1.0, CI, with motor</td>
<td>300 hp ca.</td>
<td>rpm</td>
<td>B 10-82</td>
<td>7.2 ea</td>
<td>S 2-83</td>
<td>50.1 ea</td>
<td>RUST</td>
<td>SF</td>
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### Notes:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars. RUST: Rust Engineering
2. Equipment costs are FDB job site with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.
3. S: Scheduled  FL: Field Labor  M/A: Not Applicable
<table>
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<tr>
<th>REV. ICRC/RUST EQUIP NO</th>
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<th>DELV DATE</th>
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<th>PURCH BY</th>
<th>TYPE EQUIP</th>
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<tbody>
<tr>
<td>TK-16610</td>
<td>1</td>
<td>Tank, inhibitor storage, fiberglass, 1,000 gal capacity, covered flat top, 0 psig, 90°F max</td>
<td>6' dia x 4.5' high</td>
<td>S 10-82 P</td>
<td>S 12-82 0.4 P</td>
<td>S 4-83 3.1 CMC SF</td>
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<td>TK-16610</td>
<td>1</td>
<td>Tank, sulfuric acid, ca, 10,000 gal capacity, horizontal, 0 psig, 190°F max</td>
<td>12' dia x 12' TT</td>
<td>S 10-82 P</td>
<td>S 12-82 1.6 P</td>
<td>S 4-83 13.4 CMC SF</td>
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<tr>
<td>W-16610</td>
<td>1</td>
<td>Scale, chlorine, ton cylinder, 3600 lb load, tank size 6.67' x 2.5' diameter</td>
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<td>S 10-82 P</td>
<td>S 11-82 0.7 P</td>
<td>S 3-83 6.0 RUST SF</td>
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</tr>
<tr>
<td>X-16610</td>
<td>1</td>
<td>Chemical feed system, inhibitor, inc vertical tank, 316 SS, 100 gal capacity, open top</td>
<td>2.58' dia x 3.1' high</td>
<td>S 10-82 P</td>
<td>S 12-82 0.7 P</td>
<td>S 4-83 6.2 RUST SF</td>
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<td></td>
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</tr>
<tr>
<td>X-16610</td>
<td>2</td>
<td>Pump, 316 SS, diaphragm, 0.5 gpm, 100 t/dh, ambient temp, sp gr 1.1, with motor</td>
<td>1 hp 1,800 rpm A</td>
<td>S 10-82 P with P</td>
<td>S 12-82 inc with P</td>
<td>S 4-83 inc with P</td>
<td>RUST SF</td>
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<td></td>
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<tr>
<td>X-16611</td>
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<td>Chemical feed system, sulfuric acid, inc vertical tank, 316 SS, 100 gal capacity, open top</td>
<td>3.5' dia x 3.9' high</td>
<td>S 10-82 P</td>
<td>S 12-82 0.7 P</td>
<td>S 4-83 6.2 RUST SF</td>
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</tr>
<tr>
<td>X-16611</td>
<td>2</td>
<td>Pump, 316 SS, diaphragm, 0.5 gpm, 100 t/dh, ambient temp, sp gr 1.85, with motor</td>
<td>1 hp 1,800 rpm A</td>
<td>S 10-82 P with P</td>
<td>S 12-82 inc with P</td>
<td>S 4-83 inc with P</td>
<td>RUST SF</td>
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</tbody>
</table>

**NOTES:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB job site with shipping & vendor field support less vendor engineering.
3. Material for field fab equipment.
4. This equipment is Appendice C Bulks.

**RUST:** Rust Engineering  
**CNC:** Stone & Webster  
**P:** Projected  
**FL:** Field Labor  
**N/A:** Not Applicable  
**S:** Scheduled  
**SF:** Shop Fabricated  
**FF:** Field Fabricated
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<th>SIZE/WEIGHT</th>
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<th>PURCH TYPE</th>
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<td>X-16612</td>
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<td>Chlorinator, cooling tower, 1200 lb/day max</td>
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<td>P</td>
<td>1 1-82</td>
<td>1.7</td>
<td>S 3-83</td>
<td>17.6</td>
<td>RUST</td>
<td>SF</td>
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Notes:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks.
## Equipment List/Summary

<table>
<thead>
<tr>
<th>WBS Element: 1.4.1.2.1</th>
<th>ICRC Area: 17</th>
<th>13.8 kV Distribution—Substation No. 7</th>
<th>REV. 4</th>
<th>03-26-82</th>
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**REVIEW: ICRC/RUST**

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<th>DELV DATE</th>
<th>EQUIP COST</th>
<th>PURCH BY</th>
<th>TYPE EQUIP</th>
</tr>
</thead>
</table>

**CA-17014 A**

- Capacitor, 4.16 kV, 200 kVAC, with vacuum switch and individually fused cans, complete with voltage control; all located in an all-weather metal enclosure.

**CA-17014 con't.**

- Enclosure with conduit entrance from bottom

**GR-17012 A**

- Resistor, neutral grounding, rated 2,500 volts, 600 amperes for 10 seconds; complete with mounting frame and screen enclosure

**MC-17013 A**

- Motor control center, medium voltage, 4.16 kV, NEMA type I, with incoming line module and terminal lugs

**MC-17017 A**

- Motor control center, 0.68 kV, NEMA type I with incoming line module and terminal lugs

**SG-17011 A**

- Switchgear, 3 phase, 4.16 kV, 1,200 amperes located in an outdoor, protected-isle, all-weather metal enclosure, complete with CPT, CT's.

**SG-17011 con't.**

- and PT's for load metering, dc power supply if required, (2) relay and metering cubicles in addition to breaker cubicles, and provisions for

### Notes:

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2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks.
## Equipment List/Summary

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<tr>
<th>REV.</th>
<th>ICRC/RUST EQUIP NO</th>
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<th>NEED DATE</th>
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<th>DELV DATE</th>
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<td>SC-17011</td>
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<td>conduit entrance to each cubicle from top or bottom</td>
<td></td>
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<td>CMC</td>
<td>SF</td>
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<tr>
<td>2.</td>
<td>SG-17016</td>
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<td>Switchgear, 3 phase, 0.48 KV, 3,000 ampere, located in an outdoor, protected-isle, all-weather metal enclosure; complete with CT's and PT's</td>
<td>P</td>
<td>P</td>
<td>A</td>
<td>A</td>
<td>SG-17011</td>
<td>SF</td>
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<tr>
<td>3.</td>
<td>SG-17016</td>
<td></td>
<td>for load metering, dc power supply if required, and provisions for conduit entrance to each cubicle from top or bottom</td>
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<td>CMC</td>
<td>SF</td>
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<tr>
<td>4.</td>
<td>TR-17010</td>
<td>1</td>
<td>Transformer, primary unit substation, 3 phase, rated 1,000/1,150/1,288 kVA (55/65C), 13,800 - 4,160 V/2,400 with (2) 24% taps above and below rated voltage; with fans for 480 volt 3 phase supply, top oil thermistor with alarm contacts, liquid level gauge; (1) 600V ampere mr ct on each hv bushing and lv neutral bushing, (1) 1,200V ampere mr ct for relaying and metering on each lv bushing; incoming line section to consist of oil filled fused load break switch rated 60 ampere with termination compartment for (1) 3/c 250CHM IAC and (1) 3/c 250CHM IAC; switch and power fuses to</td>
<td>P</td>
<td>P</td>
<td>A</td>
<td>A</td>
<td>42.3</td>
<td>RUST</td>
<td>SF</td>
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**Notes:**
1. All costs are Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks.
**EQUIPMENT LIST/SUMMARY**

**WBS ELEMENT:** 1.4.1.2.1  **ICRC AREA:** 17  
**13.8 KV DISTRIBUTION--SUBSTATION NO. 7**

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<td></td>
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<td></td>
<td>TR-17010</td>
<td>be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear</td>
<td></td>
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<td>RUST SF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TR-17010</td>
<td>located in an outdoor, protected-isle, all-weather metal enclosure</td>
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<td></td>
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<td>RUST SF</td>
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<td>TR-17015</td>
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<td>1</td>
<td>A</td>
<td>Transformer, 3 phase, power center, rated 1,500/1,725/1,932 KVA (55/65)c, 13,800 - 480V/277 with (2) 25% tape above and below rated voltage; equipped with fans for 480 volt 3 phase supply, top oil thermometer with alarm contacts, and liquid level guage; incoming line section to consist of oil filled fused load break switch, rated 200 amperes, with termination compartment for (1) 3/0 250MCM IAC; switch and power fuse to</td>
<td>S 7-83</td>
<td>S 11-83</td>
<td>inc</td>
<td>S 5-84</td>
<td>inc</td>
<td></td>
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<tr>
<td>TR-17015</td>
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<td>be located in oil filled compartment separate from the main transformer tank outgoing section to consist of throat connection to switchgear</td>
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<td>TR-17015</td>
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<td>located in an outdoor, protected-isle, all-weather metal enclosure</td>
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**NOTES:**

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2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.  
3. This equipment is Appendix C Bulks.
## EQUIPMENT LIST/Summary

**WBS ELEMENT:** 1.4.1.1.2  
**ICRC AREA:** 16  
**13.8 KV DISTRIBUTION--SUBSTATION NO. 9**  
**REV:** 4  
**03-26-82**  
**PAGE 1 OF 3**

<table>
<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST</th>
<th>EQUIP NO</th>
<th>QTY</th>
<th>EQUIPMENT DESCRIPTION</th>
<th>P.O. NUMBER</th>
<th>SIZE/WEIGHT</th>
<th>P.O. DATE</th>
<th>NEED DATE</th>
<th>COST</th>
<th>DELV DATE</th>
<th>EQUIP COST</th>
<th>PURCH</th>
<th>TYPE</th>
<th>EQUIP</th>
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<tbody>
<tr>
<td>CA-16030</td>
<td>A</td>
<td>1</td>
<td>Capacitor, 4.16 KV, 1,000 KVAC, with vacuum switch and individually fused cans, complete with voltage control; all located in an all weather metal enclosure with conduit entrance from bottom</td>
<td>S 11-82</td>
<td>3-83 inc</td>
<td>S 6-83 inc</td>
<td>RUST SF</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>CA-16030</td>
<td>A</td>
<td>1</td>
<td>Capacitor, 4.16 KV, 1,000 KVAC, with vacuum switch and individually fused cans, complete with voltage control; all located in an all weather metal enclosure with conduit entrance from bottom</td>
<td>S 11-82</td>
<td>3-83 inc</td>
<td>S 6-83 inc</td>
<td>RUST SF</td>
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<tr>
<td>GR-16028</td>
<td>A</td>
<td>1</td>
<td>Resistor, neutral grounding, rated 2,400 volts, 400 amperes for 10 seconds; complete with mounting frame and screen</td>
<td>S 7-83</td>
<td>11-83 inc</td>
<td>S 5-84 inc</td>
<td>RUST SF</td>
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<tr>
<td>MC-16029</td>
<td>A</td>
<td>1</td>
<td>Motor control center, medium voltage, 4.16 KV, NEMA TYPE I, with incoming line module and terminal lugs</td>
<td>S 11-82</td>
<td>2-83</td>
<td>13.6</td>
<td>S 6-83</td>
<td>114.9</td>
<td>CMC SF</td>
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<td></td>
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<tr>
<td>MC-16033</td>
<td>A</td>
<td>1</td>
<td>Motor control center, 0.48 KV, NEMA TYPE I with incoming line module and terminal lugs</td>
<td>S 11-82</td>
<td>2-83</td>
<td>inc</td>
<td>S 6-83</td>
<td>inc</td>
<td>CMC SF</td>
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<tr>
<td>SG-16027</td>
<td>A</td>
<td>1</td>
<td>Switchgear, 3 phase, 4.16 KV, 1,200 amperes located in an outdoor, protective-isle, all-weather metal enclosure, complete with CPT, CT's, and PT's for load metering, dc power supply if required, (2) relay and metering cubicles in addition to breaker cubicles, and provisions for support less vendor engineering</td>
<td>S 11-82</td>
<td>3-83</td>
<td>72.0</td>
<td>S 6-83</td>
<td>608.5</td>
<td>CMC SF</td>
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</tbody>
</table>

**NOTES:**

1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.  
2. Equipment costs are FOB job site with shipping & vendor field support less vendor engineering.  
3. This equipment is Appendix C Bulks.  
4. RUST: Rust Engineering  
5. CMC: Stone & Webster  
6. FL: Field Labor  
7. M: Material for field fab equipment  
8. N/A: Not Applicable  
9. SF: Shop Fabricated  
10. FF: Field Fabricated
<table>
<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST EQUIP NO</th>
<th>QTY</th>
<th>EQUIPMENT DESCRIPTION</th>
<th>P.O. NUMBER</th>
<th>SIZE/WEIGHT</th>
<th>P.O. DATE</th>
<th>DELV DATE</th>
<th>EQUIP COST</th>
<th>PURCH TYPE</th>
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<td></td>
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<tr>
<td>SG-16027</td>
<td></td>
<td></td>
<td>Conduit entrance to each cubicle from top or bottom</td>
<td></td>
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<td></td>
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<td></td>
<td>CMC SF</td>
</tr>
<tr>
<td>SG-16032</td>
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<td></td>
<td>Switchgear, 3 phase, 0.48 KV, 3,040 amperes, located in an outdoor, protected-isle, oil-weather, metal enclosure; complete with CT's and PT's</td>
<td>S 11-82</td>
<td>3-83 inc</td>
<td>S 6-83 inc</td>
<td></td>
<td>CMC SF</td>
<td></td>
</tr>
<tr>
<td>SG-16032</td>
<td></td>
<td></td>
<td>for load metering, dc power supply if required, and provisions for conduit entrance to each cubicle from top or bottom</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>CMC SF</td>
</tr>
<tr>
<td>TR-16026</td>
<td>1</td>
<td></td>
<td>Transformer, primary unit substation, 3 phase, rated 5,000/6,250/7,000 KVA (55/65C), 13,880 - 4,1601/2.400 with (2) 2-1/2% taps above and below rated</td>
<td>S 7-83 5-84</td>
<td>3-83 9.3</td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
</tr>
<tr>
<td>TR-16026</td>
<td></td>
<td></td>
<td>voltage; with fans for 480 volt 3 phase supply, top oil thermometers with alarm contacts, liquid level gauge, (1) 600/3 amperes MR CT on each HV</td>
<td>P 6-84</td>
<td>87.4</td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
</tr>
<tr>
<td>TR-16026</td>
<td></td>
<td></td>
<td>bushing and LV neutral bushing (1) 1,200/5 amperes MR CT for relaying and metering on each LV bushing; incoming line section to consist of oil filled</td>
<td>A 3-84</td>
<td></td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
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<tr>
<td>TR-16026</td>
<td></td>
<td></td>
<td>fused load break switch rated 600 amperes with termination compartment for (1) 3/c, 250MCM IAC and (1) 3/c 250MCM IAC; switch and power fuse to</td>
<td>A 3-84</td>
<td></td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks.
<table>
<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST EQIP NO</th>
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<th>EQUIPMENT DESCRIPTION</th>
<th>P.O. NUMBER</th>
<th>SIZE/WEIGHT</th>
<th>P.O. DATE</th>
<th>VENDOR ENG</th>
<th>DELV DATE</th>
<th>EQUIP COST</th>
<th>PURCH BY</th>
<th>TYPE EQUIP</th>
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<tbody>
<tr>
<td>TR-16026</td>
<td>con't.</td>
<td></td>
<td>be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear</td>
<td></td>
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<td></td>
<td>RUST SF</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>TR-16026</td>
<td>con't.</td>
<td></td>
<td>located in an outdoor, protected-isle, all-weather metal enclosure</td>
<td></td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR-16031</td>
<td>A</td>
<td>1</td>
<td>Transformer, 3 phase, power center, rated 1,500/1,725/1,932 KVA (55/65 c), 13,800 - 480V/277 with (2) 24% taps above and below rated voltage;</td>
<td>S 7-83</td>
<td>P</td>
<td>S 11-83</td>
<td>inc S 9-84</td>
<td>inc</td>
<td>RUST SF</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>TR-16026 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR-16031</td>
<td>con't.</td>
<td></td>
<td>equipped with fans for 480 volt 3 phase supply, top oil thermometer with alarm contacts, and liquid level gauge; incoming line section to</td>
<td></td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>TR-16031</td>
<td>con't.</td>
<td></td>
<td>consist of oil filled fused load break switch, rated 200 amperes, with termination compartment for (1) 3/c 250MCM IAC; switch and power fuses to</td>
<td></td>
<td></td>
<td></td>
<td>RUST SF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR-16031</td>
<td>con't.</td>
<td></td>
<td>be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear located</td>
<td></td>
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<td>RUST SF</td>
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</tr>
<tr>
<td>TR-16031</td>
<td>con't.</td>
<td></td>
<td>in an outdoor, protected-isle, all weather metal enclosure</td>
<td></td>
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<td></td>
<td>RUST SF</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**NOTES:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars. RUST: Rust Engineering S: Scheduled FL: Field Labor N/A: Not Applicable CMIC: Stone & Webster M: Material for field fab equipment P: Projected A: Actual SF: Shop Fabricated FF: Field Fabricated
2.2.4.6 Equipment Data Sheets

The equipment data sheets for the cooling tower system follow this page.
## COOLING TOWER DATA SHEET

### PROJECT
- **6000 TPD SRC-1 DEMONSTRATION PLANT**
- **PLANT LOCATION**: NEWMAN, KENTUCKY

### SERVICE
- **PLANT COOLING WATER**

### VENDOR
- **P.O. NO.**

### OPERATING CONDITIONS

<table>
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<th>Description</th>
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<td>WATER QUANTITY (GPM)</td>
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<td>SOLIDS IN MAKEUP WATER (mg/l)</td>
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<td>WATER INLET TEMP (°F)</td>
<td>108 (NORM) 115 (MAX)</td>
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<tr>
<td>% BLOWDOWN</td>
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<tr>
<td>WATER OUTLET TEMP (°F)</td>
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<tr>
<td>% DRIFT LOSS</td>
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<td>WET BULB TEMP (°F)</td>
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<tr>
<td>% EVAP LOSS</td>
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<tr>
<td>DRY BULB TEMP (°F)</td>
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<tr>
<td>% SPRAY LOSS</td>
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<tr>
<td>ELEV ABOVE SEA LEVEL</td>
<td>TOTAL MAKEUP (GPM) 2014</td>
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### TOWER DESCRIPTION

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<td>GROUND LEVEL</td>
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<td>PREVAILING WIND</td>
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### TOWER DESCRIPTION (CONT.)

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<td>WATER RATE-GPM PER SQ FT OF TOWER AREA IN PATH OF WATER</td>
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</tr>
<tr>
<td>AIR RATE-CFM PER SQ FT OF TOWER AREA IN PATH OF AIR</td>
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</tr>
<tr>
<td>NO &amp; SIZE OF DISTRIBUTOR PIPE CONNECTIONS</td>
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</tr>
<tr>
<td>FRAME MATERIAL</td>
<td>DOUGLAS FIR</td>
</tr>
<tr>
<td>TYPE OF FILL</td>
<td>PVC, OR EPI</td>
</tr>
<tr>
<td>BASIN DIMENSIONS OUTSIDE (W' X L')</td>
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<tr>
<td>WATER RATE-GPM PER SQ FT OF TOWER AREA IN PATH OF WATER</td>
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<td>AIR RATE-CFM PER SQ FT OF TOWER AREA IN PATH OF AIR</td>
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<tr>
<td>NO &amp; SIZE OF DISTRIBUTOR PIPE CONNECTIONS</td>
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<tr>
<td>FRAME MATERIAL</td>
<td>DOUGLAS FIR</td>
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<td>TYPE OF FILL</td>
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<td>FAN NOISE LEVEL 50 AWAY (INTERNATIONAL SCALE)</td>
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<td>TYPE</td>
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<tr>
<td>GROUP</td>
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</tbody>
</table>

### REMARKS
- **FANS ARE EQUIPMENT NUMBERS C-16601 A thru K**

---

PREPARED BY: O.E. MITCHELL

APPROVED BY: [Signature] [Date]

FORM 8346 (8/80)
COOLING TOWER DATA SHEET

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPD SRC DEMONSTRATION PLANT
SERVICE: ASU COOLING WATER

OPERATING CONDITIONS

WATER QUANTITY (GPM) 16,000
WATER INLET TEMP (°F) 108
WATER OUTLET TEMP (°F) 88
WET BULB TEMP (°F) 78
DRY BULB TEMP (°F) 68
ELEV ABOVE SEA LEVEL
TOWER EXPOSURE UNOBSTRUCTED
TOWER SITE DESCRIPTION GROUND LEVEL
DESIGN WIND LOAD (LB/SQ FT) 30
TOWER PUMP HEAD (FT) 40

WATER INLET TEMP: 108°F
WATER OUTLET TEMP: 88°F
WET BULB TEMP: 78°F
DRY BULB TEMP: 68°F
ELEV ABOVE SEA LEVEL
TOWER EXPOSURE: UNOBSTRUCTED
TOWER SITE DESCRIPTION: GROUND LEVEL
DESIGN WIND LOAD: 30 LB/SQ FT
TOWER PUMP HEAD: 40 FT

TOWER DESCRIPTION

MOUNTED ON CROSS FLOW
OVERALL DIMENSIONS (W x L INCL STACKS)
BASIN DIMENSIONS OUTSIDE (W x L)
WATER RATE GPM PER SQ FT OF TOWER AREA IN PATH OF WATER
AIR RATE CFM PER SQ FT OF TOWER AREA IN PATH OF AIR
NO. & SIZE OF DISTRIBUTOR PIPE CONNECTIONS
FRAME MATERIAL DOUGLAS FIR
CROSS BRACES HORIZONTALS
CASING FRP - 12 OZ.
DRIFT ELIMINATOR PVC
HARDWARE STAINLESS STEEL
DISTRIBUTORS NOZZLES & SPRAY HEADS
FANS, GEARS & MOTORS
NO. OF FANS 3 DIA
NO. OF BLADES MATERIAL
MAKER OF FANS MAX SAFE RPM
CFM REQUIRED PER FAN AT TOWER RATING
INDUCED / FORCED
FAN NOISE LEVEL 50' AWAY (INTERNATIONAL SCALE)
MAKER OF GEAR AGMA RATING
GEAR LUBRICATION
DRIVE SHAFT TYPE MATERIAL
COUPLING TYPE MAKER
ELECTRIC AREA CLASS GROUP

REMARKS:
FANS ARE EQUIPMENT NUMBERS C-16610 A THRU C

PREPARED BY O.E. MITCHELL
DATE 3-26-82
APPROVED BY
DATE 7/6/84
REVISION △ △ △ A2
Each filter unit will be rated at 720 gpm. The units will be gravity type with integral backwash water storage. The filtering media will be 24" of sand. The tank dimensions are 12'6" diameter by 15'9" high.

The filters will have automatic controls and will serve Cooling Tower CT-16601.
Each filter unit will be rated at 278 gpm. The units will be gravity type with integral backwash water storage. The filtering media will be 24" of sand. The tank dimensions are 8'0" diameter by 15'9" high.

The filters will have automatic controls and will service Cooling Tower CT-16610.
Client: International Coal Refining Company
Project: 6000 TPSD SRC-I Demonstration Plant
Plant Location: Newman, Kentucky

Vendor: Corrosion Inhibitor Transfer Pump

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of Motors Req'd</th>
<th>Model</th>
<th>Serial No.</th>
<th>Item No.</th>
<th>Furr. By Purchaser</th>
<th>Mfr By</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
</tbody>
</table>

Note: 1. Indicates information to be completed by purchaser

Operating Conditions (Each Pump):

- Liquid: Corrosion Inhibitor GPM at PT NOR: 15.2
- PT: NPT Max: 90, Suction: Pslg Max: 2, RATED: 1
- SP Gr at PT: 1.1, Diff. Press. PSI: 14.2
- Vap Press at PT PSI: 25, Diff. Head FT: 30
- Vis at PT LB/MN/FT.HR: PSI: 30
- Corrosion Caused by:

Construction:

- Nozzles Size in. Rating Facing Location
- Suction Discharge
- Case Mt: Centerline Foot: Racket: Vert (Type)
- Sp H: Axial: Rad Type: Volume: Sgl: Dbl: Diffuser
- Press May Allow: Pslg F: Hydro Test: Pslg
- Connect: Vent: Drain: Gauge: Steam Jacket
- Impeller Dia: Rated: Max: Type
- Mount Between Brgs: Overhung
- Bearings: Type: Radial: Thrust
- Lube: Ring: Oil: Flood: Oil Mist: Finger: Pressure
- Coupling: Mfr: Model
- Driver Haf MTD By: Pump Mfr: Driver Mfr
- Mech Seal: Packing: Aux Seals/Sealing
- Mfr Type: Model
- Mfr Code: API Code

Auxiliary piping:

- C.W. Pipe Plan: Cu: SS: Tubing: Pipe
- Total Cooling Water Req'd GPM: Sight F. I. Req'd
- Packing Cool Injection Req'd: Total GPM: PSI
- External Seal Flush Fluid: GPM: PSI
- Aux. Seal Flush/Ouichen Fluid

Materials:

- Pump Case Trim: API Class
- Lining: Hastelloy C: Coat All: In
- Impeller: Hastelloy C: Wear Rings
- Shaft: Hastelloy C: Sleeves: Hastelloy C
- Case Int Coating/Finishing: Glenn
- Baseplate: GH: Pan

Elevation Ft: Dust/Fumes

Amb Temp: MAX: Min: Area: Elect Cl: Gr: Div

Cooling Water Supply: PSI: F Return: PSI: °F

Remarks:

Prepared By: R. Sciaccia
Date: 10-15-81

Approved By: Date: App'd Date: App'd Date: App'd Date:
# Centrifugal Pump Data Sheet

**Client:** International Coal Refining Company  
**Project:** 6000 TPD SNC Demonstration Plant  
**Plant Location:** Newman, Kentucky  
**Vendor:** Sulfuric Acid Transfer Pumps

## Operating Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
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## Construction

- **Nozzles:** Size in.  
- **Suction:** Size in.  
- **Discharge:** Size in.  
- **Case MT:** Centerline  
- **Bearing Type:** Radial  
- **Lube:** Ring Oil  
- **Coupling:** MFR  
- **Driver HA F MTQ By:** Pump MFR  
- **Mech Seal:** Packing  
- **Mfr Type:** Model  

## Auxiliary piping

- **C/W Pipe Plan:** C  
- **Total Cooling Water Reqd GPM:**  
- **Packing Cool Injection Reqd:**  
- **Seal Flush Pipe Plan:** C  
- **Total GPM:**  
- **Auxiliary Seal Flush Fluid:** C  
- **Aux Seal FlushOUENCl Fluid:**  

## Materials

- **Pump Case Trim API Class:**  
- **Casing:** Hastelloy C Corr All  
- **Impeller:** Hastelloy C Wear Rings  
- **Shaft:** Hastelloy C Sleeve(S) Hastelloy C  
- **Case Int Coating/Lining:** Gland  
- **Baseplate:** Drip Pan  

## Site Conditions

- **Elevation FT:**  
- **Amb Temp F Max Min Area Elect Cl Gr Div:**  
- **Cooling Water Supply PSIG F Return PSIG:**  

## Remarks

- **Remarks:** Pump to have vapor proof construction
**Centrifugal Pump Data Sheet**

**Client:**
INTERNATIONAL COAL REFINING COMPANY

**Project:**
BIGGS TPDS 34C-1 DEMONSTRATION PLANT

**Location:**
NEWARK, KENTUCKY

**Service:**
Cooling Water Supply Pumps

## Details

### Vessel Information
- **Type:**
- **Model:**
- **Serial No.:**
- **No. of Motors Reqd:** 6
- **No. of Turbines Reqd:**

### Materials
- **Impeller:**
- **Shaft:**
- **Case Int Coating/Lining:**

### Operation
- **Liquid:**
- **Operating Conditions Each Pump:**
- **Total Cooling Water Reqd GPM:**
- **Total GPM:**
- **Pressure:**
- **Inlet Pressure:**
- **Outlet Pressure:**

### Performance
- **Proposal Curve No:**
- **RPM:**
- **No of Stages:**
- **NPSH:**
- **Eff:**
- **Max BHP Rated:**
- **Max Head Rated:**

### Construction
- **Nozzles:**
- **Suction:**
- **Discharge:**
- **Case Mt:**
- **Impeller Dia:**
- **Mount:**
- **Bearings Type:**
- **Coupling:**
- **Driver Mfr:**
- **Mech Seal:**
- **Mfr Type Model:**
- **Mfr Code:**

### Auxiliary
- **API Code:**
- **C W Pipe Plan:**
- **Tubing OD:**
- **Total Cooling Water Reqd GPM:**
- **Injection Reqd Total GPM:**
- **Seal Fluid Plan:**
- **External Seal Fluid:**
- **Inte AUX Seal Plan:**
- **Sump Depth:**

### Materials
- **Case Trim:**
- **Shaft:**
- **Case Int Coating/Lining:**

### Inspection and Tests
- **Shop Inspection:**
- **Hydrostatic Test:**
- **Performance Test:**
- **Int Test:**

### Notes
- **API:**
- **Notes:**
- **Remarks:**

---

**Prepared by: R. Sciacca**

**Date:**
10-10-81

**Revision:**
- 1

**Approved by:**
- MWH

**Date:**
3-84

---

**Contract No:**
21-1997F

**Equipment No:**
E150603A/B/C/D/E/F/G

**No Required:**
3

---

**Sheet:**
1 of 1

---

31
### Centrifugal Pump Data Sheet

**Client:** International Coal Refining Company  
**Project:** 6000 TPD SRC-1 Demonstration Plant  
**Plant Location:** Newman, Kentucky

#### Construction

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#### Auxiliary Piping

- C W Pipe Plan: Co. SS Tubing Pipe
- Total Cooling Water Req'd GPM: SIGHT F.I. Req'd
- Packing Cool. Injection Req'd: Total GPM PSig
- External Seal Flush Plan: 11 C S S S Tubing Pipe
- External Seal Flush Fluid: C S C G M PSig
- Auxiliary Seal Plan: C S S S Tubing Pipe
- Aux Seal Flush/Quench Fluid

#### Materials

- Pump Case Trim API Class
- Casing Hastelloy C Cont'd All
- Impeller Hastelloy C Wear Rings
- Shaft Hastelloy C Sleeve(s) Hastelloy C
- Case Int Coating/Lining Gland
- Baseplate Drip Pan

#### Elevations

- Elevation Ft: Dust/Fumes
- Amb Temp F Max Min Area Elect Cl Gr Div
- Cooling Water Supply: PSig F Return PSig PF

#### Remarks

- Prepared by: R. Sciascia
- Date: 10-15-81
- Approved by: APP'D
- Date: 3-26-82

---

### Client and Vendor Information

- **Vendor:** Corrosion Inhibitor Transfer
- **P.O. No.:**
- **Serial No.:**
- **Type:** Operating Conditions (each Pump)

#### Proposal Curve No.

- **RPM:** No of Stages
- **NPSH FT:** & Impeller T.O.F
- **Eff:** BHP Rated
- **Max BHP Rated:**
- **Max Head Rated:**
- **Min Continuous GPM:**
- **Rotation (viewed from CPLG End):**

#### Inspection and Tests

- **Shop Inspection:** Req'd
- **Hydrostatic Test:** WITNESS
- **Performance Test:** Req'd WITNESS
- **NPSH Test:** Req'd WITNESS
- **Int Inspec After:** Req'd WITNESS

#### Int. Wear Parts

- Wear Rings Case Imp
- Interstage Bushings DIA IN CLEARANCE

#### Vertical Pumps

- Pit or Sump DFTH C
- Pump Length
- Min Submergence Req'd
- Column Pipe Flanged Thru-Threaded
- Line Shaft Open Enclosed
- Briggs Bowl Line Shaft
- Brg. Lub Water Oil Grease
- Float & Rod C S S S Brz None
- Float Switch:

#### Weights and Dimensions

- Approx WT Pump & Base
- Motor
- LB Turbine
- Base Plate Dimensions

#### Applicable Specifications

- API 610
- ANSI B73.1 B73.2
- Project Specifications
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<td><strong>BASEPLATE</strong></td>
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<td>38</td>
<td><strong>ELEVATION</strong></td>
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<td>39</td>
<td><strong>AMBIENT TEMP.</strong></td>
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<td>40</td>
<td><strong>COOLING WATER SUPPLY</strong></td>
<td></td>
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<tr>
<td>41</td>
<td><strong>PREP &amp;REW DATE</strong></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td><strong>REVISION</strong></td>
<td></td>
</tr>
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<td>43</td>
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<td>44</td>
<td><strong>REVISION</strong></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td><strong>PREPARED BY</strong></td>
<td>R. Sciascia</td>
</tr>
<tr>
<td>46</td>
<td><strong>DATE</strong></td>
<td>01-15-81</td>
</tr>
<tr>
<td>47</td>
<td><strong>APPROVED BY</strong></td>
<td>MWH</td>
</tr>
<tr>
<td>48</td>
<td><strong>DATE</strong></td>
<td>03-04</td>
</tr>
<tr>
<td>49</td>
<td><strong>DATE</strong></td>
<td>03-04</td>
</tr>
<tr>
<td>50</td>
<td><strong>DATE</strong></td>
<td>03-04</td>
</tr>
</tbody>
</table>

**NOTES:**
- The document is a centrifugal pump data sheet for an international coal refining company.
- It includes specifications for various components such as impellers, casing, shaft, and baseplate.
- The pump is used for cooling water supply.
- The project is a demonstration plant for 6000 TPSO sag.
- The vendor is The Rust Engineering Company.
# STORAGE TANK DATA SHEET

**CLIENT:** INTERNATIONAL COAL REFINING COMPANY

**PROJECT:** 6000 TPSD SRC I DEMONSTRATION PLANT

**SERVICE:** Inhibitor Storage

**VENDEE:** P.O. No.

**DIMENSIONS:**
- **Diameter:** 60 FT
- **Height:** 45 FT

**CAPACITY:**
- **Normal:** 1000 GAL
- **Net Working:** 1000 GAL
- **Roof:** 160 THICK

**OPERATING CONDITIONS:**
- **Material:**
  - **Bottom Material:** THICK
  - **Top Material:** THICK

**DESIGN CONDITIONS:**
- **Specify Gravity:** 110 AT TEMP
- **Pump Rate:** IN OUT
- **Vapor Press:** IN WATER
- **Max Oper Temp:** °E
- **Max Oper Temp:** °F
- **Max Oper Temp:** °C
- **Internal Fix:**
- **Design Conditions:**
  - **Removable:**

**CODE API:**
- **Appendix:**
- **Design Metal Temp:** °F
- **Design Press:** IN WATER
- **Est. Erection Wt (LB):**

**Corrosion Allow Shell:**
- **Roof:**
- **Bottom Internals:**
- **Inlet Flange:**
- **Outlet Flange:**

**Roof Type:** Flat Top

**Roof Live Loads:** PSF

**WIND PRES:** PSF

**Earthquake Code:**
- **Zone:**
- **Foundation Type:**
- **Radiography Extent:**
- **Stress Relief Yes/No:**
- **Insulation Yes/No:**
- **Insulation THICK:**

**LEAK TESTING:**
- **Bottom Shell:**
- **Roof:**

**Mill Test Reports Yes/No:**

**Painting Yes/No:** SPEC SHEET

**Sketch:**

---

**Prepared By:**

**Date:** 23 Oct 05

**Approved By:**

**Date:** APP'D
<table>
<thead>
<tr>
<th><strong>Contract No.:</strong></th>
<th>91-1997E</th>
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<tr>
<td><strong>Equipment No.:</strong></td>
<td>TK-16602, TK-16611</td>
</tr>
<tr>
<td><strong>No. Required:</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Sheet:</strong></td>
<td>1 of 1</td>
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</table>

**Client:** International Coal Refining Company

**Project:** 8000 TPSO SRC-1 Demonstration Plant

**Plant Location:** Newman, Kentucky

**Service:** Sulfuric Acid Storage

### Specifications

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<thead>
<tr>
<th><strong>Item</strong></th>
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<tr>
<td><strong>Diameter</strong></td>
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<tr>
<td><strong>Height</strong></td>
<td>12'7-7</td>
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<tr>
<td><strong>Capacity:</strong> Normal</td>
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<tr>
<td><strong>Net Working</strong></td>
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<tr>
<td><strong>Specific Gravity:</strong></td>
<td>1.835-4 at temp 110°F</td>
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<tr>
<td><strong>Pumping Rates:</strong> In</td>
<td>15 GPM</td>
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<tr>
<td><strong>Vapor Press</strong></td>
<td>In Water</td>
</tr>
<tr>
<td><strong>Max. Oper Temp</strong></td>
<td>160°F</td>
</tr>
<tr>
<td><strong>Design Conditions</strong></td>
<td>Removable</td>
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<td><strong>Code API</strong></td>
<td>Appendix</td>
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<tr>
<td><strong>Design Metal Temp</strong></td>
<td>120°F</td>
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<tr>
<td><strong>Design Press</strong></td>
<td>In Water</td>
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<tr>
<td><strong>Corrosion Allow Shell</strong></td>
<td>In</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td></td>
</tr>
<tr>
<td><strong>bottom</strong></td>
<td></td>
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<tr>
<td><strong>Internals</strong></td>
<td></td>
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<tr>
<td><strong>Flange Rating</strong></td>
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<tr>
<td><strong>Coupling Rating</strong></td>
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<td><strong>Roof Type</strong></td>
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<tr>
<td><strong>Roof Live Loads</strong></td>
<td>PSF</td>
</tr>
<tr>
<td><strong>Wind Press</strong></td>
<td>PSF</td>
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<td><strong>Earthquake Code</strong></td>
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<td><strong>Foundation Type</strong></td>
<td>4</td>
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<td><strong>Radiography Extent</strong></td>
<td>N-4</td>
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<tr>
<td><strong>Stress Relief Yes/No</strong></td>
<td>Extent N-5</td>
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<td><strong>Insulation Yes/No</strong></td>
<td>2</td>
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<td><strong>Leak Testing:</strong> Bottom Shell</td>
<td>N-7</td>
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<td><strong>Mill Test Reports Yes/No</strong></td>
<td>M-1</td>
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<tr>
<td><strong>Painting Yes/No</strong></td>
<td>Shop Coat</td>
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</tbody>
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**Prepared By:** W.A.S.

**Date:** 2/10/87

**Reviewed By:**

**Date:**

**Approved By:**

**Date:** App'd

**Date:** App'd

**Date:** App'd

**Date:** App'd
## STORAGE TANK DATA SHEET

### CLIENT
INTERNATIONAL COAL REFINING COMPANY

### PROJECT
6000 TPSO SRC-I DEMONSTRATION PLANT

### PLANT LOCATION
NEWMAN, KENTUCKY

### SERVICE
Inhibitor Storage

### VENDOR

### DIAMETER
6'

### HEIGHT
4.5 FT.

### CAPACITY NORMAL
1000 GAL SHELL FRP THICK IN.

### NET WORKING
GAL ROOF THICK IN.

### OPERATING CONDITIONS

### SPECIFIC GRAVITY LIQ AT TEMP
AT 70°F STRUCTURALS

### PUMPING RATES
IN OUT 15 GPM NOZZLE: NECK FLANGE

### VAPOR PRESS IN WATER COUPLINGS

### MAX OPER TEMP
90°F INTERNALS: FIXED

### DESIGN CONDITIONS
REMOVABLE

### CODE API APPENDIX

### DESIGN METAL TEMP
AT 70°F BOLTING

### DESIGN PRESS IN WATER
EST. ERECTION WT (LB)

### CORROSION ALLOW SHELL ROOF IN

### BOTTOM INTERNALS IN

### ROOF TYPE
FLAT, HINGED

### ROOF LIVE LOADS
PSF

### WIND PRESS
PSF

### EARTHQUAKE CODE ZONE

### FOUNDATION TYPE

### RADIOGRAPHY EXTENT

### STRESS RELIEF YES/NO

### INSULATION YES/THICK

### LEAK TESTING BOTTOM SHELL ROOF

### MILL TEST REPORTS YES/NO

### PAINTING YES/SPEC SHOP COAT

### SKETCH

### PREPARED BY

### DATE
22/09/81

### APPROVED BY

### DATE
APPRO'D

### SHEET
1 OF 1
A chlorine feed system with a capacity of 6000 lb/day. The chlorination equipment shall consist of a vacuum type chlorinator, chlorine solution eductor (J-16601), vacuum regulator, pressure reducing valve, flow meter, instruments and controls as required for feeding chlorine from a battery of ton chlorine containers. Weighing scales are included. (W-16601A-C)
The four (4) Cooling Tower Chemical Feed Systems are as follows:

For CT - 16610  
X - 16610 Inhibitor  
X - 16611 Sulfuric Acid

For CT - 16601  
X - 16601 Inhibitor  
X - 16602 Sulfuric Acid

Each chemical feed system will consist of a 100 gallon, 316 SS vertical day tank, and two (2) positive displacement type metering pumps.
A chlorine feed system with a capacity of 1200 lb/day. The chlorination equipment shall consist of a vacuum type chlorinator, chlorine solution eductor (J-16610), vacuum regulator, pressure reducing valve, flow meter, instruments and controls as required for feeding chlorine from a battery of ton chlorine containers. Weighing scales are included. (W-16610)
2.2.5 Process Water Supply

2.2.5.1 System Description

A combination process water and fire water storage tank constructed of carbon steel will be provided. Only the upper portion of the tank, 1,600,000 gallons, will be available for process water storage. The entire tank, 3.6 million gallons, will be available for fire water storage. The process water pumps (P-17108 A-C) operating on pressure control, will provide a constant supply to the process water distribution header.

2.2.5.2 Utility Flow Diagram

Refer to the following drawing included with Process Water Treatment, Paragraph 3.1.2.

00-17-01003D Process water Treatment Process and Control Diagram (Sheet 2)
2.2.6 Potable Water Supply

2.2.6.1 System Description

A water storage tank constructed of carbon steel will provide storage for potable water. A potable water booster pump (P-17203) will be provided to maintain a constant pressure on the potable water distribution system. When the pressure in the distribution system drops, indicating an increase in demand, the potable water supply pumps (P-17204 A and B) will provide the increased flow requirement. Chlorine and sodium hexametaphosphate will be added to maintain a residual concentration of each in the distribution header. The chlorinator (X-17202) and the sodium hexametaphosphate feed system (X-17201) are further described in paragraph 3.1.1, Potable Water Treatment.

2.2.6.2 Utility Flow Diagram

Refer to the following drawing included with Potable Water Treatment, Paragraph 3.1.1.

00-17-01001D  Potable Water System Process and Control Diagram
2.2.7 **Nitrogen System**

2.2.7.1 **System Description**

The nitrogen system consists of piping, valves, and flowmeters necessary to distribute nitrogen from the area 14 air separator unit to the various area contractors. All of the nitrogen producing equipment is furnished by the area 14 contractor.

2.2.7.2 **Utility Flow Diagram**

Refer to the following drawing included with Interconnecting Systems, Paragraph 2.3.

00-16-03009 Interconnecting Piping System, Nitrogen
2.2.8 Compressed Air System (Refer to Process Flow Diagram No. 00-16-01004D and Interconnecting Piping System, Instrument Air/Plant Air, Dwg. No. 00-16-03008)

2.2.8.1 System Description

2.2.8.1.1 General

The plant and instrument air requirements are provided by a common compressed air system, including a common distribution header. Pressure control valves are furnished for the plant air lines at the battery limits of each area contractor air user to prevent depressurization of the compressed air system. Since a common system is provided, both plant and instrument air are of the same quality at the area contractors battery limits. The system consists of three centrifugal air compressors, three prefilters, one air dryer, three afterfilters, one receiver vessel, distribution piping, and valves.

2.2.8.1.2 Air Compressors

Two of three motor-driven, packaged centrifugal air compressors (C-16701 A, B, and C) are provided to meet the normal instrument and plant air requirements. All three compressors are needed to satisfy the maximum air demand. Each air compressor has four stages of compression and includes air intake filter, three intercoolers, one aftercooler with moisture separator, inlet throttle valve, discharge check valve, bypass silencer, control panel, and lubrication system. The lubrication system provides sufficient lubrication to the compressor bearings for continuous operation, start-up, and emergency loss of power conditions.

2.2.8.1.3 Prefilters

Following the compressors, the compressed air enters the coalescing, cartridge type prefilters (FL-16702 A, B, and C) for removal of any entrained...
moisture or oil. Two of the prefilters are adequate to meet maximum plant and instrument air demands.

2.2.8.1.4 Air Dryer

After the prefilters, the compressed air passes through a desiccant type, heat regenerated, twin tower air dryer (D-16701) for dew point suppression to -40°F at 100 psig pressure. One air dryer is furnished and is sized for maximum plant and instrument air demand.

2.2.8.1.5 Afterfilters

Three cartridge-type afterfilters (FL-16703A, B and C) are furnished on the outlet of the dryer to remove dust or desiccant carryover from the dryer. Two of the afterfilters are adequate to meet the maximum plant and instrument air demand.

2.2.8.1.6 Air Receiver

One common air receiver (V-16701) vessel is furnished for the compressed air system and is sized for the maximum air demand conditions. The receiver is a vertical, cylindrical pressure vessel designed and fabricated in accordance with the ASME Boiler and Pressure Vessel Code.

2.2.8.2 Utility Flow Diagram

The following utility flow diagram is included after this page:

00-16-010040 Compressed Air System Process Flow Diagram
2.2.8.3 Utility Summary

The utility summary for the Compressed Air System follows this page.
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tr>
<td>Y-16701</td>
<td>Air Receiver</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>D-16701</td>
<td>Air Dryer</td>
<td>20</td>
<td>-</td>
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<tr>
<td>C-16701A</td>
<td>Air Compressor</td>
<td>750</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</table>

**TOTAL**: 5000 6700 6340 550 3300 5345

**Prepared by**: D. Smith 7/14/94  
**Reviewed by**:  
**Approved by**:  

*Notes:*
2.2.8.4 Motor List

The motor list for the Compressed Air System follows this page.
# COMPRESSED AIR SYSTEM

## MOTOR LIST

<table>
<thead>
<tr>
<th>Equipment No.</th>
<th>Description</th>
<th>Installed Hp</th>
<th>Operating Hp</th>
<th>HR/Day</th>
<th>KWH/DAY</th>
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<tr>
<td>C-16701A</td>
<td>Air Compressor</td>
<td>900</td>
<td>670</td>
<td>24</td>
<td>16,080</td>
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<td>C-16701B</td>
<td>Air Compressor</td>
<td>900</td>
<td>670</td>
<td>24</td>
<td>16,080</td>
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<tr>
<td>C-16701C</td>
<td>Air Compressor</td>
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<td>0</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>2,700</strong></td>
<td><strong>1,340</strong></td>
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<td><strong>32,160</strong></td>
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</table>
2.2.8.5 **Equipment List/Summary**

The equipment list/summary for the compressed air system follows this page.
## EQUIPMENT LIST/SUMMARY

REV. 4  
03-26-82

VENDOR ENG

<table>
<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST</th>
<th>EQUIP NO</th>
<th>QTY</th>
<th>EQUIPMENT DESCRIPTION</th>
<th>P.O.</th>
<th>P.O. SIZE/WEIGHT</th>
<th>VENDOR ENG</th>
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<tr>
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<tr>
<td>C-16701</td>
<td></td>
<td></td>
<td>3</td>
<td>Air compressor, cs, centrifugal, 4,000 scfm, 110 psig discharge pressure, 90°F inlet temp., with motor drive</td>
<td>900 hp</td>
<td>S 10-82 S 1-83 16.9 ea</td>
<td>138.4 ea RUST SF</td>
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<tr>
<td>A thru C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,800 rpm</td>
<td>P P</td>
<td>A</td>
</tr>
</tbody>
</table>

| D-16701 |          |          | 2   | Air dryer, desiccant type, 8 hr., NEMA cycle, 150 psig design, 10,000 scfm, 150 psig steam heater, -40°F outlet dew point | S 10-82 S 1-83 8.3 ea | S 9-83 82.7 ea RUST SF |
| A and B  |          |          |     |                        | P P | A A | A |

| FL-16701 |          |          | 3   | Filter, air intake, cs, 4000 scfm, 0 psig, 90°F, 118 sq ft effective filter area | S 10-82 S 1-83 1.0 ea | S 6-83 7.8 ea RUST SF |
| A thru C |          |          |     |                        | P P | P | A |

| FL-16702 |          |          | 2   | Air prefilter, coalescing elements, 5,000 scfm, 150 psig design, 100 psig operating, 90°F, 214.2 sq ft effective filter area, 8" flange outlet | S 10-82 S 1-83 inc | S 6-83 inc RUST SF |
| A and B  |          |          |     |                        | P P | with P | A FL-16701 |

| FL-16703 |          |          | 2   | Air prefilter, particulate elements, 5,000 scfm, 150 psig design, 100 psig operating, 90°F, 214.2 sq ft effective filter area, 8" flange outlet | S 10-82 S 1-83 inc | S 6-83 inc RUST SF |
| A and B  |          |          |     |                        | P P | with P | A FL-16701 |

| V-16701  |          |          | 1   | Air receiver, vertical, cs, 150 psig design, ASME VIII-1, 5,565 gal capacity | 7' dia x 20' high | S 10-82 S 11-82 2.1 | S 2-83 17.7 RUST SF |

### NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.  
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.  
3. This equipment is Appendix C Bulks.

* RUST: Rust Engineering  
* S: Scheduled  
* FL: Field Labor  
* M/A: Not Applicable  
* CMC: Stone & Webster  
* P: Projected  
* H: Material for field fab equipment  
* A: Actual  
* SF: Shop Fabricated  
* FF: Field Fabricated
2.2.8.6 Equipment Data Sheets

The equipment data sheets for the compressed air system follow this page.
| PROCESS CONTROL | | | | |
| --- | --- | --- | --- |
| METHOD | | | |
| 1. BYPASS FROM | | | |
| 2. ANTI-SURGE BYPASS | | | |
| 3. SIESTION THRUSTLING FROM | | | |
| 4. SPEED VARIATION FROM | | | |
| 5. OTHER | | | |
| 6. SIGNAL | | | |
| 7. SOURCE | | | |
| 8. TYPE | | | |
| 9. RANGE FOR PNEUMATIC CONTROL—RPM | PSIG & RPM | PSIG | |
| 10. OTHER | | | |

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<tr>
<th>OPERATING CONDITIONS</th>
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<tr>
<td>(ALL DATA ON PER UNIT BASIS)</td>
<td>NORMAL</td>
<td>RATED</td>
<td>OTHER CONDITIONS</td>
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<tr>
<td>GAS HANDLED</td>
<td>Air</td>
<td>Air</td>
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<tr>
<td>MMSCFD (14.7 PSIA &amp; 60°F) WET</td>
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<td>5.328</td>
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<tr>
<td>SCFM (14.7 PSIA &amp; 60°F) WET</td>
<td>3.482</td>
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<tr>
<td>MMSCFD (14.7 PSIA &amp; 60°F) DRY</td>
<td>4.910</td>
<td>5.157</td>
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<tr>
<td>SCFM (14.7 PSIA &amp; 60°F) DRY</td>
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<td>LB/ MOLES/HR — DRY</td>
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<tr>
<td>TEMPERATURE (°F)</td>
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<td>RELATIVE HUMIDITY (%)</td>
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<td>MOLECULAR WEIGHT (M)</td>
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<td>1.4</td>
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<tr>
<td>COMPRESSIBILITY (Z) OR</td>
<td></td>
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<tr>
<td>INLET VOLUME</td>
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<td>3668</td>
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<td>TEMPERATURE (°F)</td>
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<td>90</td>
<td></td>
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<tr>
<td>CP/CV (KJ)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>COMPRESSIBILITY (Z) OR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPRESSION RATIO (P1/P1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BHP REQUIRED (ALL LOSSES INCL.)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SPEED (RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EST SURGE ICFT (AT SPEED ABOVE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POLYTROPIC HEAT (FT)</td>
<td></td>
<td></td>
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<tr>
<td>POLYTROPIC EFFICIENCY (%)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>GUARANTEE POINT</td>
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<td></td>
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<tr>
<td>PERFORMANCE CURVE NO</td>
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<thead>
<tr>
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<th>V. F. Duckett</th>
<th></th>
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<tr>
<td>DATE APPROVED BY</td>
<td></td>
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| REVISION | 1 | | | |
| --- | --- | --- | --- |
| DATE | APP'D | DATE | APP'D | DATE | APP'D | DATE |
### Gas Analysis

<table>
<thead>
<tr>
<th>Gas</th>
<th>Normal</th>
<th>Rated</th>
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<tbody>
<tr>
<td>Dry Air</td>
<td>97.9</td>
<td>96.8</td>
</tr>
<tr>
<td>Moisture</td>
<td>2.1</td>
<td>3.2</td>
</tr>
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</table>

### Other Conditions

- **Location:**
  - Indoor
  - Heated
  - Under roof
  - Outdoor
  - Unheated
  - Partial sides
  - Grade
  - Mezzanine

- **Electrical Area Class:**
  - Industrial (GR)
  - Div. 1

- **Winterization Required:**
  - Tropicalization Required

### Site Data

- **Elevation:** 388 ft
- **Barometer:** 14.49 PSIA
- **Range of Ambient Temp:**
  - Site Rated °F: DRY BULB 60, WET BULB 94
  - Maximum °F: 10

### Unusual Conditions:

- **Other:** Dust

### Noise Specifications:

- **Applicable to Machine:**
  - See specification
- **Applicable to Neighborhood:**
  - See specification
- **Acoustic Housing:**
  - Yes

### Applicable Specifications:

- API 617 CENT COMPR. FOR GEN REFINERY SERVICES

### Painting:

- Manufacturer's Std

### Shipment:

- Domestic
  - Outdoor Storage Over 3 Months
- Export
  - Export Boxing Required
### OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
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<tbody>
<tr>
<td>Normal Flow</td>
<td></td>
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<tr>
<td>Rated Flow</td>
<td>10,000 SCFM</td>
</tr>
<tr>
<td>Operating Pressure</td>
<td>100 PSIG</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>90°F</td>
</tr>
<tr>
<td>Outlet Dew Point</td>
<td>-40°F @ 100 PSIG</td>
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### DESIGN

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<tr>
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<th>Details</th>
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<tr>
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<td>ASME, B&amp;PV, Section VIII-1</td>
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<td>Stamped</td>
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<tr>
<td>National Board Registration</td>
<td>Yes</td>
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<tr>
<td>Design Pressure</td>
<td>150 PSIG</td>
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<tr>
<td>Design Temperature</td>
<td>200°F</td>
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<td>Desiccant</td>
<td>Activated Alumina</td>
</tr>
<tr>
<td>Nema Cycle</td>
<td>8 Hour</td>
</tr>
<tr>
<td>Regeneration Method</td>
<td>Steam Heater</td>
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### MATERIALS

<table>
<thead>
<tr>
<th>Shell</th>
<th>SA-285, GRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heads</td>
<td>SA-285, GRC</td>
</tr>
<tr>
<td>Supports</td>
<td>SA-36</td>
</tr>
<tr>
<td>Nozzles</td>
<td>SA-106, GRB</td>
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<tr>
<td>FILTER DATA SHEET</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td><strong>CLIENT</strong></td>
<td>INTERNATIONAL COAL REFINING COMPANY</td>
</tr>
<tr>
<td><strong>PROJECT</strong></td>
<td>6000 TPSD SRC-I DEMONSTRATION PLANT</td>
</tr>
<tr>
<td><strong>PLANT LOCATION</strong></td>
<td>NEWMAN, KENTUCKY</td>
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<tr>
<td><strong>SERVICE</strong></td>
<td>Compressed Air Prefilter</td>
</tr>
<tr>
<td><strong>VENDOR</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MODEL</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SERIAL NO</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>□ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER □ BY MANUFACTURER</td>
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### BASIC DATA

<table>
<thead>
<tr>
<th><strong>RATED FLOW</strong> (фт/мин/6ФПМ)</th>
<th>SCFM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MOLECULAR WEIGHT</strong></td>
<td>28.9</td>
</tr>
<tr>
<td><strong>SPECIFIC GRAVITY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>VISCOSITY</strong> (LB.MASS/FT-HR)</td>
<td></td>
</tr>
<tr>
<td><strong>INLET PRESSURE</strong> (PSIG)</td>
<td>110</td>
</tr>
<tr>
<td><strong>INLET TEMP</strong> (°F)</td>
<td>90</td>
</tr>
<tr>
<td><strong>CORROSION CONTAMINANT</strong></td>
<td>Oil &amp; Moisture</td>
</tr>
<tr>
<td><strong>SUSPENDED SOLIDS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PARTICLE SIZE (AVERAGE)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SOLIDS BY WT (%)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MAX ALLOW PRESSURE DROP CLEAN (PSI)</strong></td>
<td>One</td>
</tr>
<tr>
<td><strong>RETENTION (NOMINAL) %</strong></td>
<td>98% Of 3 Microns Or Better</td>
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</tbody>
</table>

### OPERATING CONDITIONS

- **FILTER TYPE**
- **NO OF ELEMENTS**
- **TYPE OF ELEMENTS**
- **MATERIAL OF ELEMENTS**
- **MESH SIZE**
- **CONSTRUCTION OF FILTER**

### DESIGN CONDITIONS

- **DESIGN PRESSURE** (PSIG) | 150 |
- **DESIGN TEMPERATURE** (°F) | 200 |
- **CORROSION ALLOWANCE** (IN) | 0.10 |
- **MATERIALS—SHELL & HEADS** | SA-285, GRC |
- **INSULATION—PAINT** |
- **ASME CODE DESIGN** | □ |
- **STAMPED** | □ |

### CONNECTIONS

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<thead>
<tr>
<th><strong>CONNECTION</strong></th>
<th><strong>QUAN.</strong></th>
<th><strong>SIZE</strong></th>
<th><strong>RATING</strong></th>
<th><strong>FACE</strong></th>
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<td>Flg</td>
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<td>Flg</td>
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<tr>
<td>□ VENT</td>
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<td>□ DRAIN</td>
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<tr>
<td>□ PRESS INDICATOR</td>
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<td></td>
</tr>
<tr>
<td>□ LEVEL GAUGE</td>
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<tr>
<td>□ QUICK OPENING COVER</td>
<td></td>
<td></td>
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### PREPARED BY V. L. DUCKETT

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<thead>
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<th><strong>REVISION</strong></th>
<th><strong>REVISION</strong></th>
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<tbody>
<tr>
<td>10-15-81</td>
<td>△</td>
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FORM 9220 (5/81)
**FILTER DATA SHEET**

**INTERNATIONAL COAL REFINING COMPANY**

**PROJECT:** 6000 TPD SRC I DEMONSTRATION PLANT

**PLANT LOCATION:** NEWMAN, KENTUCKY

**SERVICE:** Compressed Air AfterFilter

**VENDOR:** P.O. NO.

**MODEL:** SERIAL NO.

**NOTE:** Indicates information to be completed by Purchaser

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<thead>
<tr>
<th>BASIC DATA</th>
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</thead>
<tbody>
<tr>
<td><strong>OPERATING CONDITIONS</strong></td>
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<td><strong>RATED FLOW (SCFM)</strong></td>
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<td><strong>MOLECULAR WEIGHT</strong></td>
</tr>
<tr>
<td><strong>SPECIFIC GRAVITY</strong></td>
</tr>
<tr>
<td><strong>VISCOSITY (LB-MASS/FT-HR)</strong></td>
</tr>
<tr>
<td><strong>INLET PRESSURE (PSIG)</strong></td>
</tr>
<tr>
<td><strong>INLET TEMP (°F)</strong></td>
</tr>
<tr>
<td><strong>CORROSIVE CONTAMINANT</strong></td>
</tr>
<tr>
<td><strong>SUSPENDED SOLIDS</strong></td>
</tr>
<tr>
<td><strong>CHARACTERISTICS OF SOLID</strong></td>
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<tr>
<td><strong>PARTICLE SIZE (AVERAGE)</strong></td>
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<tr>
<td><strong>SOLIDS BY WT (%)</strong></td>
</tr>
<tr>
<td><strong>MAX ALLOW PRESSURE DROP CLEAN (PSI)</strong></td>
</tr>
<tr>
<td><strong>RETENTION (inoxmal) %</strong></td>
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<table>
<thead>
<tr>
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<tr>
<td><strong>CONSTRUCTION OF FILTER</strong></td>
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<tr>
<td><strong>FILTER Dia. BY LENGTH</strong></td>
</tr>
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<td><strong>POSITION OF FILTER VERT — HORIZ</strong></td>
</tr>
<tr>
<td><strong>EFFECTIVE FILTER SURFACE AREA</strong></td>
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<tr>
<td><strong>WEIGHT (LB)</strong></td>
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<table>
<thead>
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<td><strong>DESIGN PRESSURE (PSIG)</strong></td>
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<tr>
<td><strong>DESIGN TEMPERATURE (°F)</strong></td>
</tr>
<tr>
<td><strong>CORROSION ALLOWANCE (IN)</strong></td>
</tr>
<tr>
<td><strong>MATERIALS—SHELL &amp; HEADS</strong></td>
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<td><strong>INSULATION—PAINT</strong></td>
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| ASME CODE DESIGN | STAMPED |

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<td>Flng</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>Flng</td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| RELIEF VALVE | PRESS INDICATOR | LEVEL GAUGE | QUICK OPENING COVER |

**PREPARED BY:** V. F. Duckett

**DATE:** 10-15-81

**APPROVED BY:**

<table>
<thead>
<tr>
<th>DATE</th>
<th>APP'D</th>
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**FORM 9020 (5/80)**
**CLIENT**

INTERNATIONAL COAL REFINING COMPANY

**PROJECT**

6000 TPD SRC I DEMONSTRATION PLANT

**PLANT LOCATION**

NEWMAN, KENTUCKY

**SERVICE**

Compressed Air Receiver

**VENDOR**

P.O. No.

**DIAMETER INSIDE**

IN OUTSIDE 84 IN

**VERT H.T. I/D**

20 FT 0 IN

**BTM T I/F FROM GRADE**

2 FT 6 IN

**OPERATING CONDITIONS**

<table>
<thead>
<tr>
<th>OPER TEMP</th>
<th>MAX TEMP</th>
<th>OPER PRESSURE</th>
<th>MAX OPER PRESSURE</th>
<th>AT TEMP</th>
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</thead>
<tbody>
<tr>
<td>90 F</td>
<td>100 F</td>
<td>100 PSIG</td>
<td>110 PSIG</td>
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**MATERIALS**

<table>
<thead>
<tr>
<th>SHELL</th>
<th>HEADS</th>
<th>NOZZLE NECK</th>
<th>FLANGE</th>
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</thead>
<tbody>
<tr>
<td>SA-515, GR70</td>
<td>SA-515, GR70</td>
<td>SA-106</td>
<td>SA-105</td>
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**CODE ASME SEC VIII DIV 1**

Stamped

**NATIONAL BOARD REGISTRATION**

Yes

**DESIGN TEMP**

200 F

**DESIGN PRESS INTERNAL**

125 PSIG

**EXTERNAL VAC**

PSI

**MAX ALLOW WORKING PRESS/TEMP**

PSIG/F

**CORR ALLOW SHELL/HEADS**

0.10 IN INTERNALS 0.10 IN

**SHELL**

THICK IN

**HEAD**

Dished

**HYDROTREAT PRESS/TEMP**

PSIG/F

**RADIATION EXTENT CODE**

Yes/No

**POSITIVE HEAT TREAT**

Yes/No

**EARTHQUAKE CODE ZONE**

Yes/No

**WIND PRESS**

PSI

**INSULATION YES NO**

THICK IN

**FIREPROOFING YES NO**

THICK IN

**VESSSEL SUPPORT TYPE**

Skirt

**NOZZLES**

**COUPLING RATING**

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<th>FACING</th>
<th>SERVICE</th>
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<tbody>
<tr>
<td>N-1</td>
<td>1</td>
<td>16 IN</td>
<td>RF Flg</td>
<td>INLET</td>
</tr>
<tr>
<td>N-2</td>
<td>1</td>
<td>16 IN</td>
<td>RF Flg</td>
<td>INLET</td>
</tr>
<tr>
<td>N-3</td>
<td>1</td>
<td>12 IN</td>
<td>Screwed</td>
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**LIQUID LEVEL FROM BOTTOM**

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<tr>
<th>NORM</th>
<th>MAX</th>
<th>MIN</th>
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</thead>
<tbody>
<tr>
<td>FT</td>
<td>FT</td>
<td>FT</td>
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**PREPARED BY**

V.R. Duckett

1-15-81

**REVISION**

1

**CONTRACT NO**

21-1997F

**EQUIPMENT NO**

V-16701

**NO REQUIRED**

1

**SHEET**

1 OF 1

**CLIENT SHEET**

PREPARED BY

APPROVED DATE

APPROVED DATE

APPROVED DATE

APPROVED DATE

FORM 9313 D 801

59
2.2.9 **Flare and Incinerators**

2.2.9.1 **System Description**

2.2.9.1.1 **Flare System**

2.2.9.1.1.1 **Design Criteria**

<table>
<thead>
<tr>
<th>Hydrocarbon Release</th>
<th>(Refer to Design Basis Memorandum, Paragraph 1-b of this document)</th>
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</thead>
<tbody>
<tr>
<td>Max allowable flare tip delta P, psi</td>
<td>0.5</td>
</tr>
<tr>
<td>Ambient temperature (average), °F</td>
<td>70.0</td>
</tr>
<tr>
<td>Wind velocity, mph</td>
<td>20.0</td>
</tr>
<tr>
<td>Max radiation at grade, Btu/hr-ft²</td>
<td>2,000.0</td>
</tr>
<tr>
<td>Max radiation at liquid or solid storage facilities, Btu/hr-ft²</td>
<td>1,500.0</td>
</tr>
<tr>
<td>Max mach number at flare tip</td>
<td>0.5</td>
</tr>
<tr>
<td>Max allowable backpressure at unit battery limits, psig</td>
<td>20.0</td>
</tr>
<tr>
<td>Max HC rate for smokeless operation, MM lbs/hr</td>
<td>0.2</td>
</tr>
<tr>
<td>Steam rate for smokeless operation, lb steam/lb HC</td>
<td>0.5</td>
</tr>
</tbody>
</table>

2.2.9.1.1.2 **Description**

2.2.9.1.1.2.1 The 6,000 TPD demonstration plant will have a single derrick-type elevated flare, designed to handle 1.0 million pounds per hour of hydrocarbon emissions.

2.2.9.1.1.2.2 The flare system will include a relief valve collecting manifold within each of the process areas. To minimize piping requirements, the individual relief valves will tie into collecting branches, which will join into a single manifold discharging into a blow-down drum.
2.2.9.1.1.2.3 Each process area will have a captive blow-down drum. Each drum will operate at 20 psig maximum. The dissolver area blow-down drum will operate at 230 psig. The high pressure blow-down drum will discharge into the Catalytic process area blow-down drum. Each operating area blow-down drum will have facilities to pump out disengaged liquid, and/or vaporize it by steam heating, using dimple jackets or coils.

2.2.9.1.1.2.4 The dissolver area high pressure blow-down drum will also have a quenching system designed to spray cold quench liquid at 1,500 gpm maximum into the dissolver relief valve effluent. The quench liquid for this application will be stored in a captive 5,000 bbl cone-roof storage tank. The quench liquid supply pumps will be steam turbine and electric motor driven and instrumented so that operation will be automatic, anticipating a dissolver malfunction. If the system is activated by the anticipating signal and no release occurs, the blow-down drum pumps will return the quench liquid to storage. Should a release occur, the quenched material will be returned to the process area for reprocessing.

2.2.9.1.1.2.5 Each process area blow-down drum will discharge into a main flare line manifold, which will then discharge into a vertical 44 ft diameter by 69 ft separator. The separator will be designed to disengage liquid and provide the proper elevation at the battery limits so that the main flare line will have the proper downward slope (0.1 inch each 10 feet) to the knockout drum located at the flare derrick base.

2.2.9.1.1.2.6 The main flare line will be 46 inches od. It will start at the vertical separator and extend 3,000 feet to the horizontal separator at the base of the flare derrick.

2.2.9.1.1.2.7 The main flare line will have 8 full-moment anchors at 400 foot intervals. Each 400 foot section will have eight other pipe supports and a thermal expansion loop designed to keep the stresses within allowable limits for a 1.1 mm pounds per hour release. A total of 68 pipe supports will be required.
2.2.9.1.1.2.8 The horizontal 22 ft dia by 80 ft knockout drum at the base of the flare derrick will have pumping and vaporizing capabilities to return condensate to process and/or vaporize it for flaring. This drum and all associated peripheral piping will be insulated for an environmental factor of 0.1. Sections will be fireproofed as required.

2.2.9.1.1.2.9 Vapors from the horizontal 22 ft diameter by 80 ft drum will discharge into the flare stack seal pot, which will isolate the main flare header from the derrick stack by a water seal. The pressure required to break this water seal will not exceed 0.5 psi. Under normal, no-emission conditions, the only material being sent to the flare stack will be either purge nitrogen or purge fuel gas. Use of these materials will be minimized by the molecular seal upstream of the flare tip.

2.2.9.1.1.2.10 The flare stack and all required utility lines will be supported by the derrick. The flare stack will be held by loose joints, to permit vertical expansion. The utility lines attached to the stack will move vertically with the stack.

2.2.9.1.1.2.11 For improved service life, the upper 50 feet of flare stack will be 316 stainless steel, including the molecular seal, flare tip, pilots, and utility piping. The flare tip will have six continuously-burning LPG pilots.

2.2.9.1.1.2.12 The ignitor system will be an integral package with LPG backup, located out of the "dead zone". The system will be housed in an open shack facing away from the flare line-of-sight. The roof and walls facing the flare will be insulated and covered with reflective material.

2.2.9.1.1.3 Sizing Criteria

2.2.9.1.1.3.1 Flare sizing was done following a system analysis, which reviewed in detail all causes and the resulting flare loads from the individual process areas. The resulting flow rates were based on data
supplied by the individual area contractors, overall process material balances, and unit flow diagrams. The following cases were individually reviewed:

<table>
<thead>
<tr>
<th>Item</th>
<th>Type of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plant wide cooling water</td>
</tr>
<tr>
<td>2</td>
<td>Plant wide electrical power</td>
</tr>
<tr>
<td>3</td>
<td>Instrument air</td>
</tr>
<tr>
<td>4</td>
<td>Local failure caused by misoperation</td>
</tr>
<tr>
<td>5</td>
<td>Fire condition</td>
</tr>
</tbody>
</table>

2.2.9.1.1.3.2 The governing condition for this plant is a combination of plant wide cooling water and power failure, resulting in the maximum emission rate given in the Design Basis Memorandum. This includes hydrocarbon emissions, vapors containing odorous or noxious gases, and flammable or otherwise hazardous vapors. Streams containing air were not included, as they would be disposed of in a vapor incinerator.

2.2.9.1.1.4 Mechanical Design Criteria

2.2.9.1.1.4.1 All vent and blow-down sub-headers will slope from the relief valves to the main branches, with a minimum slope of 0.2 inch each 10 feet. The same requirements will apply to the branches leading to the main flare header. All individual entries to and from sub-headers will be made at the top of the line. The main flare slope will be 0.1 inch each 10 feet, minimum.

2.2.9.1.1.4.2 The main flare line will be provided with 26 20-inch manways, equally spaced, for maintenance and clean-out. These manways will be horizontal with hinged davits to support the blind flange.
2.2.9.1.1.4.3 The flare stack will have a caged access ladder extending to the top of the tube, with rest platforms every 30 feet. A 360 degree work platform will be provided at the flare tip for maintenance. This service area will include a permanently-installed davit and hoisting device to facilitate removing and changing the flare tip assembly.

2.2.9.1.1.4.4 The flare stack will be mounted on top of the seal drum, which will be anchored to its own ground-level foundation. The flare stack will be guided by the derrick; however, it will not be anchored at any point, to allow for free expansion.

2.2.9.1.1.4.5 The upper 50 feet of flare stack, molecular seal, flare tip, igniters, and service piping will be 316 stainless steel.

2.2.9.1.2 Liquid and Gas Incinerators

2.2.9.1.2.1 General Description

2.2.9.1.2.1.1 To dispose of waste liquids, low-pressure hydrocarbon vents, purge gases, oxygen contaminated streams, and blanketing gases, the plant will be provided with two incinerators, one for liquids, the other for gases.

2.2.9.1.2.1.2 Each incinerator will incorporate a waste heat recovery system which will generate saturated steam at 150 psig. Each unit will also include an individual boiler feedwater recirculation system, chemical treatment facilities, and local combustion controls with flame supervision capability. Major alarms and current operating status will be linked to the central control room by a pan-alarm system. Each incinerator will use fuel gas as an auxiliary fuel.

2.2-38 Rev. 5-25-84
2.2.9.1.2.1.3 Each incinerator will have a sampling platform at the required height for flue gas composition and solid load analysis sampling. All critical temperatures, flows, and pressures required for performance calculations will be permanently recorded.

2.2.9.1.2.2 Liquid Thermal Oxidizer

2.2.9.1.2.2.1 The waste liquid incinerator will include a nitrogen-blanketed surge tank where the waste liquids from the various plant sources will be received. Venting from this tank will be disposed of in a special burner in the incinerator.

2.2.9.1.2.2.2 Waste liquids, at a maximum rate of 3,019 pounds per hour, will be pumped on level control from the surge tank to the main burner. To improve waste liquid combustion and assist in mechanical atomization, the waste liquid will be preheated by steam, to the required temperature where viscosity is no longer a controlling factor. The required pumping and preheating equipment will be part of the incinerator package.

2.2.9.1.2.2.3 To completely incinerate the anticipated wastes, the firebox must operate at above 2,000°F at a slightly negative pressure.

2.2.9.1.2.3 Vent Gas Incinerator

2.2.9.1.2.3.1 The vent gas incinerator will include an induced draft fan to collect low-pressure hydrocarbon vent gases from the various sources. The induced draft fan will maintain a constant volume to the incinerator, using an atmospheric air trim to maintain a constant sub-atmospheric pressure. The maximum anticipated combustible material flow rate will be about 2,500 pounds per hour.
2.2.9.1.2.3.2 To separate entrained liquids, the vent gas collecting manifold will discharge into a knock-out drum. The condensed liquid will then be pumped to the liquid thermal oxidizer surge tank for disposal. The vapors will be enriched, if required, with fuel gas to the minimum level that will support steady combustion.

2.2.9.1.2.3.3 The enriched vapors will be mixed with combustion air in a low-pressure-drop, high-efficiency burner. Expected firebox temperature for complete vapor oxidation is about 2,500°F at a slightly negative pressure.

2.2.9.2 Utility Flow Diagrams

The following utility flow diagrams are included after this page:

00-16-01021D Emergency Flare System
00-16-01022D Emergency Flare System Process Flow Diagram
00-16-01030D Liquid Thermal Oxidizer Process Flow Diagram
00-16-01031D Vent Gas Incinerator Process Flow Diagram
2.2.9.3 Material and Energy Balances

The material and energy balances for the liquid thermal oxidizer system are included after this page.
# Material Balance Summary

**FOR PROCESS FLOW DIAGRAM NO.**

<table>
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<th>CONTRACT NO.</th>
<th>21-2548</th>
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<td>PROJECT:</td>
<td>6000 TPD SRC-1 Demonstration Plant</td>
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**FUEL GAS**

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<th>lb-mol/hr</th>
<th>WT. %</th>
<th>lb-mol/hr</th>
<th>WT. %</th>
<th>lb-atom/hr</th>
<th>WT. %</th>
<th>lb-atom/hr</th>
<th>WT. %</th>
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<td><strong>THERM. COND @STU/H-Ft-1</strong></td>
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**ENTHALPY DATUM**

C(O), H2(g), O2(g), N2(g), Ar(g), 0°C @ 0 psia
## MATERIAL BALANCE SUMMARY

### FOR PROCESS FLOW DIAGRAM NO. 00-16-01030 D

### FOR Rust International Corporation

### CONTRACT NO. 21-2548

### PROJECT: 6000 T/D SRC-1

### Demonstration Plant

### PHASE

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### STREAM NUMBER/NAME

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### COMPONENTS

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<th>MOLE WT.</th>
<th>lb mol/hr</th>
<th>Wt. %</th>
<th>MOL %</th>
<th>lb mol/hr</th>
<th>Wt. %</th>
<th>MOL %</th>
<th>lb mol/hr</th>
<th>Wt. %</th>
<th>MOL %</th>
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### PREPARED BY

BSY

### DATE

1-19-84

### APPROVED BY


### SHEET 2 OF 2

---

*ENTHALPY DATUM C(c), H2(g), O2(g), N2(g), Ar(g), S(c) @ 0°F, 0 psia*
2.2.9.4 Utility Summary

The utility summary for the flare and incinerators follows this page.
# Utility Process Data Summary Sheet

**Plant Location:** Newmap, Kentucky

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<td>V-16813</td>
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**Total (Max Usage):** 30.6, 7.006, 7.65, 66.65, 104.0, 1.625

**Prepared by:** J. QL
**Date:** 1-24-84

**Approved by:** J. QL
**Date:** 1-24-84

**Notes:**
2.2.9.5 Motor List

The motor list for the flare and incinerators follows this page.
### FLARE AND INCINERATORS AREA
#### MOTOR LIST

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<th>Description</th>
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<th>Oper KW</th>
<th>Hrs/Day</th>
<th>KWH/Day</th>
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<td>30</td>
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<td>1.5</td>
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**TOTAL**            | 2,006   | 765    | 3,600   |

77
2.2.9.6 Equipment List/Summary

The equipment list/summary for the flare and incinerators follows this page.
## EQUIPMENT LIST/SUMMARY

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<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST</th>
<th>EQUIP. NO.</th>
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<th>DESCRIPTION</th>
<th>P. O. NUMBER</th>
<th>SIZE/</th>
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<td>Pump, quench liquid, sp gr 1.0, 1,500 gpm, 750 tpd, ea with ss trim, with motor</td>
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<td>7.0 ea</td>
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<td>50.5 ea</td>
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<td>SF</td>
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<td>S 12-82</td>
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<td>S 6-83</td>
<td>7.8 ea</td>
<td>RUST</td>
<td>SF</td>
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<td>S 12-82</td>
<td>0.9 ea</td>
<td>S 6-83</td>
<td>7.8 ea</td>
<td>RUST</td>
<td>SF</td>
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<td></td>
<td>A and B</td>
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<td></td>
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<td>A</td>
<td>A</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>TK-16806</td>
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<td>1</td>
<td>Tank, storage, quench liquid, 5,000 bbl nominal, ea, API 650</td>
<td>TK-16806</td>
<td>35' dia</td>
<td>S 10-82</td>
<td>S 1-83</td>
<td>6.4 ea</td>
<td>S 10-83</td>
<td>54.4 ea</td>
<td>CMC</td>
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<td></td>
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<td></td>
<td>x 30'</td>
<td>P</td>
<td>P</td>
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### NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bula.
### Equipment List/Summary

**WBS Element:** 1.4.1.1.2  
**ICRC Area:** 16  
**FLARE AND INCINERATORS—EMERGENCY FLARE**  
**Page 2 of 2**  

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<thead>
<tr>
<th>REV.</th>
<th>ICRC/RUST</th>
<th>EQUIP. NO.</th>
<th>QTY</th>
<th>EQUIPMENT DESCRIPTION</th>
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<th>SIZE/WEIGHT</th>
<th>P. O. DATE</th>
<th>NEED DATE</th>
<th>COST</th>
<th>DELV DATE</th>
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<th>PURCH BY</th>
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<th>EQUIP.</th>
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<tbody>
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<td>V-16808</td>
<td>5-V-16808</td>
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<td>Knockout drum, vertical, 150 psig, 9000°F, c.s.</td>
<td>S 10-82</td>
<td>44' dia x 69' TT</td>
<td>P</td>
<td>P</td>
<td>70.0</td>
<td>S 10-83</td>
<td>660.0</td>
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<td>5</td>
<td>V-16809</td>
<td>5-V-16809</td>
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<td>Knockout drum, 150 psig, 650°F, cs</td>
<td>S 10-82</td>
<td>22' dia x 80' TT</td>
<td>P</td>
<td>P</td>
<td>34.0</td>
<td>S 10-83</td>
<td>291.0</td>
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<td>SF</td>
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<tr>
<td>5</td>
<td>X-16810</td>
<td>5-X-16810</td>
<td>1</td>
<td>Elevated flare, derrick supported, complete with molecular seal, pilots, and ignitor, 1.1 x 10^6 lb/hr non-smokeless, 200,000 lb/hr smokeless</td>
<td>S 10-82</td>
<td>46' dia x 250' high</td>
<td>P</td>
<td>P</td>
<td>77.0</td>
<td>S 2-83</td>
<td>663.8</td>
<td>CMC</td>
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<tr>
<td>4</td>
<td>X-16810</td>
<td>4-X-16810</td>
<td>cont.</td>
<td>26.0 molecular weight, 0.5 lb/hr steam/lb hr smokeless</td>
<td>P</td>
<td></td>
<td>A</td>
<td>A</td>
<td></td>
<td>A</td>
<td></td>
<td>CMC</td>
<td>SF</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.  
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.  
3. This equipment is Appendix C Bulks.

**RUST:** RUST Engineering  
**CNC:** Stone & Webster  
**S:** Scheduled  
**FL:** Field Labor  
**P:** Projected  
**M:** Material for field fab equipment  
**A:** Actual  
**SF:** Shop Fabricated  

**Columns:**  
- **REV.**  
- **ICRC/RUST**  
- **EQUIP. NO.**  
- **QTY**  
- **EQUIPMENT DESCRIPTION**  
- **P. O. NUMBER**  
- **SIZE/WEIGHT**  
- **P. O. DATE**  
- **NEED DATE**  
- **COST**  
- **DELV DATE**  
- **EQUIP. COST**  
- **PURCH BY**  
- **TYPE**  
- **EQUIP.**
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<td>1</td>
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<td>S 10-82</td>
<td>30.3</td>
<td>S 6-83</td>
<td>RUST</td>
<td>SF</td>
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<tr>
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<td>P-16912</td>
<td>A and B</td>
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<td>Pump, liquid incinerator, 20 gpm x 211 tdp, c.s. with ss trim, with motor</td>
<td>S 10-82</td>
<td>60 hp</td>
<td>S 6-83</td>
<td>IN-16913</td>
<td>IN-16913</td>
<td>RUST</td>
<td>SF</td>
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<tr>
<td></td>
<td>P-16915</td>
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<td>Pump, boiler feedwater, 900 gpm x 131 tdp, sp.gr. = 0.882, c.s. with ss trim, with motor</td>
<td>S 10-82</td>
<td>2.1</td>
<td>S 10-83</td>
<td>17.8</td>
<td>IN-16913</td>
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<td>V-16911</td>
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<td>1</td>
<td>Knockout drum, 150 psig, 650°F, metal weight, 9,788 lb</td>
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<td>60 hp</td>
<td>A</td>
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<td>V-16914</td>
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<td>Drum, boiler feedwater</td>
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</table>

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars. RUST: RUST Engineering
   CMC: Stone & Webster
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

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<th>EQUIPMENT DESCRIPTION</th>
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<th>COST DATE</th>
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<td>S 10-82</td>
<td>S 12-82</td>
<td>Inc with</td>
<td>S 6-83</td>
<td>Inc. w/</td>
<td>RUST</td>
<td>SF</td>
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<td>IN-16919</td>
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<tr>
<td></td>
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<td>Incinerator, vent gas, 2,500 lb/hr combined capacity complete with peripherals and instrumentation; 125 ft dispersive stack; 150 psig waste heat boiler</td>
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<td>Pump, transfer, condensate, 150 gpm x 116 tcd, cs w/ ss trim, with motor</td>
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<td>10 hp</td>
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<td>S 12-82</td>
<td>Inc w/</td>
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<td>Inc w/</td>
<td>RUST</td>
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<td>Pump, boiler feedwater, sp.gr.=0.882, cs w/ ss trim, 700 gpm x 1:1 tcd, with motor</td>
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<td>S 12-82</td>
<td>Inc w/</td>
<td>S 6-83</td>
<td>Inc w/</td>
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**NOTES:**
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

**RUST:** RUST Engineering  **S:** Scheduled  **F/L:** Field Labor  **N/A:** Not Applicable
**CNC:** Stone & Webster  **P:** Projected  **M:** Material for field  **FF:** Field Fabricated
**A:** Actual  **FP:** Field Fabricated  **SF:** Shop Fabricated
2.2.9.7 Equipment Data Sheets

The equipment data sheets for the flare and incinerators follow this page.
**Client:** International Coal Refining Company  
**Project:** 6000 TPSD SRC-1 Demonstration Plant  
**Location:** Newnan, Kentucky

---

### Centrifugal Fan Data Sheet

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**Remarks:**

**Prepared by:** [Signature]  
**Approved by:** [Signature]  
**Date:** 10-21-81

---

**Revisions:**

- [ ]  
- [ ]  
- [ ]
### Centrifugal Pump Data Sheet

- **Client**: International Coal Refining Company
- **Project**: 6000 TPD SRC Demonstration Plant
- **Location**: Newnan, Kentucky
- **Service**: Quench Liquid Pump
- **Vendor**: The Rust Engineering Company

#### Equipment Data

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<th>Item</th>
<th>Details</th>
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#### Pump Characteristics

- **Type**: Centerline Foot Bracket
- **Model**: Very (Type)
- **Size**: 120 mm
- **Rate**: 150 m³/hr
- **Design Pressure**: 325 psi
- **Design Temperature**: 325 °F
- **Number of Stages**: 3
- **Number of Piping**: 4

#### Impeller Details

- **Impeller Diameter**: 0.5 m
- **Impeller Design**: Rated
- **Type**: Impeller
- **Max. RPM**: 1750

#### Materials

- **Casing**: Coralline
- **Impeller**: Wear Rings
- **Shaft**: Sleeves
- **Baseplate**: Drip Pan

#### Cooling Water Supply

- **Pressur**: 14 psi
- **Flow**: 150 m³/hr

#### Notes

- **Operational Conditions**: Complete by Purchaser
- **Performance**: Complete by Manufacturer

---

**Remarks**

- **Vendor Specify**
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operating Conditions (each pump)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Liquid</td>
<td>US GPM at pt nor 150' R.</td>
</tr>
<tr>
<td>3</td>
<td>PT : F nor 60' max suction psig max 108' rated</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SP gr at pt 1.0 diff press psig 108' rated</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>VAP Press at pt psia nil diff head ft 250</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>VIS at pt lbm/ft hr</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CORROS/eros caused by</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CONSTRUCTION</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>NOZZLES</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Sizing (in)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>RATING</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>FACIGN</td>
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</tr>
<tr>
<td>13</td>
<td>LOCATION</td>
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</tr>
<tr>
<td>14</td>
<td>CASE MT CENTERLINE FOOT BRACKET XXX (TYPE)</td>
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</tr>
<tr>
<td>15</td>
<td>PRESSURE</td>
<td></td>
</tr>
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<td>16</td>
<td>CONNECT EVENT DRAIN GAUGE STEAM JACKET</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>IMPELLER (in)</td>
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</tr>
<tr>
<td>18</td>
<td>MOUNT BETWEEN BRGS OVERHUNG</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>BEARINGS TYPE RADIAL</td>
<td></td>
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<tr>
<td>20</td>
<td>LUBE  : RING OIL FLOOD OIL MIST FLINGER PRESSURE</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>COUPLING F/EAST</td>
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<td>22</td>
<td>DRIVER HALF MTD BY PUMP MFR DRIV MR MR</td>
<td></td>
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<tr>
<td>23</td>
<td>MECH SEAL PACKING AUX SEAL PACKING</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>MFR TYPE MODEL</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>MFR CODE</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>AUXILIARY PIPING</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>O C W PIPE PLAN</td>
<td></td>
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<tr>
<td>28</td>
<td>TOTAL COOLING WATER RED GPM</td>
<td></td>
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<tr>
<td>29</td>
<td>PACKING COOL INJECTION RED GPM</td>
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<td>30</td>
<td>SEAL FLUSH PIPE PLAN</td>
<td></td>
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<td>31</td>
<td>EXTERNAL SEAL FLUSH FUID</td>
<td></td>
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<tr>
<td>32</td>
<td>AUXILIARY SEAL PLAN</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>MATERIALS</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>PUMP CASE/TRIM API CLASS</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>CASING</td>
<td>CORR ALL IN.</td>
</tr>
<tr>
<td>36</td>
<td>IMPPELLER WEAR RINGS</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>SHAFT SLEEVE(S)</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>CASE INT COATING/LINING</td>
<td>GLAND</td>
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<tr>
<td>39</td>
<td>BASEPLATE Drip Pan</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>ELEVATION FT 385</td>
<td>DUST/FUMES</td>
</tr>
<tr>
<td>41</td>
<td>AMB TEMP F MAX MIN AREA ELECT CL GR DIV</td>
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<tr>
<td>42</td>
<td>COOLING WATER SUPPLY PSIG RETURN PSIG F</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>REMARKS VENDOR SPECIFY</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>PREPARED BY R.M.</td>
<td>DATE 10-6-81</td>
</tr>
<tr>
<td>45</td>
<td>APPROVED BY</td>
<td>BY DATE BY DATE BY DATE</td>
</tr>
</tbody>
</table>

**Centrifugal Pump Data Sheet**
**CENTRIFUGAL PUMP DATA SHEET**

**CLIENT**
INTERNATIONAL COAL REFINING COMPANY

**PROJECT**
6000 TPD SRC-I DEMONSTRATION PLANT

**PLANT LOCATION**
NEWARK, KENTUCKY

**EQUIPMENT NO.**
P-1450

**NO. REQUIRED**
2

**PUMP**
LIQUID RECOVERY PUMP

**VENDOR**

**MODEL**

**SERIAL NO.**

**NOTE**
0 INDICATES INFORMATION TO BE COMPLETED BY PURCHASER

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>FURN. BY</th>
<th>MFR BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO OF MOTORS REQ'D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO OF TURBINES REQ'D</td>
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**OPERATING CONDITIONS (EACH PUMP)**

<table>
<thead>
<tr>
<th>LIQUID</th>
<th>US GPM AT PT. NOR</th>
<th>RATED</th>
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</thead>
<tbody>
<tr>
<td>PRESS</td>
<td>MAX ALLOW</td>
<td>PSIG</td>
</tr>
<tr>
<td>PRESS</td>
<td>MAX</td>
<td>PSIG</td>
</tr>
<tr>
<td>CONNECT</td>
<td>VENT</td>
<td>DRAIN</td>
</tr>
<tr>
<td>IMPeller DIA</td>
<td>RATED</td>
<td>MAX</td>
</tr>
<tr>
<td>MOUNT</td>
<td>BETWEEN BRGS</td>
<td>OVERHUNG</td>
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<tr>
<td>BEARINGS TYPE</td>
<td>RADIAL</td>
<td>THRUST</td>
</tr>
<tr>
<td>LUBE</td>
<td>RING OIL</td>
<td>FLOOD</td>
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<tr>
<td>COUPLING</td>
<td>MFR</td>
<td>FAST</td>
</tr>
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<td>DRIVER HST</td>
<td>MFR</td>
<td>DRIVER MFR</td>
</tr>
<tr>
<td>MFR TYPE MODEL</td>
<td></td>
<td></td>
</tr>
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**CONSTRUCTION**

- **CASING SIZE** | 150# RF | 150# RF |
- **SPLIT** | CENTERLINE | FOOT | Bracket | VERT. (TYPE) |
- **IMPeller DIA** | RATED | MAX |
- **UNIT** | Volute | SGL | DBL |
- **SEAL FLUSH PIPE PLAN** | OCS | S.S | TUBING |
- **ACCU SEAL PLAN** | OCS | S.S | TUBING |
- **CASE INLET COATING** | Lining |
- **BASE PLATE** | Drip Pan |
- **ELEVATION FT** | 356 |
- **COOLING WATER SUPPLY** | PSIG | F RETURN | PSIG |
- **AMBIENT TEMP** | MAX | MIN |
- **COOLING WATER PIPE** | PSIG |
- **APPARATUS SPECIFICATIONS** |

**MATERIALS**

**REMARKS**

**PREPARED BY**

**APPROVED BY**

<table>
<thead>
<tr>
<th>DATE</th>
<th>REVISION</th>
<th>DATE</th>
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<th>DATE</th>
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<tr>
<td>10-6-81</td>
<td></td>
<td>12-30-81</td>
<td></td>
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</table>

- **INSPECTION AND TESTS**
  - **SHOP INSPECTION**
    - **REQUIRED**
    - **WITNESS**
  - **PERFORMANCE TEST**
    - **REQUIRED**
    - **WITNESS**
  - **NPSH TEST**
    - **REQUIRED**
    - **WITNESS**
  - **INT. INSPECTION**
    - **REQUIRED**
    - **WITNESS**

**WEAR PARTS**

- **WEAR RINGS CASE** | MP |
- **WEAR RINGS** | IN CLEARANCE | IN |
- **INTERSTAGE BUSHINGS** | IN CLEARANCE | IN |
- **VERTICAL PUMPS** |
- **PIT OR SUMP DEPTH** |
- **PUMP LENGTH** |
- **MIN SUBMERSION REQ'D** |
- **COLUMN PIPE** | FLANGED | THREADED |
- **LINE SHAFT** | OPEN | ENCLOSED |
- **BRGS** | BOWL | LINE SHAFT |
- **BRG LUB** | WATER | OIL | GREASE |
- **FLOOT & ROD** | CS | S.S | BRZ | NONE |
- **FLOOT SWITCH** |
- **PUMP THRUST LB** | UP | DOWN |
- **MOUNTING PLATE REQ'D** |

**APPLICABLE SPECIFICATIONS**

- **API 610**
- **ANSI B73.1, B73.2**
- **PROJECT SPECIFICATIONS**
### CENTRIFUGAL PUMP DATA SHEET

**CLIENT**
INTERNATIONAL COAL REFINING COMPANY

**PROJECT**
6000 TPSO SRC-I DEMONSTRATION PLANT

**SERVICE**
FLARE DRUM PUMP

**VENDOR**
P.O. No.

**TYPE**

**NO. OF MOTORS REQUIRED**
ITEM NO. FURN. BY MFR BY

**NO. OF TURBINES REQUIRED**
ITEM NO. FURN. BY MFR BY

**NOTE**

- ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER
- ○ BY MANUFACTURER
- ○ OPERATING CONDITIONS (EACH PUMP)

**LIQUID**
US GPM AT PT. NO. 150 □ RATED

**DISCHARGE**
PSIG 108

**PT. F N.R.**
60, MAX SUCTION PSIG MAX □ RATED

**SP. GR. AT PT.**
1.0 DIFF. PRESS. PSI 108

**VAP PRESS AT PT.**
PSIA □, DIFF HEAD. FT. 250

**VIS AT PT.**
LBM/FT-HR □ = NSHA. FT.

**CORR/EOs CAUSED BY**
NHE, WHP 9.5

**CONSTRUCTION**

- ○ INSPECTION AND TESTS
- ○ PERFORMANCE

**PROPOSAL CURVE NO.**
RPM 1750 □ NO. OF STAGES

**NPSHR. FT.**
□ IMPELLER □ T.O.F.

**EFF. □ BHP RATED**
MAX. BHP RATED IMP.

**MAX HEAD RATED IMP.**
MIN. CONTINUOUS GPM

**ROTATION (VIEWED FROM CPLG ENDO.**

**SHOP INSPECTION**
□ REQUIRE □ DEPOSIT □ WITNESS

**HYDROSTATIC TEST**
□ REQUIRE □ DEPOSIT □ WITNESS

**PERFORMANCE TEST**
□ REQUIRE □ DEPOSIT □ WITNESS

**NPSH TEST**
□ REQUIRE □ DEPOSIT □ WITNESS

**INT. INSPECTION AFTER**
TEST

**INT. WEAR PARTS**

- ○ WEAR RINGS □ CASE □ MP

**DIA. □ IN. CLEARANCE □ IN**

**INTERSTAGE BUSHINGS**
DIA. □ IN. CLEARANCE □ IN

**VERTICAL PUMPS**

- ○ PIT OR SUMP DEPTH □

**PUMP LENGTH □**

**MIN. SUBMERGENCE REQU. □**

**COLUMN PIPE □ FLANGED □ THREADED**

**LINE SHAFT □ OPEN □ ENCLOSED**

**BRGS. □ BOWL □ LINE SHAFT**

**BRG. LUB W. □ WATER □ OIL □ GREASE**

**FLOAT & ROD □ CS □ S.S □ BRZ □ NONE**

**FLOAT SWITCH □**

**PUMP THRU^T □ UP □ DOWN**

**MOUNTING PLATE REQU. □**

**MATERIALS**

- ○ WEIGHTS AND DIMENSIONS

**APPLICABLE SPECIFICATIONS**

- ○ API 610 □ ANSI 873.1, 873.2
- ○ PROJECT SPECIFICATIONS

**PREPARED BY**
R.M.

**DATE**
10-6-81

**APPROVED BY**

<table>
<thead>
<tr>
<th>BY</th>
<th>DATE</th>
<th>BY</th>
<th>DATE</th>
<th>BY</th>
<th>DATE</th>
</tr>
</thead>
</table>

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# CENTRIFUGAL PUMP DATA SHEET

**CLIENT**: INTERNATIONAL COAL REFINING COMPANY

**PROJECT**: BOILER FEEDWATER PUMP

**PLANT LOCATION**: NEWCUM, KENTUCKY

**SERVICES**: PERFORM TEST

**VENDOR**: DISTRIBUTED BY THE RUST ENGINEERING COMPANY

**EQUIPMENT NO.**: P-16915 A & B

**NO. OF MACHINES**: 0

**FURN. BY**: VENDOR

**MFR. BY**: VENDOR

**NO. OF MOTORS**: 2

**NOTE**: (a) INDICATES INFORMATION TO BE COMPLETED BY PURCHASER

## PERFORMANCE

- **PROPOSAL CURVE NO.**
- **RPM**
- **NO. OF STAGES**
- **NPSHR FT & IMPELLER T.O.F.**
- **EFF. BHP RATED**
- **MAX BHP RATED IMP.**
- **MAX HEAD RATED IMP.**
- **MIN CONTINUOUS GPM**
- **ROTATION (VIEWED FROM CPLG END)**

## CONSTRUCTION

<table>
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<tr>
<th>NOZZLES</th>
<th>SIZE/IN</th>
<th>RATING</th>
<th>facing</th>
<th>LOCATION</th>
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</thead>
<tbody>
<tr>
<td>SUCTION</td>
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<tr>
<td>DISCHARGE</td>
<td></td>
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</table>

## AUXILIARY PIPES

- **O C/W PIPE PLAN**
- **O C S S: TUBING:**
- **O PIPE**
- **O TOTAL COOLING WATER REQ'D GPM**
- **O SIGHT F.I. REQ'D**
- **O PACKING COOL INJECTION REQ'D**
- **O TOTAL GPM**
- **O SEAL FLUSH PIPE PLAN**
- **O C S S:**
- **O TUBING & PIPE**
- **O EXTERNAL SEAL FLUSH FLUID**
- **O GPM & PSIG**
- **O AUX. SEAL FLUSH PLAN**
- **O C S S:**
- **O TUBING & PIPE**

## MATERIALS

- **O PUMP CASE/ TRIM API CLASS**
- **O CASING: CAST IRON**
- **O IMPELLER: CAST IRON**
- **O SHAFT 316SS SLEEVE:**
- **O CASE INT. COATING/ LINING**
- **O BASEPLATE**
- **O Drip Pan**

## ELEVATION FT

- **AMB TEMP F MAX**
- **MIN. AREA ELECT. CL**
- **SITING DIV.**

## COOLING WATER SUPPLY PSIG F RETURN PSIG F T

## REMARKS:

- **PREPARED BY**
- **APPROVED BY**
- **DATE**
- **REVISION**
- **APPROVED BY**
- **DATE**
- **APPROVED BY**
- **DATE**
## Centrifugal Pump Data Sheet

### Equipment Data
- **Contract No.**: 21-1997/2554
- **Equipment No.**: F-1691 B 2 26
- **No. Required**: 2
- **Sheet**: of

### International Coal Refining Company

### Project
- **Description**: Condensate Transfer Pump
- **Location**: Newman, Kentucky

### Client
- **International Coal Refining Company

### Vendor
- **P.O. No.**: 

### Notes
- **Operating Conditions**:
  - Liquid: ____________
  - Slope: ____________
  - US GPM: ____________
  - HP: ____________
  - RPM: ____________
  - No. of Stages: ____________
  - NPSHR: ____________
  - T.O.F: ____________
  - NPSH: ____________
  - BHP Rated: ____________
  - Max. BHP Rated: ____________
  - Min. Continuous GPM: ____________
  - Rotation (Viewed from CPLG END): ____________

### Construction
- **Type**: ____________
- **Model**: ____________
- **Serial No.**: ____________

### Nozzles
- **Size (in.):** ____________
- **Rating (psi):** ____________
- **Facing (psi):** ____________

### Suction
- **Discharge**: ____________
- **Case MT**: ____________
- **Centerline**: ____________
- **Foot**: ____________
- **Bracket**: ____________
- **Vert. (Type)**: ____________
- **Split**: ____________
- **Axial**: ____________
- **Rad.**: ____________
- **Type**: ____________
- **Type**: ____________

### Discharge
- **Type**: ____________
- **Type**: ____________
- **Type**: ____________
- **Type**: ____________
- **Type**: ____________

### Auxiliary Piping
- **E.W. Pipe Plan**: ____________
- **G.P.**: ____________
- **S.S.**: ____________
- **Tubing**: ____________
- **Pipe**: ____________
- **Total Cooling Water Rec'd GPM**: ____________
- **Sight F.I. Rec'd**: ____________
- **Total GPM**: ____________
- **Type**: ____________
- **Type**: ____________
- **Type**: ____________

### Materials
- **Pump Case - Trim API Class**: ____________
- **Casing**: ____________
- **Casing**: ____________
- **Casing Comp.**: ____________
- **Impeller**: ____________
- **Casing Wear Rings**: ____________
- **Cast Iron**: ____________
- **Shaft**: ____________
- **Sleeve(s)**: ____________
- **Glazed**: ____________
- **Baseplate**: ____________
- **Drain Pan**: ____________

### Elevation
- **FT**: ____________
- **DIST/FT**: ____________
- **F**: ____________
- **MAX**: ____________
- **MIN**: ____________
- **Area Elect. Cl. G.**: ____________
- **Area Elect. Cl. G.**: ____________

### Cooling Water Supply
- **PSIG**: ____________
- **F Return**: ____________
- **PSIG**: ____________

### Preparation
- **Date**: ____________
- **Revision**: ____________
- **Date**: ____________
- **Revision**: ____________
- **Date**: ____________
- **Revision**: ____________
- **Date**: ____________
- **Revision**: ____________

### APPROVED BY
- **Appr'd**: ____________
- **Appr'd**: ____________
- **Appr'd**: ____________
- **Appr'd**: ____________
### Centrifugal Pump Data Sheet

**Client:** International Coal Refining Company  
**Project:** Good TPSO SRC-I Demonstration Plant  
**Service:** Boiler Feed Water Pump  
**Vendor:** P.B. No.  
**Model:**  
**Serial No.:**

**Note:** Indicates information to be completed by Purchaser. Indicates information to be completed by manufacturer.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Size/Uni</th>
<th>Rating</th>
<th>Facing</th>
<th>Location</th>
</tr>
</thead>
</table>

**Conduit:**  
**Nozzles:**  
**Suction Discharge:**

**Case MT:** Centerline, Foot, Bracket, Vert. (Type)  
**Split:** Axial, Rad, Type: Volute, SGL, DBL, Diffuser  
**Press:** Max. Allow.  
**Connect:** Vent, Drain, Gauge, Steam Jacket  
**Impeller Dia.:** Rated  
**Mount:** Between Brgs.  
**Bearings:** Type, Radial, Thrust  
**Lube:** Ring Oil, Flood, Oil Mist, Flinger, Pressure  
**Coupling:** Mfr.  
**Driver:** Half Mtd.  
**Mech. Seal:** Packing, Aux. Seal/Packing  
**Mfr. Type:** Model  
**Mfr. Code:** API Code  

**Auxiliary Piping:**  
**E.W. Pipe Plan:**  
**Total Cooling Water Reed Gpm:**  
**Packaging Cool Injection Reed:** Total Gpm  
**Seal Flush Pipe Plan:**  
**External Seal Flush Fluid:**  
**Auxiliary Seal Plan:**  

**Materials:**

**Pump Case/Trim API Class:**

**Shaft:** 316SS  
**Sleeve:** 316SS  
**Case Int. Coating:** Liner  
**Baseplate:** Drap Pan  

**Elevation:**  
**Amb Temp:** Max, Min  
**Cooling Water Supply:** Psig  

**Remarks:**

**Prepared By:**  
**Approved By:**  
**Date:**  
**Revision:**  

**Contract No.:** 70-10717-2555  
**Equipment No.:** 9-16921A & B  
**No. Required:** 2  
**Sheet:** 1 of 1  

**Proposal Curve No.:**  
**Rpm:** No. of Stages  
**Npsr. Ft:** Impeller Type  
**Eff.:** Bhp Rated  
**Max Bhp Rated Imp.:**  
**Max Head Rated Imp.:**  
**Min Continuous Gpm:**  

### Vertical Pumps

**Pump Length:**  
**Min. Submergence Reed:**  
**Column Pipe:** Flanged, Threaded  
**Line Shaft:** Open, Enclosed  
**Brgs. Bowl:** Line Shaft  
**Brg. Lub. Water CoL:** Grease  
**Float & Rod:** C.S., O.S.  
**Float Switch:**  

**Approx. Wt. Pump & Base:**  
**Motor:**  
**Base Plate Dimensions:**

**Applicable Specifications:**  
**API 610**  
**ANSI B73.1 B73.2**  

**Project Specifications:**

---

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### Centrifugal Pump Data Sheet

#### Project Information
- **Project:** Odd TPSO SRC Demonstration Plant
- **Plant Location:** Newman, Kentucky

#### Pump Specifications
- **Type:** Liquid Incinerator Pump
- **Model:**
- **Serial No.:**
- **No. of Motors Req'd:** 2
- **No. of Turbines Req'd:**

#### Operating Conditions
- **Liquid Slop Oil:** US GPM at PT Nor.
- **Max. Impeller:**
- **Vap. Press:** At Pt. PSI
- **Vis. At Pt. LBM/FT-HR:**
- **Curv./Ehst. Caused By:**

#### Construction
- **Nozzles:**
- **Suction:**
- **Discharge:**
- **Case Mt.:**
- **Split:**
- **Press:**
- **Connect:**
- **Impeller Dia.:**
- **Mount:**
- **Bearings Type:**
- **Lube:**
- **Coupling:**
- **Driver Half Mtd by:**
- **Mech. Seal:**
- **Mfr. Type:**

#### Auxiliary Pipes
- **C.W. PIPF PLAM:**
- **Total Cooling Water Reqd GPM:**
- **Packing Cool. Injection Reqd:**
- **Seal Flush Pipe Plan:**
- **External Seal Flush Fluid:**
- **Aux. Seal Flush/Quench Fluid:**

#### Materials
- **Casing/Cast Iron Corr:**
- **Impeller/Cast Iron Wear Rings/Cast Iron:**
- **Shaft:**
- **Case Int. Coating/Lining:**
- **Baseplate/Drip Pan:**

#### Site Conditions
- **Elevation FT:**
- **Amb. Temp. F:**
- **Cooling Water Supply:**

#### Preparation and Approval
- **Prepared By:** SZ
- **Approved By:** BS

#### Project Specifications
- **API 610**
- **ANSI B73.1, B73.2**

#### Additional Notes
- **Related**: Project Specifications
## Atmospheric Tank Data Sheet

### Project Information
- **Project:** Good TP500-JEJ Demonstration Plant
- **Plant Location:** German, Kentucky

### Tank Information
- **Type Tank:** Quench Liquid Storage Tank
- **Vendor:** [Vendor Name]

### Design Data
- **Diameter:** 35’ 0”
- **Height:** 30’ 0”
- **Capacity:**
  - Normal: 5,141 BBLs
  - New Working: 5,000 BBLs

### Norway

### Tank Fittings and Appurtenances

<table>
<thead>
<tr>
<th>Description</th>
<th>Req'd</th>
<th>Size</th>
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<tbody>
<tr>
<td>Inlet-Nozzle</td>
<td>1</td>
<td>6”</td>
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<tr>
<td>Outlet-Nozzle</td>
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<td>Heating Steam - Inlet</td>
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<td>Heating Condensate-Outlet</td>
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<td>Suction Heater Manways</td>
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<td>24”</td>
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<tr>
<td>Shell Manways</td>
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<td>Mixer Manways</td>
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<td>Nozzle Mounted on Mixer M/W Cover</td>
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<td>Flush Type Cleanout</td>
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<td>Bolted Doorsheet</td>
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<td>Inlet Extension Piece</td>
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<td>Inlet Relaxation Chamber</td>
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<td>Static Eliminating Connections</td>
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<tr>
<td>Vortex Eliminator</td>
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<td>Suction Baffle</td>
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<tr>
<td>Mixer Baffle</td>
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<tr>
<td>Center Sump Suction Line</td>
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<tr>
<td>Center Product Suction Sump</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Ground to Roof Stairway: radial</td>
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<tr>
<td>Spiral</td>
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<tr>
<td>Automatic Ground Reading Gage</td>
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<tr>
<td>Mfg/Model</td>
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<td>Mixers</td>
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<td>Mfg/Model</td>
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<td>Mfg/Type</td>
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<td>Shop Pickling &amp; Special Priming</td>
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<tr>
<td>Shop Painting of Plates: Inside</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shop Painting of Plates: Outside</td>
<td></td>
<td></td>
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</tbody>
</table>

### Additional Information
- **Prepared By:** [Prepared By]
- **Date:** 10-21-81
- **Approved By:** [Approved By]
- **Date:** [Approved By Date]
- **Revisions:**
  - [Revision 1]
  - [Revision 2]
  - [Revision 3]
This is a preliminary description of a slop oil and waste liquid preparation system. The basic concept was primarily initiated for equipment cost determination. Specific details will be developed during the detail design phase.

The slop oil and waste liquid preparation system will consist of two 2,500 bbl. nitrogen-blanketed storage tanks where waste liquids can be brought in by truck or by transfer line. The dual tank system will allow material separation as well as individual mixture preparation or conditioning for effective oxidation.

The individual tanks will include high turn over mixers with cooling and heating coils using cooling water and superheated steam respectively. The inter-tank pumping/circulating transfer allows for material transfer between the tanks as well as to a static mixer section for chemical addition. All chemicals like emulsion breakers, neutralizers, inhibitors, polymers, etc. will have individual feeding and metering tanks.
1. ALL FLANGES 20" AND LARGER TO MEET API-605 STD. ALL FLANGES UNDER 20" TO MEET ASME B16.5.

2. SKIRT VENT (1 REQUIRED) TO BE A 4" SCH. 40 PIPE SLEEVE, LOCATE AS HIGH AS POSSIBLE ON SKIRT.

3. SKIRT ACCESS OPENING (1 REQUIRED) TO BE 20" NOM. DIA.

4. ALL NOZZLES TO BE REINFORCED AS REQUIRED PER THE ASME CODE, SECTION VIII DIVISION 1.

5. ALL NOZZLES TO HAVE A 6" MIN. CENTERLINE PROJECTION FROM OUTSIDE OF VESSEL WALL.

6. O.D. OF SKIRT SHALL MATCH O.D. OF VESSEL. SUPPLIER SHALL FURNISH THE SKIRT AND BASE PLATE THICKNESS AND ANCHOR BOLT DESIGN CALCULATIONS. THE SKIRT SHALL BE 3/8" MINIMUM THICKNESS.

7. SUPPLIER SHALL DESIGN & FURNISH TWO LIFTING LUGS.

8. SUPPLIER SHALL FURNISH TWO ELECTRICAL GROUNDING CLIPS.

9. SUPPLIER SHALL CALCULATE THE MAWP, NEW AND COLD, USING AS BUILT THICKNESSES. SHOP HYDROTEST PRESSURE SHALL BE A MINIMUM OF 1.5 TIMES THIS MAWP. THE LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>VERTICAL FLARE, C.O., DRUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>SUPPLIER SHALL UPRATE THE VESSEL TO THE MAWP IN THE FULLY CORRODED CONDITION. AND THEN UPRATE TO THE MAXIMUM TEMPERATURE. THIS MAWP, FUTURE HYDROTEST PRESSURE IN VERTICAL POSITION AND LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.</td>
</tr>
<tr>
<td>11</td>
<td>THE VESSEL SKIRT SHALL BE FIREPROOFED BY OTHERS WITH 2&quot; OF SHOTCRETE. (GUNITE OR EQUAL) ON OUTSIDE ONLY.</td>
</tr>
<tr>
<td>12</td>
<td>AFTER COMPLETION, THE SUPPLIER SHALL REMOVE ALL FOREIGN MATERIAL FROM INSIDE AND OUTSIDE THE VESSEL WALL. THE SUPPLIER SHALL SANDBLAST ALL EXTERIOR SURFACES TO NEAR WHITE METAL (SSPC-SP10) AND THEN APPLY 2-3 MILS D.F.T. ZINC PRIMER.</td>
</tr>
<tr>
<td>13</td>
<td>ALL FLANGE BOLT HOLES SHALL STRADDLE THE VESSEL CENTERLINES.</td>
</tr>
<tr>
<td>14</td>
<td>SUPPLIER SHALL FURNISH A NEW SET OF GASKETS FOR ALL BLIND FLANGED NOZZLES. THE GASKETS SHALL BE 1/16&quot; THICK COMPRESSED ASBESTOS, JSMO-60 OR EQ.</td>
</tr>
<tr>
<td>15</td>
<td>SUPPLIER SHALL DESIGN THIS VESSEL IN ACCORDANCE WITH ASME SECTION VIII, DIVISION 1 CODE. SEISMIC AND WIND LOADING SHALL BE PER ANSI ASME-1972 STD. USE 80 MPH BASIC WIND SPEED, EXPOSURE &quot;C&quot; AND SEISMIC ZONE 2.</td>
</tr>
<tr>
<td>16</td>
<td>THE SUPPLIER HAS THE OPTION TO GIVE ALTERNATE QUOTE IF PROVEN ECONOMICAL FOR ANY CARBON STEEL SUBSTITUTE MATL.</td>
</tr>
<tr>
<td>17</td>
<td>SUPPLIER SHALL FURNISH VORTEX BREAKER FOR NOZZLE N3, SHT. B OF 3</td>
</tr>
</tbody>
</table>

**Notes:**

- **Plant Location:** NEWMAN, KENTUCKY
- **General Equipment Data Sheet:**
- **Contract No.:** 21-1997 F
- **Approved by:** B. MACADA
- **Date:** 10-28
- **EQUIP. IDENT. NO.:** V-1680
GENERAL EQUIPMENT
DATA SHEET

1. ALL FLANGES 2½" AND LARGER TO MEET API-605 STD.

2. ALL NOZZLES TO BE REINFORCED AS REQUIRED PER THE
A.S.M.E. CODE, SECTION VIII DIVISION 1.

3. ALL NOZZLES TO HAVE A 6" MIN. CENTERLINE
PROJECTION FROM OUTSIDE OF VESSEL WALL.

4. THIS VESSEL TO BE INSULATED BY OTHERS WITH 2" OF
ASBESTOS FREE CALCIUM SILICATE INSULATION. SHALL BE
COVERED WITH .016" THICK ALUMINUM JACKETING AND
BANDED WITH STAINLESS STEEL. THE SADDLES SHALL BE
FIREPROOFED BY OTHERS WITH 2" OF SHOTCRETE (GUNITE OR EQ)

5. SUPPLIER SHALL CALCULATE THE MAWP, NEW AND COLD,
USING AS BUILT THICKNESSES. "SHOP HYDROTEST PRESSURE
SHALL BE A MINIMUM OF 1.5 TIMES THIS MAWP. THE
LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.

6. SUPPLIER SHALL UPRATE THE VESSEL TO THE MAWP IN
THE FULLY CORRODED CONDITION AND THEN UPRATE TO
THE MAXIMUM TEMPERATURE. THIS MAWP, FUTURE HYDRO-
TEST PRESSURE AND LIMITING COMPONENT SHALL BE
SPECIFIED ON DRAWING.

7. THE SUPPLIER SHALL DESIGN THIS VESSEL IN ACCORDANCE
WITH A.S.M.E. SECTION VIII DIVISION 1 CODE. SEISMIC AND WIND
LOADING SHALL BE PER ANSI ASB.1-1972 STANDARD. USE
80 MPH BASIC WIND SPEED, EXPOSURE "C" AND SEISMIC ZONE 2.

SHT. 2 OF 3
8. Supplier shall furnish a new set of gaskets for all blind flanged nozzles. The gaskets shall be ½" thick compressed asbestos, JMMGO or equal.

9. Supplier shall furnish vortex breaker for nozzle N3.

10. The bayonet heater installed thru nozzle N7 will be supplied by others.

11. All flange bolt holes shall straddle the vessel centerlines.

12. The supplier has the option to give alternate quote if proven economical for any carbon steel substitute material.

13. The supplier shall furnish an electrical grounding clip for each saddle.

14. The supplier shall design the saddle supports. When calculating the bending stress at the horn of the saddle support, the thickness of the wear plate shall not be considered. Stiffener rings or increased shell plate thickness may be used, if required, to reduce stresses at the saddles.
**CLIENT**
INTernational Coal Refining Company

**PROJECT**
5000 TPSD SRC-I Demonstration Plant

**EQUIPMENT NO.**
V-14916

**PLANT LOCATION**
Newman, Kentucky

**SERVICE**
Knockout Drum, Vent Gas Incinerator

**DIAMETER INSIDE**
IN
**DIA.**
IN

**VERT. H.T.L. TO T.I.**
FT

**MT. L. FROM GRADE**
FT

**MAT. NO.**

**MATERIALS**

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<th>SHELL</th>
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<th>SUPPORT</th>
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<tr>
<td>SA-516-70</td>
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<td>SA-36</td>
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<tr>
<td>3/8&quot;</td>
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<td>GASKETS 1/16&quot; COMP. ASC.</td>
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**OPERATING CONDITIONS**

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<td>SA-53B/SA-105</td>
<td>SA-181</td>
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**OPER TEMP**
F

**MAX TEMP**
F

**OPER PRESSURE**
PSIG

**PSIG**

**STAMPED**

| NATIONAL BOARD REGISTRATION | 75 |

**DESIGN**

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**RESS TEMP**
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**PRESSURE**
PSIG

**EXTERNAL PRESSURE**
PSI

**MAX ALLOW WORKING PRESS/TEMP**
102/1650

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<td>3/8&quot;</td>
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**HYDROTEST PRESS/TEMP**
153

**RADIATION EXTENT**
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<table>
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<th>WIND PRESS</th>
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<tr>
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| VESSEL SUPPORT TYPE | SWIFT |

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<th>NOZZLES</th>
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<th>SIZE</th>
<th>FACING</th>
<th>SERVICE</th>
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</thead>
</table>

| N-1 | 1 | RF 150° | INLET |
| N-2 | 1 | RF 150° | OUTLET | LAROR |
| N-3 | 1 | RF 150° | OUTLET | LIQUID |
| N-4 | Z | RF 150° | LEVEL |
| N-5 | 1 | WATER | RELIEF |

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<th>LIQUID LEVEL</th>
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<table>
<thead>
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<th>MAX</th>
<th>MIN</th>
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**PREPARED BY**
S. R.

**DATE**
10-21-81

**APPROVED BY**

<table>
<thead>
<tr>
<th>BY</th>
<th>DATE</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>APP'D</th>
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**SHR No.**
103
The Rust Engineering Company

PROJECT: GOOD TP50 SRC-1 DEMONSTRATION PLANT
PLANT LOCATION: NEWMANN, KENTUCKY

SERVICE: FLARE ASSEMBLY

VENDOR: P.O. NO.

THIS IS A PRELIMINARY DESCRIPTION OF AN ELEVATED FLARE SUPPORTED BY A DERRICK. THE BASIC CONCEPT WAS PRIMARILY INTENDED FOR EQUIPMENT COST DEVELOPMENT. SPECIFIC DETAILS WILL BE PROVIDED DURING THE DETAIL DESIGN PHASE.

PROCESS REQUIREMENTS

THE FLARE FROM THE FLARE SHALL BE SMOKELESS WITH THE SMOKELESS CAPACITY OF 200,000 M3/HR USING 0.5 LBS OF STEAM PER LB OF HYDRO CARBON. THE EMERGENCY RELEASE CAPACITY OF THE FLARE SHALL BE 1,100,000 M3/HR (NON-SMOKELESS).

THE FLARE HEAT WILL BE 250 FT. MOI. W.T. 26. FLOW TEMPERATURE 400°F. ALLOWABLE TIP 4P = 0.5 PSI.

FLARE SYSTEM SHALL BE COMPLETE WITH SUPPORTING DERRICK, MOLECOULAR SEAL, WATER SEAL AT THE BASE, ACCESS WORK PLATFORM AT TOP, CAGED LADDERS WITH REST PLATFORMS EVERY 30 FT., IGNITOR, AND PILOTS.
This is a preliminary description of a slop oil and waste liquid oxidizing system. The basic concept was primarily intended for equipment cost determination. Specific details as well as the final data sheets and specifications will be developed during the detail design phase.

The thermal oxidizer shall be capable of disposing of slop oil and waste liquid mixtures of varying calorific value using fuel gas as auxiliary fuel. The waste liquids will be pumped to the burner at the proper temperature, pressure, and adjusted composition from the preparation area. The oxidizer will incorporate a waste heat recovery system which will generate saturated steam at 150 psig. Each unit will include an individual feed water recirculation system, chemical treatment facilities, and local operation controls with plant supervision capability. Major alarms and current operating status will be linked to the central control room by a pan alarm system.

Basic Oxidizer Rating:

<table>
<thead>
<tr>
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<th>Value</th>
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</thead>
<tbody>
<tr>
<td>1. Waste liquid</td>
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</tr>
<tr>
<td>2. Auxiliary fuel normal duty, MMBtu/hr</td>
<td>10.0</td>
</tr>
<tr>
<td>3. Auxiliary fuel maximum duty, MMBtu/hr</td>
<td>30.0</td>
</tr>
<tr>
<td>4. Maximum duty, MMBtu/hr</td>
<td>45.0</td>
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</tbody>
</table>

The oxidizer flue gas stack will have a minimum height of 125 ft. Minimum flue box temperature 2,000°F.
This is a preliminary description for a vent gas incinerator. The basic concept was primarily intended for equipment cost determination. Specific details as well as the final data sheets and specifications will be developed during the detail design phase.

The vent gas incinerator shall be capable of disposing of hydrocarbon-contaminated nitrogen-blanketing vapors from the storage, process, and loading areas. These vent gases will have a varying calorific value and will require fuel gas for auxiliary fuel.

The incinerator will include an induced draft flue gas stream of a check-out drum for 1915 and liquid separation. The check-out drum supply header is maintained at a selectedugas release pressure and it is connected to all the sources via sub headers.

The incinerator will incorporate a waste heat recovery system which will generate saturated steam at some of each unit. The incinerator includes an auxiliary feed water recirculation system, chemical treatment facilities, and local combustion controls with flange Supervision Capability. Major alarms and current operating status will be linked to the central control room by a pan-alarm system.

Basic oxidizer rating:

1. Vent Vapors: 4,140 kg/hr 2,500
2. Auxiliary fuel normality minimum: 10.0
3. Auxiliary fuel maximum pressure: 30.0
4. Maximum duty, kg/hr: 35.0

The oxidizer fuel gas stack will have a minimum height of 125 ft. Minimum fire box temperature 2,000° F.

Prepared by

Date

Approved by

Date
2.2.10 Fuels

2.2.10.1 System Description

Plant fuels, which include fuel oil, plant generated gaseous fuel, excess plant generated hydrogen, and LPG are distributed to the various area contractors as required. Separate piping system headers are provided for gaseous and liquid fuels.

2.2.10.2 Utility Flow Diagrams

Refer to the following drawings included with Interconnecting Systems, Paragraph 2.3.

00-16-03010 Interconnecting Piping System, Fuel Gas, Hydrogen & LPG
00-16-03011 Interconnecting Piping System, Fuel Oil
2.3 INTERCONNECTING SYSTEMS

2.3.1 Facilities Description

2.3.1.1 The interconnecting system will consist of a structurally designed pipe bridge that will be approximately 20 feet wide with a clearance of 30 feet from finish grade at all road and railroad crossings. The bridge will be designed with two and three tiers as required to accommodate the various pipe sizes. All process lines will be located on the 1st tier; steam and condensate lines will be located on the 2nd tier; all other utility lines will be located on the 3rd tier where possible. A 4th tier will be installed, as required, to accommodate all electrical cable trays and instrumentation lines. The minimum spacing between each tier will be 6 feet.

2.3.1.2 The north-south run of pipe bridge will be installed at coordinates N.2000 by E.15000, approximately. The bridge will run north to coordinates N.4850 by E.14300 to the liquid storage area. At this coordinate, the pipe bridge will terminate and all piping will be installed on pipe sleepers for the liquid storage and solids storage (area 11) and coal preparation (area 11).

2.3.1.3 All sleepers will be installed a maximum of 30 inches from finish grade. Any pipe in storage areas that must penetrate a diked area will be installed in a pipe sleeve 2 inches larger than the carrier pipes, and will be sealed at the end inside the diked area to prevent leakage from the diked area in case of spillage or rupture of the storage tank.

2.3.1.4 In areas where pipe runs will consist of small diameter pipe, or with only a few lines involved, pipe will be installed on T-pole supports. These T-pole supports will be spaced in a manner to support the smallest diameter pipe in the run.
2.3.1.5 All T-pole supports will be constructed of round pipe of proper size and will be installed in a concrete footer. The cross members of the T-pole supports will be structural steel welded to the pipe.

2.3.1.6 The T-pole supports will be 8 feet wide and the bottom of the cross members will have a clearance of 20 feet from finish grade. Where T-pole supports traverse a road or railroad, the bottom of the cross members will be 30 feet from finish grade.

2.3.1.7 In areas where two-tier pipe bridges will be used, all process and steam lines (if required) will be installed on the first tier, the second tier will be used for all other utilities. A third tier will be installed as required to accommodate electrical cable trays and instrumentation. A 6 foot minimum spacing will be maintained between each tier.

2.3.1.8 Provisions will be made for electrical cable trays and instrumentation on sleepers and T-pole supports in liquid and solid storage areas.

2.3.1.9 The strong wastewaters, which consist primarily of ammonia sulfide water, stripper (ASWS) bottoms, GKT blowdown, and hazardous waste landfill leachate will be conveyed in above ground pipes to the strong wastewater treatment system. A single sewer system will be provided to convey weak wastes (contaminated runoff and sanitary waste) to the weak waste treatment system. A ditch system will be provided to collect stormwater from uncurbed areas.
2.3.1A  ICRC Interface Integration

Please refer to the ICRC "Revised Integration Documentation" dated June, 1983, Document No. DOE/OR/03054-24, UC-89. This document defines baseline interface information and compiles interconnecting stream information into two categories: the process interface streams and the utilities interface streams.
2.3.2 Interconnecting Diagrams

The following interconnecting diagrams, together with the line calculations summary sheets, are included in this section:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>00-16-03001</td>
<td>Interconnecting Piping System, H.P. Boiler Feed Water</td>
</tr>
<tr>
<td>00-16-03002</td>
<td>Interconnecting Piping System, L. P. Boiler Feed Water</td>
</tr>
<tr>
<td>00-16-03003</td>
<td>Interconnecting Piping System, 900# Steam</td>
</tr>
<tr>
<td>00-16-03004</td>
<td>Interconnecting Piping System, 450# Steam</td>
</tr>
<tr>
<td>00-16-03005</td>
<td>Interconnecting Piping System, 150# Steam</td>
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<td>00-16-03006</td>
<td>Interconnecting Piping System, 75# Steam</td>
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<td>00-16-03007</td>
<td>Interconnecting Piping System, 27# Steam</td>
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<tr>
<td>00-16-03008</td>
<td>Interconnecting Piping System, Instrument Air/Plant Air</td>
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<td>Interconnecting Piping System, Nitrogen</td>
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<tr>
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<td>Interconnecting Piping System, Fuel Gas, Hydrogen &amp; LPG</td>
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<td>Interconnecting Piping System, Fuel Oil</td>
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<td>Interconnecting Piping System, Cooling Water Supply</td>
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<td>Interconnecting Piping System, Cooling Water Return</td>
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<td>Interconnecting Piping System, Process Water</td>
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<td>Interconnecting Piping System, Condensate</td>
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<td>00-16-05001</td>
<td>Interconnecting Piping System, Process Lines-Process Solvents and Flushing Oil</td>
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<td>Interconnecting Piping System, Process Lines - Coal and KMAC</td>
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<tr>
<td>00-16-05003</td>
<td>Interconnecting Piping System, Process Lines - Crude Liquid Products</td>
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</tbody>
</table>
00-16-05004 Interconnecting Piping System, Process Lines - SRC & TSL-SRC
00-16-05005 Interconnecting Piping System, Process Lines - Fractionated Liquid Products to Tank Farm
00-16-05006 Interconnecting Piping System, Process Lines - Sour Waters
00-16-05007 Interconnecting Piping System, Process Lines - Sour Gases
00-16-05008 Interconnecting Piping System, Process Lines - Liquid Products from EBH to Product Fractionation
00-16-05009 Interconnecting Piping System, Process Lines - Vent Gases to Incinerator
00-16-05010 Interconnecting Piping System, Process Lines - Coker/Calciner Liquid Effluents
00-16-05011 Interconnecting Piping System, Process Lines - Oxygen
00-16-05012 Interconnecting Piping System, Process Lines - Gas System Waste Streams
00-16-05013 Interconnecting Piping System, Process Lines - GKT Ash Slurry
00-16-05014 Interconnecting Piping System, Process Lines - Hydrogen
00-16-05015 Interconnecting Piping System, Process Lines - Gas System Liquid Hydrocarbon Effluents
00-16-05016 Interconnecting Piping System, Process Lines - Gas System Vent Gases
00-16-05017 Interconnecting Piping System, Process Lines - Gas System Waste Water
00-16-05018 Interconnecting Piping System, Process Lines - Gas System Waste Streams
00-16-05019 Interconnecting Piping System, Process Lines - Naphtha Hydrotreating
00-16-05020 Interconnecting Piping System, Process Lines - Miscellaneous Waste Streams
NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83 REF: GROUP-ASSIGNED NO. 7489
   B) G/S B/M, SECTION A, REV. 0 DATED 7/7/83
1. All flow rates shown are maximum flows as documented (247) as revised integration documentation of the procedure documentation (6099). 

2. All area maximum flows as shown are not existing since they do not occur at the same time. (see fuel oil heater)
NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
NOTES:
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
Notes:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted, all pipes are C.S.
3. Mat. of Constr.

1. AREA 12 SRC
   1A SRC Process
   1B Deashing
   1C Product Fractionation
   1D Solidification

2. AREA 13 PRODUCT UPGRADING
   2A Coker/Calcinier
   2B Expanded-bed Hydrocracker

3. AREA 14 CRYOCIC SEPARATION
   3A Air Separation
   3B Hydrogen Purification

4. AREA 15 GAS SYSTEMS
   4A Gasification
   4B Gas Treatment
   4C Sulfur Recovery

5. AREA 16 UTILITIES
   5A Main Substation
   5B BFW Treatment
   5C Cooling Tower No. 1
   5D Cooling Tower No. 2
   5E Power House and Air Compressor
   5F Flare
   5G Liquid Thermal Oxidizer
   5H Gas Incinerator

6. AREA 17 OXIDE TREATMENT
   6A Water Treatment
   6B Wastewater Treatment
   6C Surge Basin
   6D Hazardous Waste Landfill
   6E Non-Hazardous Waste Landfill
   6F Landfill Cover Stock Pile
   6G Evaporator
   6H Central Control Building
   6I Administration Building
   6J Service Change Building
   6K Contract Maintenance Change Bldg.
   6L Warehouse Building
   6M Maintenance Building
   6N Storm Retention Pond
   60 Ash Ponds

7. AREA 11 RAW MATERIAL & PRODUCT STORAGE
   7A Coal Storage
   7B Coal Pulverizer
   7C Liquid Storage
   7D SRC/CRS Storage

8. NAPTHA HYDROTREATING
NOTES:
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

OXYGEN TO GKT

OXYGEN TO WWTP
NOTES:
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
LEGEND

1. AREA 12 SRC
   1A SRC Process
   1B Deashing
   1C Product Fractionation
   1D Solidification

2. AREA 13 PRODUCT UPGRADE
   2A Coker/Calciner
   2B Expanded-bed Hydrocracker

3. AREA 14 CRYOGENIC SEPARATION
   3A Air Separation
   3B Hydrogen Purification

4. AREA 15 GAS SYSTEMS
   4A Gasification
   4B Gas Treatment
   4C Sulfur Recovery

5. AREA 16 UTILITIES
   5A Main Substation
   5B Pumping Station
   5C Cooling Tower No. 1
   5D Cooling Tower No. 2
   5E Power House and Air Compressor
   5F Flare
   5G Liquid Thermal Oxidizer
   5H Gas Incinerator

6. AREA 17 OFFSITES
   6A Water Treatment
   6B Wastewater Treatment
   6C Surge Basin
   6D Hazardous Waste Landfill
   6E Non-Hazardous Waste Landfill
   6F Landfill Cover Stock Pile
   6G Evaporator
   6H Central Control Building
   6I Administration Building
   6J Service Change Building
   6K Contract Maintenance Change Bldg.
   6L Warehouse Building
   6M Maintenance Building
   6N Storm Retention Pond
   6O Ash Ponds

7. AREA 11 RAW MATERIAL & PRODUCT STORAGE
   7A Coal Storage
   7B Coal Pulverizer
   7C Liquid Storage
   7D SRC/TSL Storage

8. NAPHTHA HYDROTREAT
NOTES:
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
FLOW, LB/HR

FLOW, GPM

TO

LEGEND

1 FLOW, LB/HR

LEGEND

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deastring
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Caliner
2B Expanded-bed Hydrocracker

3 AREA 14 CRYOGENIC SEPARATION
3A Air Separation
3B Hydrogen Purification

4 AREA 15 GAS SYSTEMS
4A Gasification
4B Gas Treatment
4C Sulfur Recovery

5 AREA 16 UTILITIES
5A Main Substation
5B BFW Treatment
5C Cooling Tower No. 1
5D Cooling Tower No. 2
5E Power House and Air Compressor
5F Flare
5G Liquid Thermal Oxidizer
5H Gas Incinerator

6 AREA 17 OFF-SITES
6A Water Treatment
6B Wastewater Treatment
6C Surge Basin
6D Hazardous Waste Landfill
6E Non-Hazardous Waste Landfill
6F Landfill Cover Stock Pile
6G Evaporator
6H Central Control Building
6I Administration Building
6J Service Change Building
6K Contract Maintenance Change Bldg.
6L Warehouse Building
6M Maintenance Building
6N Storm Retention Pond
60 Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.

2. Unless otherwise noted all pipes are C.S.

3. Mat. of constr. 316 S.S.

4. All flow rates shown are maximum flow rates.

5. Unless otherwise noted all pipes are C.S.

6. Mat. of constr. 316 S.S.
NOTES:
1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. By conveyor/truck
NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
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**Surface Temp:**
- 100°F
- 20°F
- 4°F
- 85°F

**Pressure:**
- 150 PSI
- 100 PSI
- 50 PSI
- 10 PSI

**Flow Conditions:**
- Acfs
- Lin
- Temp
- Lb/Hr

**Remarks:**
- 43.40
- 0.25
- 45.80
- 0.63
- 43.80
- 0.20
- 38.50
- 0.20
- 38.30
- 0.33
- 1.97
- 0.18
- 1.25
- 0.97
- 73.30
- 0.38
- 128.0
- 1.07
- 36.9
- 0.13
- 38.50
- 0.20
- 38.50
- 0.20

**Units:**
- Lb/HR
- Acfs
- Temp
- Lb/ft
- Visc
- Z
- Surface Temp
- Velocity
- Pressure
- Equivalent Length

**Notes:**
- Form 44/122 (8/82)
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**Remarks**: REVIEWED BY, DATE, APPROVED BY, DATE.
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**FORM 44-152 (9/82)**

**PREPARED BY:** A. SAKA

**DATE:** 11/20/83

**APPROVED BY:**

**DATE:** 11/20/83

**REVISION △** **REVISION △** **REVISION △** **REMARKS △**

**CONTRACT NO.: 21-22-9498**

**AREA NO.: 16**

**REF. 7463: 04-16-05010**

**SHEET:** 2 of 21

**UNIT: LBS/HR**

**TEMP: °F**

**VISC.:**

**LINE: 5"-3"**

**LENGTH FT: 0-561**

**VELOCITY FT/SEC:**

**PRESSURE DROP PSI/100 FT:**

**EQUIVALENT LENGTH FT:**

**COMMENT:**

**REMARKS:**

**DROP PSI:**

**LENGTH FT:**

**FLOW CONDITIONS:**

**LB/HR**

**SCFM**

**PRESS.**

**LB/FT**

**VISC./**

**SURFACE TENSION (IN. W.)**

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## Utilities Lines - Compressed Air

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- **Prepared By:** B. Shawk
- **Date:** 1/20/94
- **Revised:**
  - **By:**
    - **Date:**
  - **By:**
    - **Date:**
  - **By:**
    - **Date:**
  - **By:**
    - **Date:**
  - **By:**
    - **Date:**

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**Notes:**
- **LB/HR:**
- **SCFM:**
- **PSID:**
- **TEMP:**
- **LB/FT:**
- **VISC.:**
- **Z:**
- **SURFACE TENSION:**
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**Remarks**

- PMR/HR: Pounds mass per hour
- SEC/PD (ACFS): Seconds per day (acfm)
- PRESL. PD: Pressure drop
- TEMP. °F: Temperature in °F
- VISC. cP: Viscosity in centipoise (cP)
- LBF/2': Lb per foot
- LIN. G-G: Line gage
- VELOCITY FT/SEC: Velocity in feet per second
- PRESSURE DROP PS/100 FT: Pressure drop in pounds per 100 feet
- EQUIVALENT LENGTH FT: Equivalent length in feet

**Graphical Elements**

- A Rust International Corporation logo is present at the top left of the page.
- A line diagram is present at the bottom of the page, with various lines labeled with their respective contents and measurements.
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**Prepared by:** R. Smith  
**Approved by:** J. Doe  
**Date:** 7/24/99  
**Req/Downloads:** 6/21/99  
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- WATER TREATMENT
- WATER WASTE
- WATER AGU
- WATER MAINT.
- WATER WAREHOUSE
- SERVICE CHANGE
- EIN- AREA 13
- COKER/ CALCIER
- ADMIN. BLDG
- LIQUID
- FLARE AREA 16
- SRC/TEL STORAGE
- COAL STORAGE
- MAIN CONTROL
- SRC PROCELS
- EVAPORATOR

**Remarks**
- [Details of remarks by various contributors]
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**Notes:**
- LB/HR: Pounds per hour
- GP.M.: GPM
- PRESS: Pressure
- TEMP: Temperature
- SP. GR: Specific gravity
- VISC: Viscosity
- SURFACE TENSION: Surface tension in dynes per centimeter
- REMARKS: Additional notes or comments.
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**Remarks:**

- **DATE:** 10/25/93
- **APPROVED:**
  - By DATE
  - By DATE
  - By DATE

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* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
### Line Calculations Summary Sheet

**Process Lines - Sour Waters**

**Plant Location:** Newman, KS

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**Flow Conditions**

- **Area Unit:** A
- **Unit:** Area
- **Flow Rate:** HR/t/hr
- **Pressure:** PSI
- **Temperature:** °F
- **Drop:** FT

**Remarks:**

- **Revision:**
- **Date:** 1/10/89
- **Approved by:**
- **Date:**

**Notes:**

- **Contract No.:** 21-2548
- **Area No.:** 16
- **Ref. No.:** 00-16-05006
- **Sheet No.:** 6 of 20
# Process Lines - Sour Gases

**Client:** ICRC  
**Project:** 6000 T/D SRC-I Demonstration Plant  
**Location:** Newman, Kentucky

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**Notes:**
- All pipes are capped, unless otherwise noted.
- Flow rates and temperatures are approximate.

**Prepared by:** 
**Approved by:** 
**Revision History:**
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**Remarks:**
- UNLESS OTHERWISE NOTED, ALL PIPES ARE C.S.
- AREA/UNIT = 0.100
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*Unless otherwise noted, all pipes are C.S.*
## Line Calculations

**Summary Sheet: Lines**

### Coker/Calciner Liquid Effluents

**Plant Location:** Newman, Kentucky

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### Flow Conditions

- **Flow:** [Flow Rate]
- **GPM:** [Gallons Per Minute]
- **Temp:** [Temperature]
- **LB/FT:** [Pounds Per Foot]
- **NPSH:** [Net Positive Suction Head]
- **Surface Tension:** [Surface Tension]
- **PSI:** [Pounds Per Square Inch]
- **Ft:** [Foot]
- **Equivalent Length:** [Equivalent Length]
- **Remarks:** [Remarks]

---

**Prepared By:** [Name]
**Date:** [Date]
**Approved By:** [Name]
**Date:** [Date]

---

**Details:**

- **Velocity:** [Velocity]
- **Pressure Drop:** [Pressure Drop]
- **Equivalent Length:** [Equivalent Length]

---

**Notes:**

- All pipes are C.S. unless otherwise noted.
**PROCESS LINES - OXYGEN**

**PLANT LOCATION:** NEWMAN, KENTUCKY

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**SUMMARY SHEET**

**REFERENCE:** REA-D-00-16-05011

**CONTACT NO.:** 212-254-848

**AREA NO.:** 10

**SHEET:** 11 of 20

---

**PREPARED BY:** [Signature]

**DATE:** 1/20/93

**APPROVED BY:** [Signature]

**DATE:** 1/20/93

**REMARKS:**

- UNLESS OTHERWISE NOTED, ALL PIPES ARE C.S.
- (1) lb (in.2)/ft, lb
- (2) dyn/cm
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**Remarks:**

- All lb in mass/ft. nw.
- 3 PLASTIC LINED
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**Remarks:**
- Unless otherwise noted, all pipes are C.S.
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**PLANT LOCATION:** NEWMAN, KENTUCKY

**LINE CALCULATIONS SUMMARY SHEET**

**REMARKS:**
- "UNLESS OTHERWISE NOTED, ALL PIPE ARE C/S" (10 LB. MAX/FT-M)
- "BY CONVEYOR/TRUCK" (13)
- "PLASTIC LINED" (14)
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**PLANT LOCATION:** NEWMAN, KENTUCKY

**LINE NO.:** 21-2568

**AREA NO.:** 00-16-05019

**SHEET:** 19 of 20

**PROJECT:** 6000 T/D SRC-1 DEMONSTRATION PLANT

**EVENT:** ICSC

**CONTACT:** Rust International Corporation

**CONTRACTOR:** ICSC

**ROW CONDITION:** 4 FROM 4000 T/D SRC-1 DEMONSTRATION PLANT

**FLOW CONDITIONS:**
- LB/MM: LIQUID
- LPC: PRESS.
- FT/SEC: TEMP
- PS/100 FT: LB/MM
- INCH: PRESS.
- FT/SEC: VELOCITY
- PS/100 FT: PRESS.

**NOTE:** UNLESS OTHERWISE NOTED, ALL FIGURES ARE C.S.
### Process Lines - Miscellaneous Waste Streams

**Line Calculations Summary Sheet**

**Process Lines: Newman, Kentucky**

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**Remarks:** All pipes are 5" unless otherwise noted.
2.3.3 Layout Drawings

The following layout drawings are included after this page.

00-16-400010 Plot Plan, Bridge Piping Layout (Sheet 1)
00-16-400020 Plot Plan, Bridge Piping Layout (Sheet 2)
00-16-400030 Plot Plan, Bridge Piping Sections (Sheet 3)
00-16-100040 Sewer System Layout
2.4 UTILITY SYSTEMS INTEGRATION

2.4.1 Instrumentation Requirements

2.4.1.1 The instrumentation and control system for the utilities and offsites of the SRC plant will be designed for extensive use of remote control systems which will be provided for all of the essential functions required for start-up, shutdown, selection of alternates, flow routes, operation of inter-related systems, removal of problem equipment from service, placing spares into operation, and other operator activity that would otherwise require frequent trips to equipment items for local control.

2.4.1.2 The control system will utilize up-to-date state of the art techniques with special emphasis on operator interface. Micro-processor based control will be utilized with the analog loops arranged to permit relative ease of interface with the controllers. For most applications, the use of digital control will be supervisory set-point control.

2.4.1.3 Pneumatic instrumentation will be considered for application where environment prevents the use of electronic instruments. Otherwise pneumatic instrumentation will not be used, or will be limited to applicable areas.

2.4.1.4 Electronic loops for all areas will have 4-20 milliamp dc signals, or as stated in the general engineering specification.