Babcock and Wilcox Co.

PENGAD-Bayonne,N.J.
PLAINTIFF'S EXHIBIT
EXX-172

530390

BID TABULATION

PAGE 1 OF 1

TITLE: OBLA Furnace Modifications - Convection Section Arch.

APPROPRIATION NO: 8144

SPECIFICATION NO: CE-1824

SUPPLIER		CE-1804		CE-1824				
MANUFACTURER		Bigelow-Liptak		Babcock-Wilcox				
BASE COST		30,680 ✓		26,872.46 ✓				
ADDERS				5741.60	(for type 310 ss. hanger rods)			
TOTAL		30,680		32,614.06				
DELIVERY		8-10 wks		6-8 wks.				
NOTES -	(1) B-W has lower cold face design temperature; 180°F vs. 200F for BL.							
	(2) B-W roof system weighs approx. 12,000 lb. vs. 35,600 lb. for BL. Installation savings will be appreciable for the lightweight system.							
	(3) Stainless steel hangers and rods included in B-W quotation will be purchased locally, resulting in a lower cost for this alternate.							
LESS (cost of hangers)		— ?		10,742.40				
PLUS (additional Kaowool)		—		~~16,000.00~~ ~~326.00~~ 330.60				
TOTAL ORDER		30,680 - ?		~~16,406.60~~ 16,410.66				

RECOMMENDATION: Babcock-Wilcox based on the above comments.

ESTIMATED COST	QUOTED COST	NOTED BY	PREPARED BY	DATE
none	16,406.66	DCS.	HC Smith	July 12, 1972

530080

PURCHASING INFORMATION REQUEST

DATE April 28, 1972

SUBJECT QBLA Furnace Modification Project

Convection Section Roof

TO PURCHASING DEPARTMENT FROM Project Development DEPARTMENT BY R. C. Anderson

PLEASE CONTACT

☐ SUPPLIERS ☐ MANUFACTURERS

☐ FABRICATORS ☐ THE FOLLOWING FIRMS & ANY OTHERS YOU MAY WISH TO INCLUDE

Babcock & Wilcox

PLEASE OBTAIN THE FOLLOWING INFORMATION BY ☐ REGULAR MAIL ☐ AIRMAIL ☐ WIRE ☐ PHONE

☐ QUOTATIONS FOR TOTAL QUANTITY

☐ QUOTATIONS FOR INDIVIDUAL ITEMS

☐ PRICE LISTS

☐ OTHER

☐ DELIVERY DATE IN REFINERY FROM DATE OF ORDER

☐ DESCRIPTIVE LITERATURE

☐ DIMENSIONED DRAWINGS

(AVAILABLE SIZES, MATERIAL SPECIFICATIONS, ALLOWABLE WORKING CONDITIONS, ETC.)

FOR FURNISHING THE FOLLOWING ITEMS OR MATERIAL (QUANTITY, DESCRIPTION, SPECIFICATIONS, ATTACHED DRAWINGS, NPA RATINGS, ETC.)

Please request a quotation from Babcock & Wilcox for a refractory brick furnace arch as described in the attached specification CE-1829 (three copies attached).

Materials shall be quoted on a quantity basis and on an individual price basis for spare parts cost evaluation.

The vendor is requested to define the extent and limits of the engineering and drawing work offered.

Proposals shall include the complete specifications (ASTM reference and manufacturer's data) for all materials offered and shall include heat transfer calculations noted in this specification.

Bids are requested by May 19, 1972.

PLEASE SEND THIS INFORMATION TO THE DEPARTMENT FOR REVIEW.

cc: DCA, SGT

QBLA FURNACE MODIFICATION PROJECT

Convection Section Roof

1. This specification covers the materials and engineering for the replacement of five convection section roofs in the QBLA steam cracking furnaces of Enjay Chemical Company, Baton Rouge, Louisiana.

2. Drawings and reference sketches are attached for use in preparing the roof design and support.

   CE-1804-1 - Existing Steel Plan
   CE-1804-2 - Existing Arch Sections
   CE-1804-3 - Existing Steel Elevations
   CE-1804-4a - New Convection Section Tube Layout
   CE-1804-4b - New Convection Section Corbelling Detail
   CE-1804-5 - Convection Section Hot Face Design Temp.

3. Roof replacement involves designing the new system within the framework of existing steel members.

4. An insulating cover shall be provided over the brick consisting of a layer of castable and a layer of insulation block sufficient to provide a cold side surface temperature of 180°F and provide a seal against air infiltration. Heat loss calculations shall be submitted for approval with the bid.

5. Hanger metal tip temperatures shall be determined from the hot face design temperatures shown on Sketch CE-1804-5. Heat transfer calculations shall be submitted with the bid.

   Based on the hanger metal tip temperatures, materials shall be selected as follows:

Maximum Allowable Tip Temperature °F	Material
850	Carbon Steel
1450	18-8 Chrome Nickel
Above 1450	25-20 Chrome Nickel

6. Firebrick shall be rated at 2300°F.

7. All drawings, data and correspondence of an engineering nature shall be forwarded to Requisition Section, Room 4057, Mechanical Engineering Department, Enjay Chemical Company, P. O. Box 241. A copy of cover letters forwarding this information should be sent to Owner's Purchasing Department, P. O. Box 481, Baton Rouge, Louisiana, 70821.

PROPOSAL

BIGELOW-LIPTAK CORPORATION

HEAT ENCLOSURES

21201 CIVIC CENTER DRIVE
SOUTHFIELD, MICHIGAN 48075

TO ENJAY CHEMICAL COMPANY

OF BATON ROUGE, LOUISIANA

FOR SAME

Date February 15, 1972

PROPOSAL NO. PA-3132-A

Attn: Mr. R. Androbus

Bigelow-Liptak Corporation, hereinafter designated as the Company, hereby proposes to furnish the materials and/or services specified on the following pages, f. o. b. points of shipment with freight allowed to Baton Rouge, La. based on the most economical routing and method of transportation,

for installation in or in connection with Five Suspended Arches

and in accordance with the preliminary drawing (s) Enjay Sketch SK-8049-4 and Bigelow-Liptak Typical Tile & Casting Detail Sheets

and the final drawings to be submitted by the Company and approved by the Purchaser.

CONDITIONS OF CONTRACT

If this proposal becomes an effective agreement as hereinafter provided, the Company shall cause the materials to be shipped within 8-10 weeks after the Purchaser furnishes complete data for and approves the final drawings and furnishes shipping instructions: Provided, however, that the Company shall not be liable for delays due to circumstances or acts beyond its control including, without limiting the generality of the foregoing, accident, strike or other labor troubles or disputes, flood, fire, war, civil commotion, lack of or inability to obtain labor or materials, embargo, delays in transportation, or federal, state or local action, requirements, regulations or restrictions. The materials may be shipped from different points and in separate allotments, and each shipment shall constitute a separate transaction with respect to the terms of payment specified herein. If the Purchaser delays shipments for more than sixty (60) days after notification that the Company is ready to proceed therewith, fifty per cent (50%) of the entire contract price shall immediately become due and payable. If the Purchaser delays shipments for more than thirty (30) days after any materials are ready for shipment under a schedule previously approved by the Purchaser, the entire balance of the contract price shall immediately become due and payable. If the Purchaser defaults in making payment as provided herein, the Company may, at its option, withhold further shipments until the default has been remedied.

Includes five complete sets of 8" suspended arch construction with 4" projections as shown on Enjay sketch SK-8049-4. Arch construction to be constructed of Bigelow-Liptak first quality special refractory shapes, support castings in the grade of metal as shown on the above-mentioned sketch, carbon steel hooks and pipe.

Further included is necessary 1900 deg F block insulation to apply a 3½" layer over the entire arch.

This item does not include any structural supporting steel for the arch construction.

Estimated Weight of Refractories	142,800 lbs.
Estimated Weight of Metallics	7,900 lbs.
Estimated Weight of Insulation	9,700 lbs.

PRICE: Materials only - $34,000
THIRTY FOUR THOUSAND DOLLARS

PROPOSAL

BIGELOW-LIPTAK CORPORATION

HEAT ENCLOSURES

21201 CIVIC CENTER DRIVE
SOUTHFIELD, MICHIGAN 48075

Date March 27, 1972

TO ENJAY CHEMICAL COMPANY

OF BATON ROUGE, LOUISIANA

PROPOSAL NO. PA-3132-A-1

FOR SAME

Attn: Mr. J. A. Poche, Buyer
QBLA Furnace Modification

Bigelow-Liptak Corporation, hereinafter designated as the Company, hereby proposes to furnish the materials and/or services specified on the following pages, f. o. b. points of shipment with freight allowed to Baton Rouge, La. based on the most economical routing and method of transportation,

for installation in or in connection with QBLA Furnace Modification Project Convection Section Roof - File C

and in accordance with the preliminary drawing (s) As Listed on Specification CE-1804 sheet 1

and the final drawings to be submitted by the Company and approved by the Purchaser.

CONDITIONS OF CONTRACT

If this proposal becomes an effective agreement as hereinafter provided, the Company shall cause the materials to be shipped within 8-10 weeks after the Purchaser furnishes complete data for and approves the final drawings and furnishes shipping instructions: Provided, however, that the Company shall not be liable for delays due to circumstances or acts beyond its control including, without limiting the generality of the foregoing, accident, strike or other labor troubles or disputes, flood, fire, war, civil commotion, lack of or inability to obtain labor or materials, embargo, delays in transportation, or federal, state or local action, requirements, regulations or restrictions. The materials may be shipped from different points and in separate allotments, and each shipment shall constitute a separate transaction with respect to the terms of payment specified herein. If the Purchaser delays shipments for more than sixty (60) days after notification that the Company is ready to proceed therewith, fifty per cent (50%) of the entire contract price shall immediately become due and payable. If the Purchaser delays shipments for more than thirty (30) days after any materials are ready for shipment under a schedule previously approved by the Purchaser, the entire balance of the contract price shall immediately become due and payable. If the Purchaser defaults in making payment as provided herein, the Company may, at its option, withhold further shipments until the default has been remedied.

ITEM I - MATERIAL

Includes necessary tile and castings to construct five convection arches as shown on Enjay Sketch CE-1804-4A. Construction to consist of Bigelow-Liptak special refractory shapes, first quality material, alloy supporting hangers, carbon steel hooks and pipe. The arch hangers will be manufactured of 310 (25-20 chrome-nickel) alloy in the areas from the hot end through tube #10, and in 304 (18-8 chrome-nickel) alloy from tube #10 through the cool end.

Further included is necessary insulation over the entire arch construction consisting of 4" of MTB block (multiple thermal barrier) consisting of 3½" of 1900 deg F block insulation and 1/2" of 2200 deg F ceramic board from the hot zone through tube #6; 3" of 1900 deg F block insulation from tube #6 through tube #12, and 2" of 1900 deg F block insulation from tube #12 through the cool end.

Above quotation does not include any structural supporting steel for the arch construction.

PRICE: ITEM I - $30,680

NOTE: The above price takes into account that three areas 5'-6" x 10'-0" each, in the northeast end of the convection zone, will not be replaced.

Estimated Weight of Refractories	123,000 lbs.
Estimated Weight of Metallics	10,500 lbs.
Estimated Weight of Insulation	8,000 lbs.

For your convenience, we wish to list the following repair prices for the specialty items in the abovementioned arches:

8" Tile Shape - First Quality	$2.06 ea.
12" " "	3.10 ea.
304 Alloy two-tile Hangers	4.40 ea.
304 Alloy three-tile Hangers	5.00 ea.
310 Alloy two-tile Hangers	5.30 ea.
310 Alloy three-tile Hangers	5.90 ea.
Carbon Steel Hooks	.90 ea.

The above prices are FOB shipping points.

QBLA FURNACE MODIFICATION PROJECT

Convection Section Roof

1. This specification covers the materials and engineering for the replacement of five convection section roofs in the QBLA steam cracking furnaces of Enjay Chemical Company, Baton Rouge, Louisiana.

2. Drawings and reference sketches are attached for use in preparing the roof design and support.

   CE-1804-1 - Existing Steel Plan
   CE-1804-2 - Existing Arch Sections
   CE-1804-3 - Existing Steel Elevations
   CE-1804-4a - New Convection Section Tube Layout
   CE-1804-4b - New Convection Section Corbelling Detail
   CE-1804-5 - Convection Section Hot Face Design Temp.

3. Roof replacement involves designing the new system within the framework of existing steel members.

4. An insulating cover shall be provided over the brick consisting of a layer of castable and a layer of insulation block sufficient to provide a cold side surface temperature of 180°F and provide a seal against air infiltration. Heat loss calculations shall be submitted for approval with the bid.

5. Hanger metal tip temperatures shall be determined from the hot face design temperatures shown on Sketch CE-1804-5. Heat transfer calculations shall be submitted with the bid.

   Based on the hanger metal tip temperatures, materials shall be selected as follows:

Maximum Allowable Tip Temperature °F	Material
850	Carbon Steel
1450	18-8 Chrome Nickel
Above 1450	25-20 Chrome Nickel

6. Firebrick shall be rated at 2300°F.

7. All drawings, data and correspondence of an engineering nature shall be forwarded to Requisition Section, Room 4057, Mechanical Engineering Department, Enjay Chemical Company, P. O. Box 241. A copy of cover letters forwarding this information should be sent to Owner's Purchasing Department, P. O. Box 481, Baton Rouge, Louisiana, 70821.



ETT0000603

All information sent to Enjay or Humble shall be identified with the following data in the order given below. Each sheet of drawings and data or the cover or title page of bound manuals shall be identified separately. Drawings shall be white background with blue or black lines suitable for 35 MM microfilming.

Order No. - (As noted on face of order)

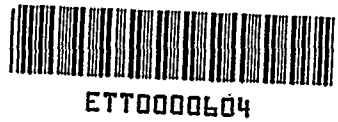
Appropriation - 8144

Job Title - QBLA Furnace Modifications

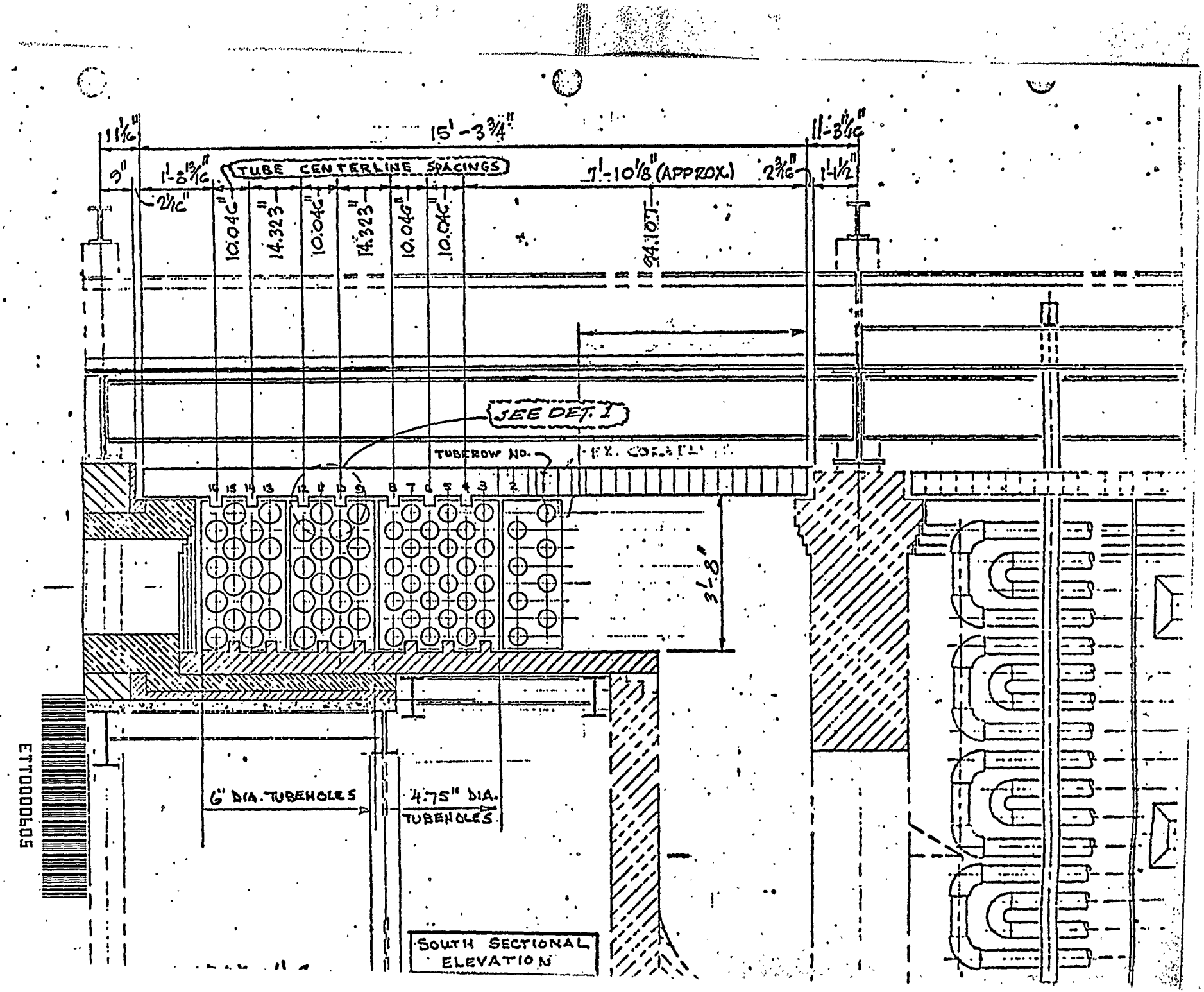
Equipment Item Nos. - F-17A, F-17B, F-18A, F-18B, F-19A

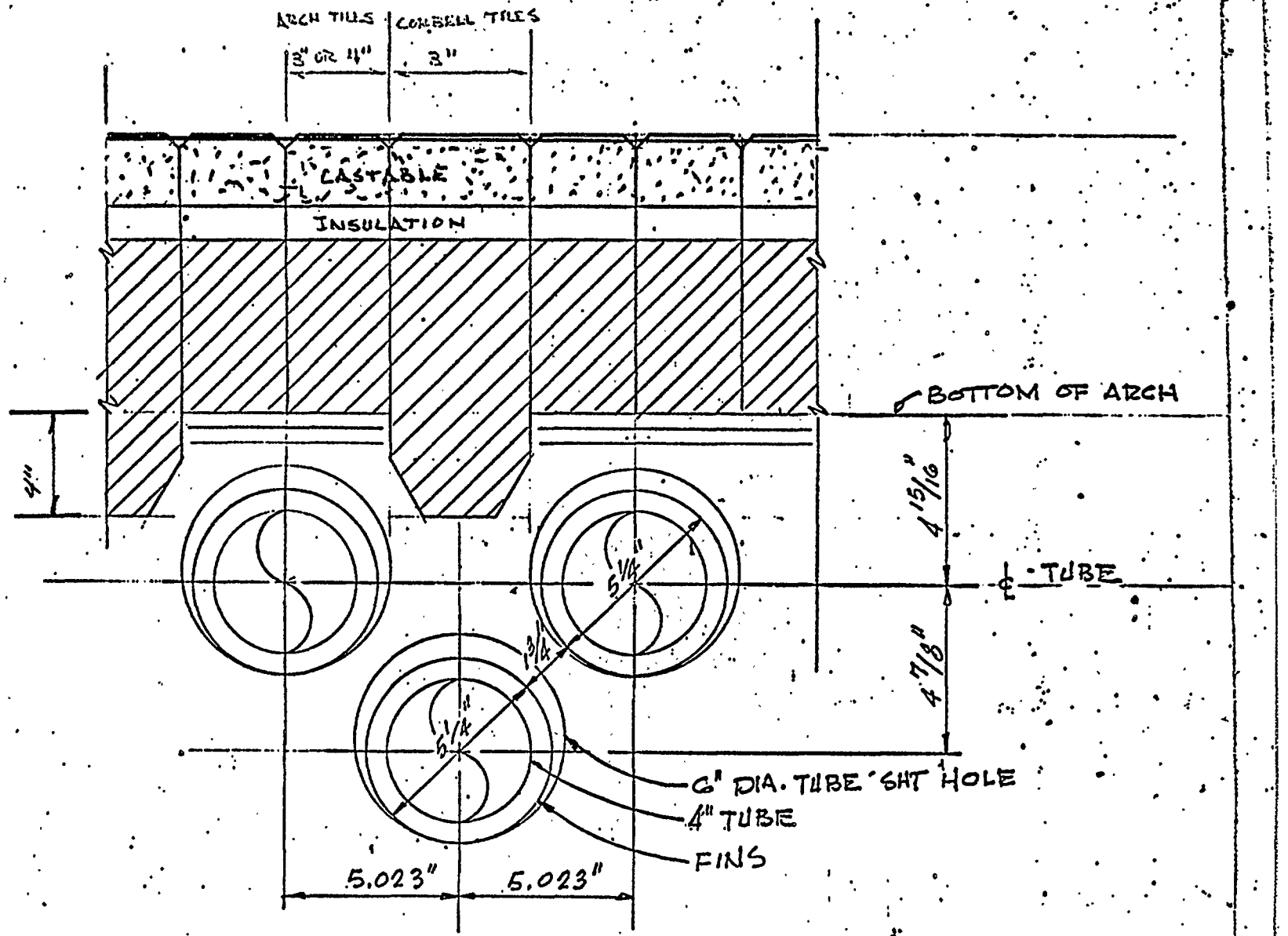
The following quantities of information are required, as indicated:

No. of Copies	Description	Schedule - Days
12	Certified Outline Drawings for approval, including piece details	14 from receipt of order
12	Final Certified Drawings	14 from receipt of approval
6	Parts Lists, including pattern numbers, price and delivery	Promptly after receipt of drawing approval



ETT0000604


11 1/16"
15'-3 3/4"
11'-3 11/16"
9"
1'-0 13/16"
TUBE CENTERLINE SPACINGS
7'-10 1/8" (APPROX.)
2 3/16"
1'-1 1/2"
2 1/16"
10.046"
14.323"
10.046"
14.323"
10.046"
10.046"
94.107"
SEE DET. 1
TUBEROW NO.
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
3'-8"
6" DIA. TUBEHOLES
4.75" DIA. TUBEHOLES
SOUTH SECTIONAL ELEVATION
ETT000605

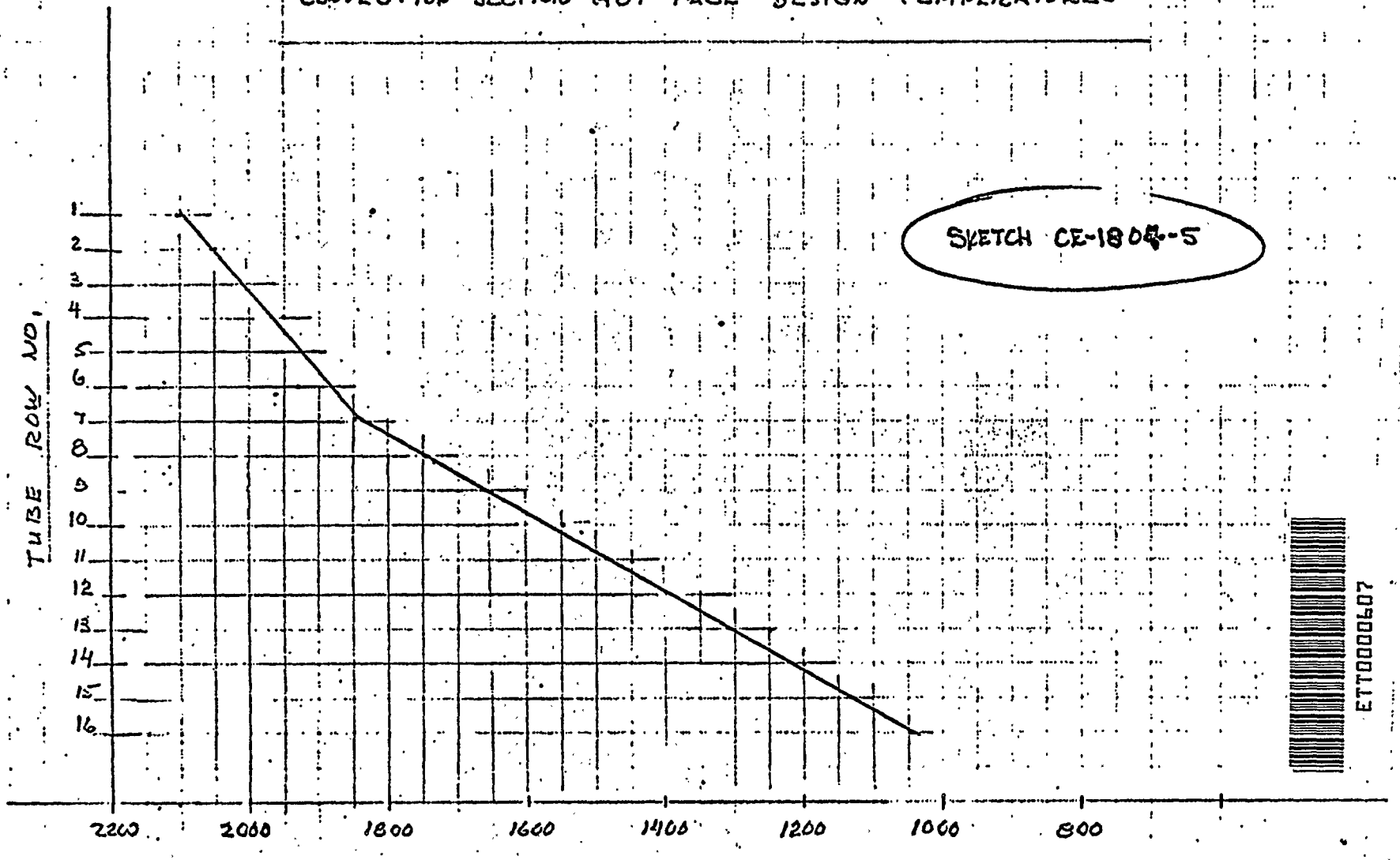


DETAIL "I"

3" = 1'-0"

ET0000608

CONVECTION SECTION HOT FACE DESIGN TEMPERATURES



ETT0000607

QBLA FURNACE MODIFICATION PROJECT

Convection Section Roof

1. This specification covers the materials and engineering for the replacement of five convection section roofs in the QBLA steam cracking furnaces of Enjay Chemical Company, Baton Rouge, Louisiana.

2. Drawings and reference sketches are attached for use in preparing the roof design and support.

   CE-1804-1 - Existing Steel Plan
   CE-1804-2 - Existing Arch Sections
   CE-1804-3 - Existing Steel Elevations
   CE-1804-4a - New Convection Section Tube Layout
   CE-1804-4b - New Convection Section Corbelling Detail.
   CE-1804-5 - Convection Section Hot Face Design Temp.
   CE-1804-6 - Existing Tile Hangers

3. Roof replacement involves designing the new system within the framework of existing steel members. Tiles shall be the same pattern as the existing members which are used in the radiant section of the furnaces, except as required for spacing and corbelling.

4. Tile hangers shall be the "tee" style hanger as presently installed in the radiant arch. These hangers are pattern No. 4498 (three tiles) and 4499 (two tiles) as shown on the enclosed drawing.

5. An insulating cover shall be provided over the tile consisting of a layer of castable and a layer of insulation block sufficient to provide a cold side surface temperature of 200°F. Heat loss calculations shall be submitted for approval with the bid.

6. Tile hanger metal tip temperatures shall be determined from the hot face design temperatures shown on Sketch CE-1804-5. Heat transfer calculations shall be submitted with the bid.

   Based on the hanger metal tip temperatures, materials shall be selected as follows:

Maximum Allowable Tip Temperature °F.	Material
850	Carbon Steel
1450	18-8 Chrome Nickel
Above 1450	25-20 Chrome Nickel

7. A portion of three of the five convection roofs has been repaired, consisting of an area measuring 5'6" x 10'0" in the northeast quadrant of the roof. This area will not require rebuilding.

8. All drawings, data and correspondence of an engineering nature shall be forwarded to Requisition Section, Room 4057, Mechanical Engineering Dept., Enjay Chemical Co., P. O. Box 241. A copy of cover letters forwarding this information should be sent to Owner's Purchasing Department, P. O. Box 481, Baton Rouge, La. 70821.



ETT0000612

All information sent to Enjay or Humble shall be identified with the following data in the order given below. Each sheet of drawings and data or the cover or title page of bound manuals shall be identified separately. Drawings shall be white background with blue or black lines suitable for 35 MM microfilming.

Order No. - (As noted on face of order)

Appropriation - 8144

Job Title - QBLA Furnace Modifications

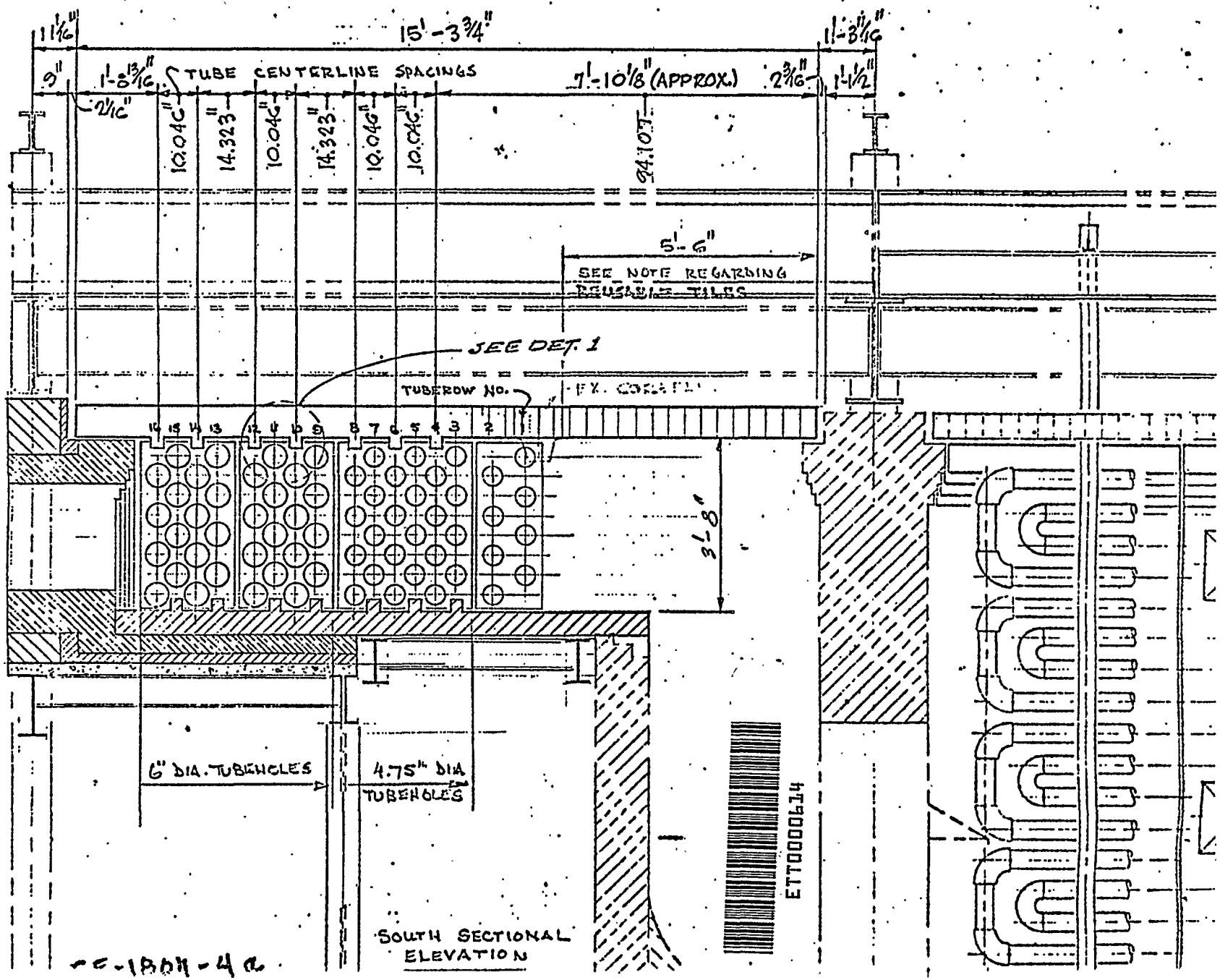
Equipment Item Nos. - F-17A, F-17B, F-18A, F-18B, F-19A

The following quantities of information are required, as indicated:

No. of Copies	Description	Schedule - Days
6	Certified Outline Drawings for approval, including piece details	14 from receipt of order
6	Final Certified Drawings	14 from receipt of approval
6	Parts Lists, including pattern numbers, price and delivery	Promptly after receipt of drawing approval

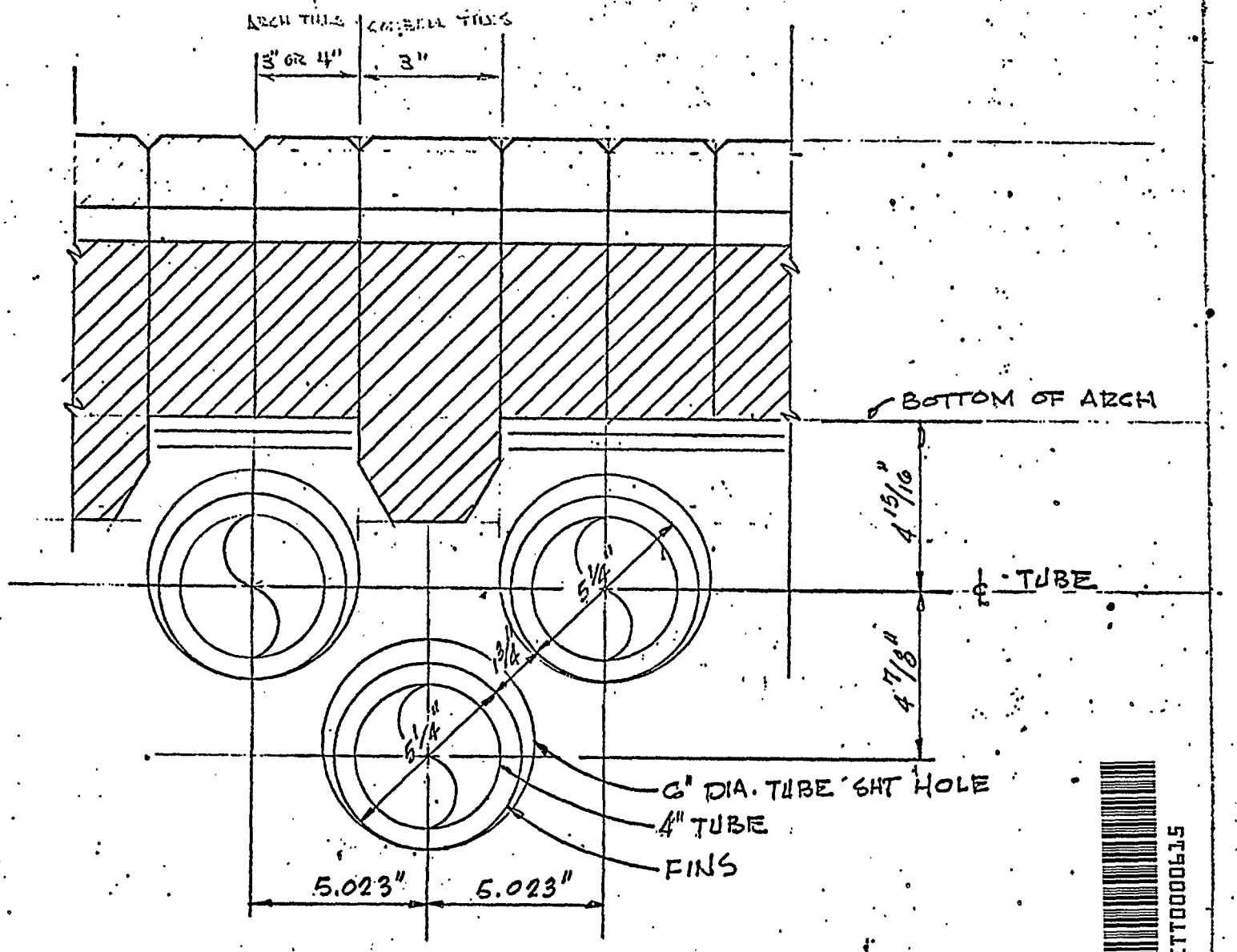


ETT0000613



15'-3 3/4"
1 1/16"
1'-3 11/16"
9"
1'-8 13/16"
TUBE CENTERLINE SPACINGS
7'-10 1/8" (APPROX.)
2 3/16"
1'-1 1/2"
2 1/16"
10.046"
14.323"
10.046"
14.323"
10.046"
10.046"
94.107
5'-6"
SEE NOTE REGARDING
SEE DET. 1
TUBEROW NO.
3'-8"
6" DIA. TUBEHOLES
4.75" DIA TUBEHOLES
SOUTH SECTIONAL ELEVATION

ETT0000614



DETAIL "1"

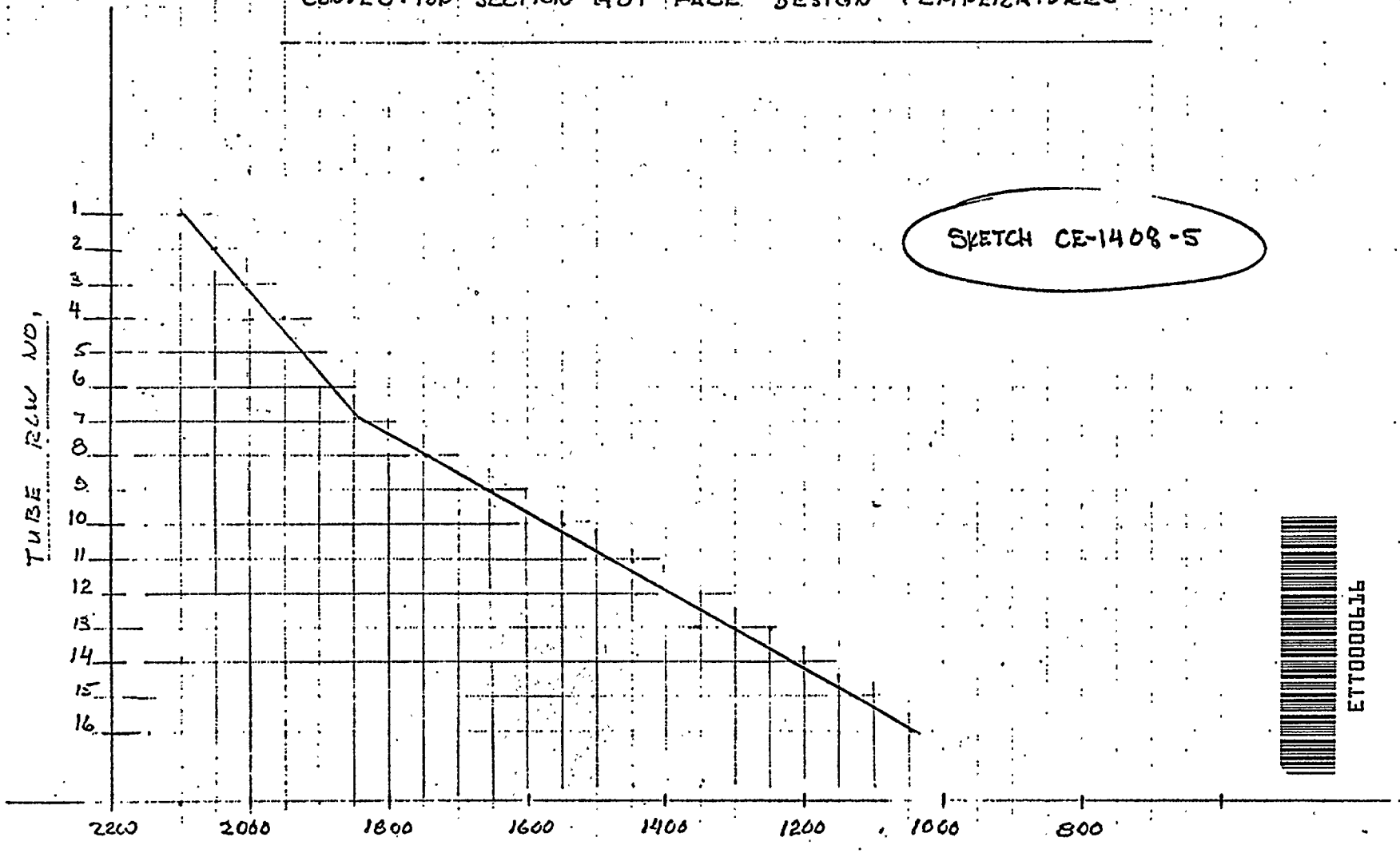
3" = 1'-0"

1 CE-1804 b

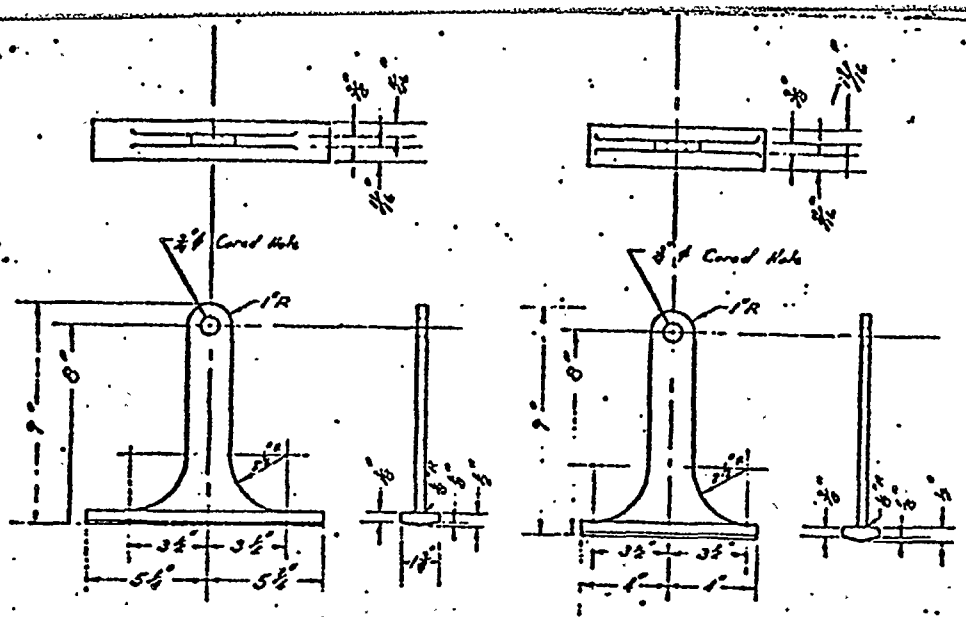
ETT0000615

CONVECTION SECTION HOT FACE DESIGN TEMPERATURES

SKETCH CE-1408-5



ETT0000616



Pattern 4498

Pattern 4499

(Material - 25-12 Cr. Ni Existing Only)

CE-1408-6

FABRICATION BY: ☐ G.G.C. DEPT. ☒ OTHERS

DIRECTION BY: ☒ G.G.C. DEPT. ☐ OTHERS

No 3 Steam Cracking Unit

Detail of Furnace Floor

Brick Hangers

ESSO STANDARD OIL C

LOUISIANA DIVISION

MECHANICAL ENGINEERING DEPARTME

BATON ROUGE LA

DISTRIBUTION

NAME	DATE

2603560002654

2509 | 1-1 | 23

ETT0000617

BID TABULATION

TITLE: OBLA Furnace Modifications - Convection Section Arch.

APPROPRIATION NO. 8144

SPECIFICATION NO. CE-1824

SUPPLIER		CE-1804		CE-1824				
MANUFACTURER		BIGELOW-LIPTAK		BABCOCK-W ILCOX				
BASE COST		30,680 ✓		26,872.46 ✓				
ADDERS				5741.60	(for type 310 SS. hanger rods)			
TOTAL		30,680		32,614.06				
DELIVERY		8-10 wks		6-8 wks.				

NOTES:

(1) B-W has lower cold face design temperature; 180°F vs. 200F for BL.

(2) B-W roof system weighs approx. 12,000 lb. vs. 35,000 lb. for BL. Installation savings will be appreciable for the lightweight system.

(3) Stainless steel hangers and rods included in B-W quotation will be purchased locally, resulting in a lower cost for this alternate.

LESS (cost of hangers)		— ?		10,792.40				
PLUS (additional Kaowool)		—		~~160.00~~ ~~326.00~~ 330.60				
TOTAL ORDER		30,680 - ?		~~16,406.66~~ 16,410.66				

RECOMMENDATION: Babcock-Wilcox based on the above comments.

ESTIMATED COST	QUOTED COST OK	NOTED BY	PREPARED BY	DATE
none	16,406.66	WCS.	WC Smith	July 12, 1972.

Contract Summary & Preliminary Bid Tabulation

Project Title QBLA Furnace Modif. Project Convection Section Roof

	Date		
Inquiry Mailed	5/2/72	Spec. No.	CE-1829
Bid Due Date	5/19/72	Contract No.	
Date Awarded		Authorization No.	
		Buyer	C
		Engineer	DCAntrobus

Estimated Cost $ or Manhours _____

Initial Contract Price _____

Awarded Lump Sum TO: _____

Awarded Cost Plus TO: _____

REMARKS:

Contractors Bidding	Amount
1. Babcock & Wilcox Co.	
2.	
3.	
4.	
5.	
6.	
7.	

Signed _____ Date _____

" _____

Sub Contractors Proposed by Low Bidder

1. Electrical _____
2. Painting _____
3. Insulation _____
4. Foundations _____
5. Other _____

ETT0000619

PURCHASING FILE
CSP [illegible]

May 2, 1972

QBLA Furnace Modification
Project Convection Section
Roof - File C

a/q - about 6/2 inquiry cost

Babcock & Wilcox Company
Refractories Division
Box 923
Augusta, Georgia 30903
ATTN: MR. ON ON

Gentlemen:

Please let us have price and time required to effect delivery for your furnishing material and engineering for a suspended tile furnace arch, as described in our attached Specification CE-1829.

Materials should be quoted on a quantity basis and on an individual price basis for spare parts cost evaluation. You are requested to define the extent and limits of the engineering and drawing work offered.

Also, your proposal is to include the complete specifications (ASTM reference and manufacturer's data) for all materials offered, and shall include heat transfer calculations noted in this specification.

Your proposal is requested by May 19, 1972, in the attached "sealed bid" envelope.

Yours very truly,

J. A. POCHE
Buyer

JAP:EL
Attachments

bcc: Mr. D. C. Antrobus



ETT0000620

530080

PURCHASING INFORMATION REQUEST

DATE April 28, 1972

SUBJECT QBLA Furnace Modification Project

Convection Section Roof

TO **PURCHASING DEPARTMENT** FROM Project Development **DEPARTMENT** BY D.L. Antrobus

PLEASE CONTACT

☐ SUPPLIERS ☐ MANUFACTURERS

☐ FABRICATORS ☐ THE FOLLOWING FIRMS & ANY OTHERS YOU MAY WISH TO INCLUDE

Babcock & Wilcox

PLEASE OBTAIN THE FOLLOWING INFORMATION BY ☐ REGULAR MAIL ☐ AIRMAIL ☐ WIRE ☐ PHONE

☐ QUOTATIONS FOR TOTAL QUANTITY ☐ DELIVERY DATE IN REFINERY FROM DATE OF ORDER

☐ QUOTATIONS FOR INDIVIDUAL ITEMS ☐ DESCRIPTIVE LITERATURE

☐ PRICE LISTS ☐ DIMENSIONED DRAWINGS

☐ OTHER

(AVAILABLE SIZES, MATERIAL SPECIFICATIONS, ALLOWABLE WORKING CONDITIONS, ETC.)

FOR FURNISHING THE FOLLOWING ITEMS OR MATERIAL (QUANTITY, DESCRIPTION, SPECIFICATIONS, ATTACHED DRAWINGS, NPA RATINGS, ETC.)

Please request a quotation from Babcock & Wilcox for a refractory brick furnace arch as described in the attached specification CE-1829 (three copies attached).

Materials shall be quoted on a quantity basis and on an individual price basis for spare parts cost evaluation.

The vendor is requested to define the extent and limits of the engineering and drawing work offered.

Proposals shall include the complete specifications (ASTM reference and manufacturer's data) for all materials offered and shall include heat transfer calculations noted in this specification.

Bids are requested by May 19, 1972.



ETT0000621

PLEASE SEND THIS INFORMATION TO THE **DEPARTMENT FOR REVIEW.**

cc: DCA, SGT

QBLA FURNACE MODIFICATION PROJECT

Convection Section Roof

1. This specification covers the materials and engineering for the replacement of five convection section roofs in the QBLA steam cracking furnaces of Enjay Chemical Company, Baton Rouge, Louisiana.

2. Drawings and reference sketches are attached for use in preparing the roof design and support.

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   CE-1804-2 - Existing Arch Sections
   CE-1804-3 - Existing Steel Elevations
   CE-1804-4a - New Convection Section Tube Layout
   CE-1804-4b - New Convection Section Corbelling Detail
   CE-1804-5 - Convection Section Hot Face Design Temp.

3. Roof replacement involves designing the new system within the framework of existing steel members.

4. An insulating cover shall be provided over the brick consisting of a layer of castable and a layer of insulation block sufficient to provide a cold side surface temperature of 180°F and provide a seal against air infiltration. Heat loss calculations shall be submitted for approval with the bid.

5. Hanger metal tip temperatures shall be determined from the hot face design temperatures shown on Sketch CE-1804-5. Heat transfer calculations shall be submitted with the bid.

   Based on the hanger metal tip temperatures, materials shall be selected as follows:

Maximum Allowable Tip Temperature °F	Material
850	Carbon Steel
1450	18-8 Chrome Nickel
Above 1450	25-20 Chrome Nickel

6. Firebrick shall be rated at 2300°F.

7. All drawings, data and correspondence of an engineering nature shall be forwarded to Requisition Section, Room 4057, Mechanical Engineering Department, Enjay Chemical Company, P. O. Box 241. A copy of cover letters forwarding this information should be sent to Owner's Purchasing Department, P. O. Box 481, Baton Rouge, Louisiana, 70821.



ETT0000622

All information sent to Enjay or Humble shall be identified with the following data in the order given below. Each sheet of drawings and data or the cover or title page of bound manuals shall be identified separately. Drawings shall be white background with blue or black lines suitable for 35 MM microfilming.

Order No. - (As noted on face of order)

Appropriation - 8144

Job Title - QBLA Furnace Modifications

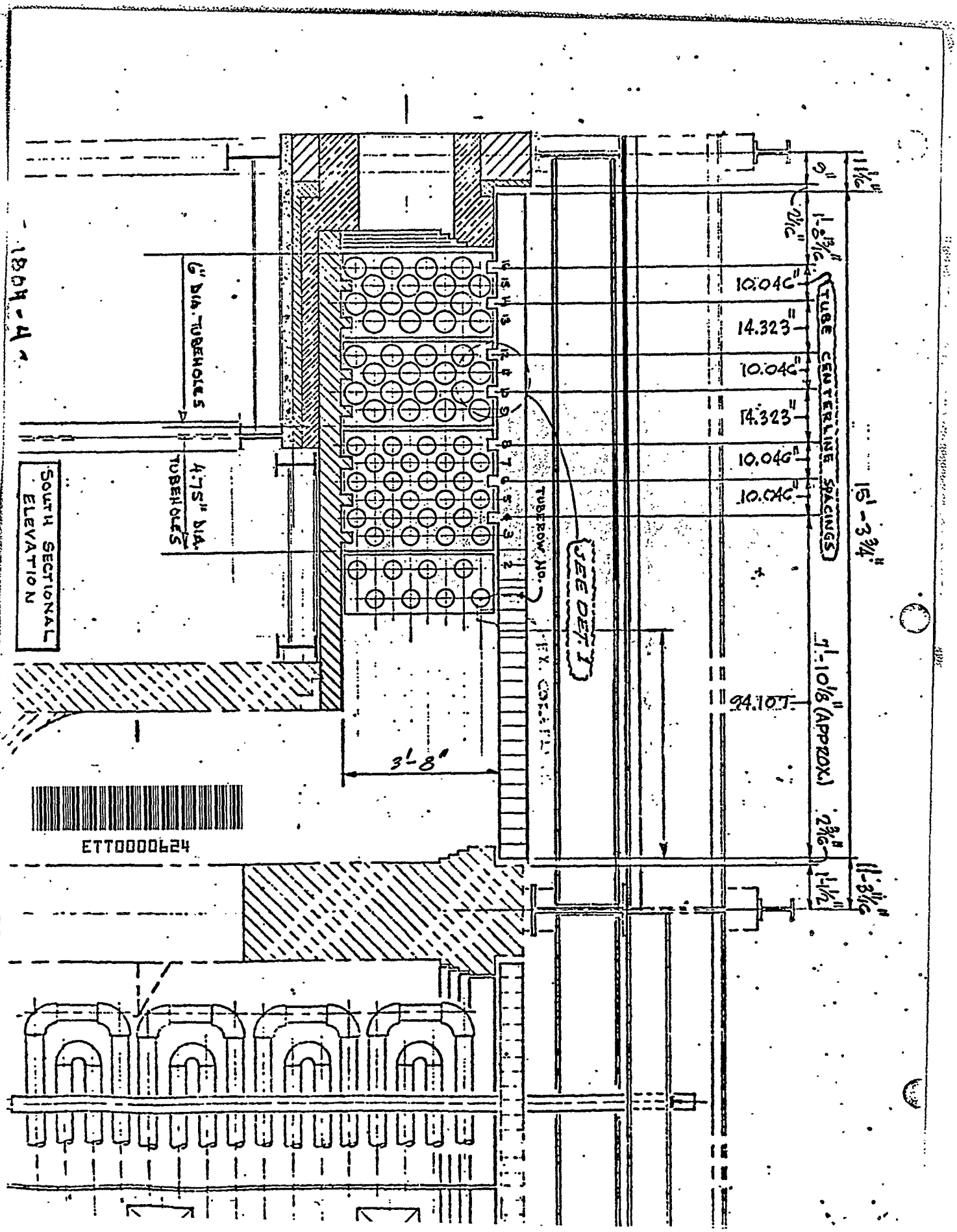
Equipment Item Nos. - F-17A, F-17B, F-18A, F-18B, F-19A

The following quantities of information are required, as indicated:

No. of Copies	Description	Schedule - Days
12	Certified Outline Drawings for approval, including piece details	14 from receipt of order
12	Final Certified Drawings	14 from receipt of approval
6	Parts Lists, including pattern numbers, price and delivery	Promptly after receipt of drawing approval

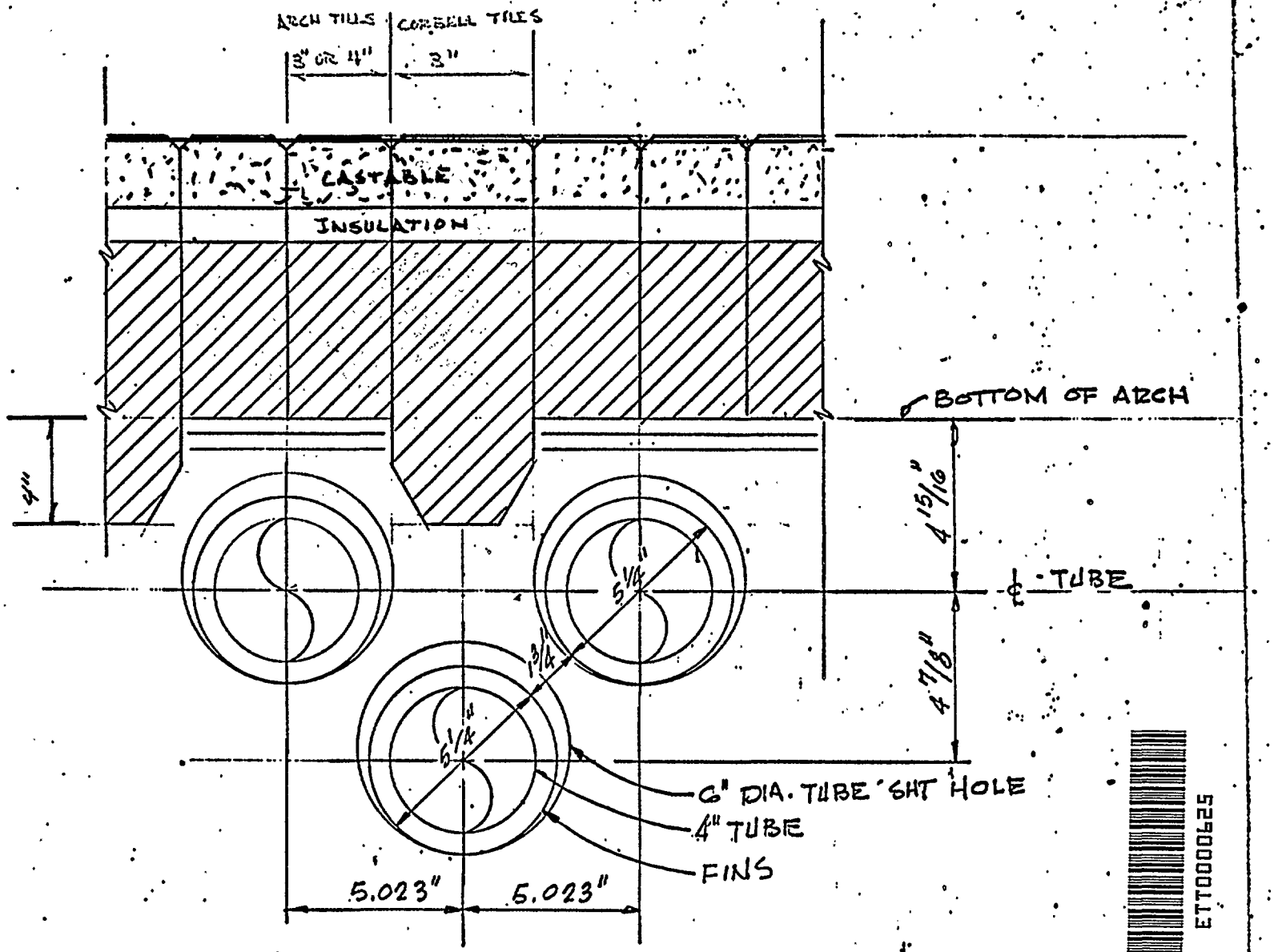


ETT0000623



SOUTH SECTIONAL ELEVATION
6" DIA. TUBEHOLES
4.75" DIA. TUBEHOLES
TUBEROW NO.
SEE DET. I
TUBE CENTERLINE SPACINGS
10.046"
14.323"
10.046"
14.323"
10.046"
10.046"
15'-3 3/4"
7'-10 1/8" (APPROX.)
94.107
3'-8"
11 1/16"
9"
2 1/16"
1'-8 13/16"
2 3/16"
1'-1 1/2"
11'-3 11/16"

ETT0000624



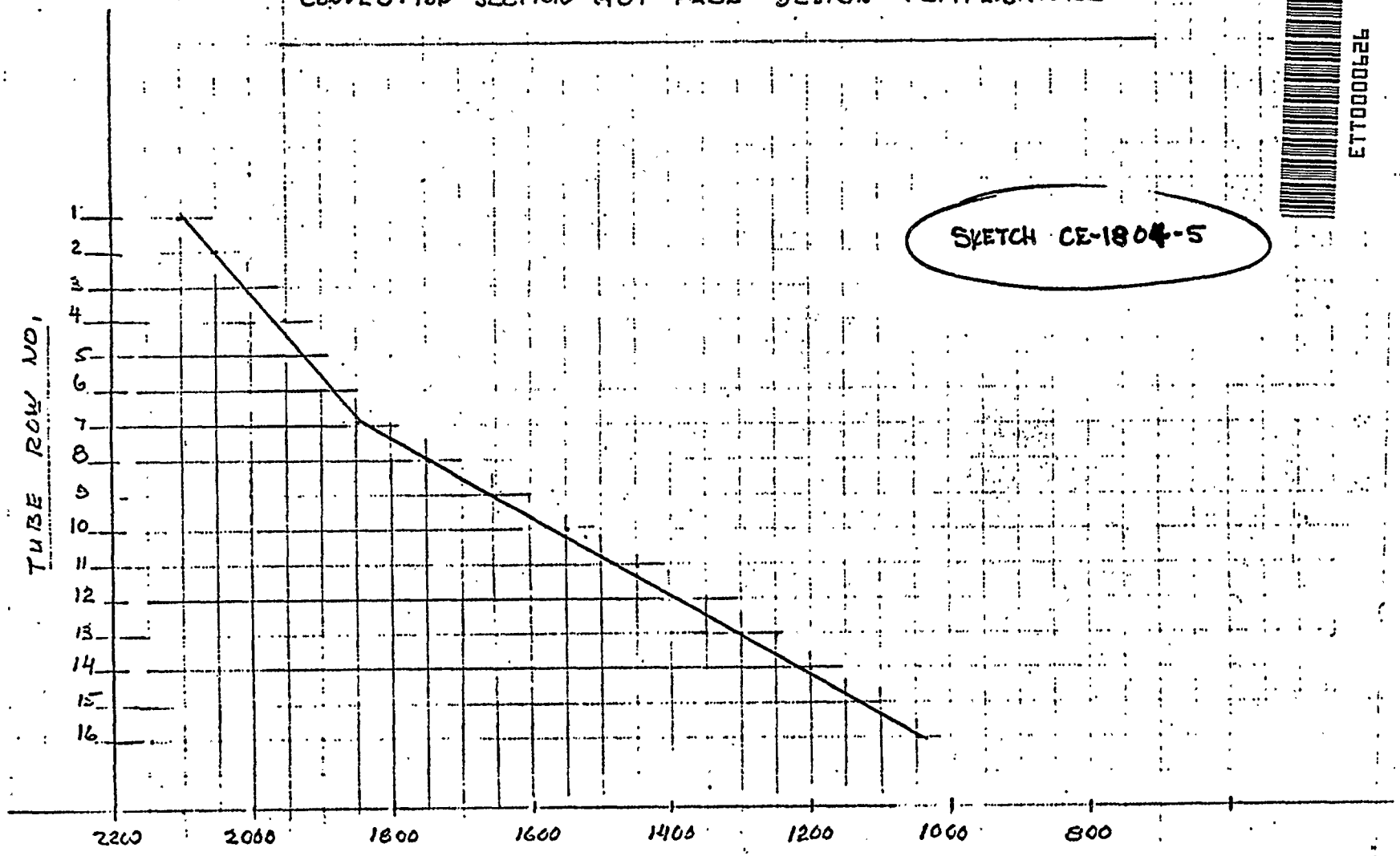
DETAIL 1

3" = 1'-0"

1 CE-1804 4b

ETT0000625

CONVECTION SECTION HOT FACE DESIGN TEMPERATURES



SKETCH CE-1804-5

DESIGN TEMP. °F THROUGH THE INDICATED ROW NUMBER.

ETT0006124

Babcock & Wilcox
Refractories Division

Product Information

2 14 - 1

B&W INSULATING FIREBRICK

AVERAGE PROPERTIES

	K-1620	K-20	K-23	K-26	K-28
Service Temperatures, °F					
Exposed	1600	2000	2300	2600	2800
Backup	2000	2000	2300	2600	2800
Density, Avg. (ASTM C 437-61)					
Lb./9" Straight	1.60	1.70	1.85	2.60	2.70
Lb./Cu. Ft.	27.3	29.1	31.6	44.5	46.2
Melting Point, °F	2700	2750	2750	3100	3190
Thermal Conductivity, BTU, In/Hr F^2 Deg F (ASTM C 182-47)					
Mean Temperature @ 500°F	0.91	0.97	1.07	1.70	1.82
@ 1000°F	1.19	1.25	1.32	2.10	2.16
@ 1500°F	1.49	1.55	1.59	2.71	2.64
@ 2000°F	-	-	1.91	3.43	3.20
@ 2400°F	-	-	-	-	-
Hot Load Strength, % Deformation 10 PSI (Per ASTM C 16-68)					
1½ Hrs. @ 1600°F	0	-	-	-	-
1½ Hrs. @ 2000°F	0	0	-	-	-
1½ Hrs. @ 2200°F	-	-	0.1	0.3	0.3
Permanent Linear Change, %					
Mean Temperature @ 1550°F	0	-	-	-	-
@ 1950°F	-	0	-	-	-
@ 2250°F	-	-	0	-	-
@ 2550°F	-	-	-	-0.2	-
@ 2750°F	-	-	-	-	-0.6
Cold Crushing Strength, PSI (ASTM C 93-67)	90	110	145	195	190
Modulus of Rupture, PSI (ASTM C 93-67)	90	110	150	200	200
Chemical Analysis, % (ASTM C 573-65)					
Alumina Al_2O_3	38.7	39.6	40.1	40.1	46.1
Silica SiO_2	44.1	43.0	43.3	54.6	50.8
Iron Oxide Fe_2O_3	0.5	0.7	0.6	2.4	1.0
Titanium Oxide TiO_2	1.5	1.1	1.1	1.2	1.4
Calcium Oxide CaO	14.9	15.0	14.4	1.5	0.3
Magnesium Oxide MgO	0.1	0.1	0.1	0.1	0.1
Alkalies, As Na_2O	0.2	0.3	0.4	0.4	0.3
Coefficient of Linear Reversible Thermal Expansion, In./In./°F	3.0×10^{-6}	3.0×10^{-6}	3.0×10^{-6}	2.9×10^{-6}	2.9×10^{-6}

Data are average results of control tests conducted under standard procedures and are subject to normal variations. Results should not be used for specification purposes.

B&W INSULATING FIREBRICK

2 14 - 1

AVERAGE PROPERTIES

	K-30	K-3000	Insalcor	Insulpure
Service Temperatures, °F				
Exposed	2900	3000	3250	2800
Backup	2900	3000	3250	2800
Density, Avg. (ASTM C 437-61)				
Lb./9" Straight	3.06	3.25	4.60	2.9
Lb./Cu. Ft.	52.3	55.5	78.7	49.5
Melting Point, °F	3190	3350	3350	3475
Thermal Conductivity, BTU, In/Hr F^2 Deg F (ASTM C 182-47)				
Mean Temperature @ 500°F	2.04	2.13	6.03	2.03
@ 1000°F	2.36	2.37	5.87	2.07
@ 1500°F	2.96	2.83	6.30	2.26
@ 2000°F	3.80	3.44	7.30	2.56
@ 2400°F	-	4.00	8.40	2.86
Hot Load Strength, % Deformation 10 PSI (Per ASTM C 16-68)				
1½ Hrs. @ 1600°F	-	-	-	-
1½ Hrs. @ 2000°F	-	-	-	-
1½ Hrs. @ 2200°F	0.2	0.5	-	-
1½ Hrs. @ 2640°F	-	0.5	-	0.5
12.5 PSI 1½ Hrs. @ 2730°F	-	-	0.1	-
Permanent Linear Change, %				
Mean Temperature @ 1550°F	-	-	-	-
@ 1950°F	-	-	-	-
@ 2250°F	-	-	-	-
@ 2550°F	-	-	-	-
@ 2750°F	-	-	-	-0.3
@ 2800°F	-0.5	-	-	-
@ 2950°F	-	-0.6	-	-
@ 3250°F	-	-	+0.4	-
Cold Crushing Strength, PSI (ASTM C 93-67)	295	275	900	220
Modulus of Rupture, PSI (ASTM C 93-67)	280	230	350	200
Chemical Analysis, % (ASTM C 573-65)				
Alumina Al_2O_3	45.3	64.8	76.6	94.5
Silica SiO_2	51.4	33.2	21.5	0.3
Iron Oxide Fe_2O_3	0.9	0.6	0.4	-
Titanium Oxide TiO_2	1.4	0.7	0.6	-
Calcium Oxide CaO	0.5	0.3	0.1	5.2
Magnesium Oxide MgO	0.1	Trace	0.1	-
Alkalies, As Na_2O	0.4	0.4	0.3	-
Coefficient of Linear Reversible Thermal Expansion, In./In./°F	2.9×10^{-6}	2.9×10^{-6}	3.8×10^{-6}	5.2×10^{-6}

Data are average results of control tests conducted under standard procedures and are subject to normal variations. Results should not be used for specification purposes.

ETT0000633

Supersedes 2 14 - 1 Issued March 13, 1968

INSTRUCTIONS TO SENDER

1. DETACH YELLOW COPY
2. SEND WHITE AND PINK PARTS WITH CARBON TO PERSON ADDRESSED.

amco sets by Ivan allen COMPANY

INSTRUCTIONS TO RECIPIENT

1. WRITE REPLY AT BOTTOM.
2. DETACH STUB, RETAIN WHITE COPY AND RETURN PINK COPY TO SENDER

FORM 215

To: MR D C ANTROBUS

ENJAY CHEMICAL Co.

cc. R FTURCOTTE

FROM: E H Fidler

SUBJECT: Humble O.C - Heater Roof | RM-7049-D RM-7050-D

DATE: 6-14-72

Reply Message

FOLD

MESSAGE

Charlie - Attached are heat flux calculations and curves — I was unable to find any test data on K-23 IFB coated with Refractory Green paint and how much it reduced the permeability. Attached is a sheet shown Test results of our K-30 IFB coated with various material of which the Refractory Green paint is the most efficient at reducing permeability. Added to this sheet is a Test on K-23 coated with a different material, Mix 49. These should give a good estimate of the reduction in permeability to be expect The quote is coming from our Houston office.

SIGNED Fred

DATE OF REPLY

REPLY TO

REPLY

SIGNED

RECIPIENT

DETACH AND FILE FOR FOLLOW-UP

ETT0000634

MR. J. D. McCULLOUGH ATTACHMENT 11-12-68

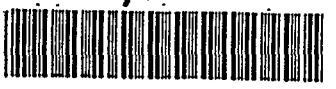
PERMEABILITY OF COATED IFB (K-30)

	Permeability, CFH/sq.ft/in/1.0 p
MIX 49	
As received	27,000
Coated	
Cured 450°F, 24 hrs.	2,800
Fired 2850°F, 5 hrs.	2,650
MULL-KOTE	
As received	18,000
Coated	
Cured 300°F, 16 hrs.	1,200
Fired 2600°F, 2 hrs.	8,100
REFRACTORY GREEN PAINT	
As received	21,300
Coated	
Dried 300°F, 16 hrs.	200
Fired 2600°F, 2 hrs.	2,900
REFRACTORY WHITE PAINT	
As received	21,700
Coated	
Dried 300°F, 16 hrs.	1,700
Fired 2600°F, 2 hrs.	19,600

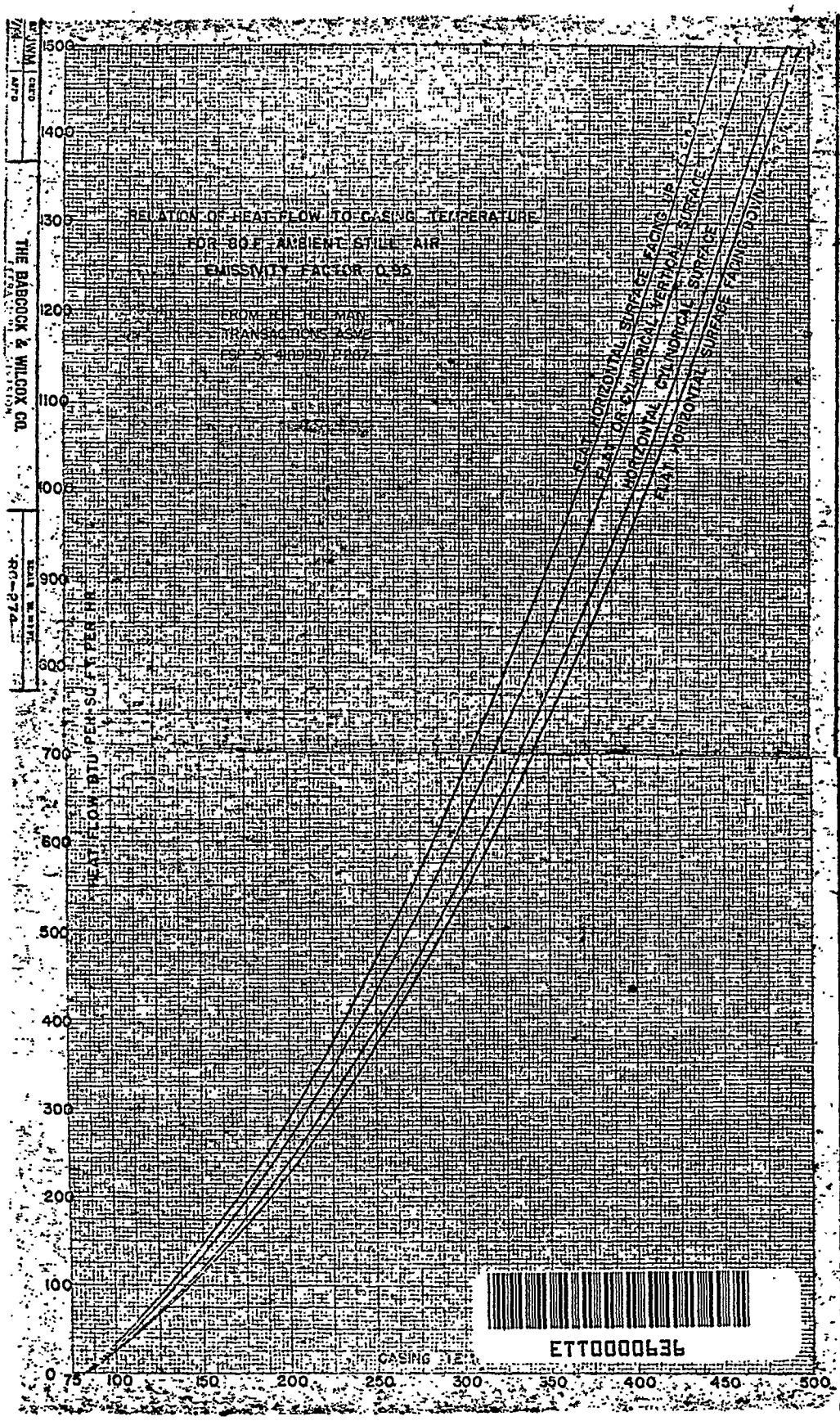
WCB:dk

K-23 WITH MIX 49

As received	4550
Coated	
Dried 450°F, 24 Hrs	800
Fired 2250°F 5 Hrs	1150



ETT0000635



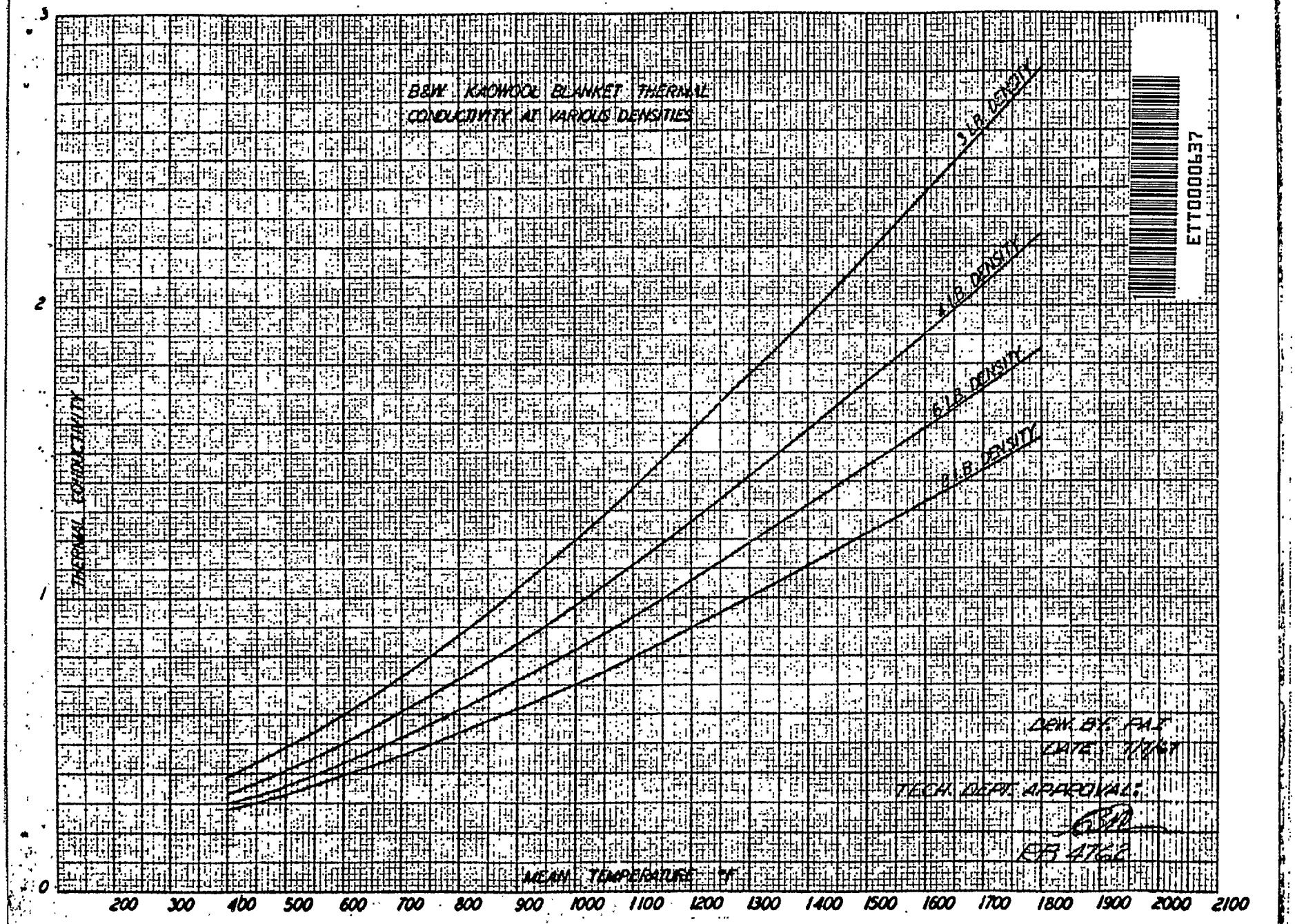
THE BABCOCK & WILCOX CO.

SCALE NO. 1 IN. = 1 FT.

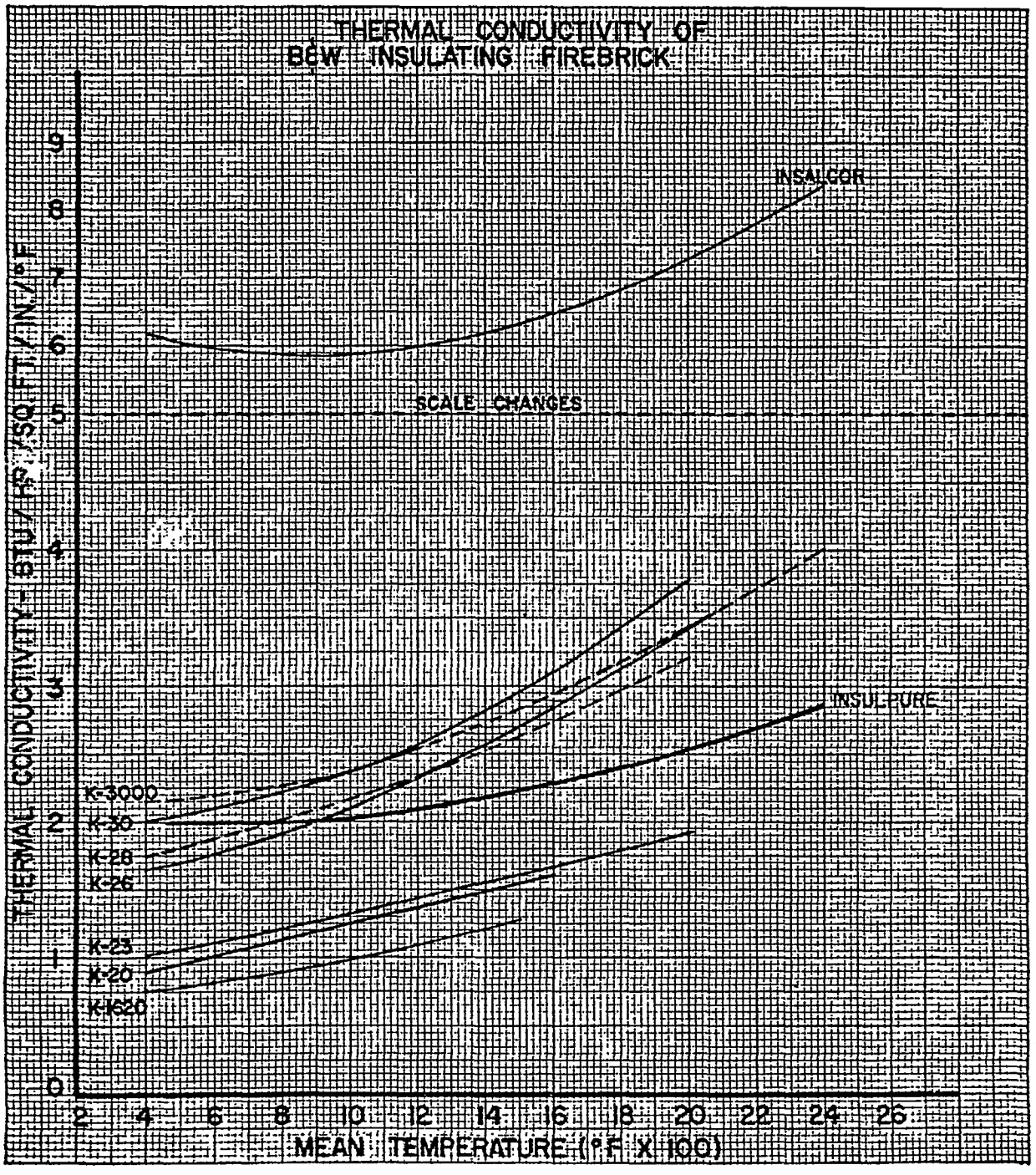
RC-274

THIS DRAWING OWNED BY THE BABCOCK & WILCOX CO. IS CONDITIONALLY LOANED TO [illegible] WHO BY RECEIVING IT HAS AGREED NOT TO REPRODUCE OR COPY IT, IN WHOLE OR IN PART, OR TO FURNISH INFORMATION FROM IT TO OTHERS, OR TO MAKE ANY USE OF IT THAT IS, OR MAY BE, INJURIOUS TO THE BABCOCK & WILCOX CO. AND TO RETURN IT UPON REQUEST. THIS DRAWING NOT TO BE USED FOR CONSTRUCTION PURPOSES. DO NOT SCALE, USE DIMENSIONS ONLY.

ETT0000636


B&W KAOWOOL BLANKET THERMAL
CONDUCTIVITY AT VARIOUS DENSITIES
3 LB. DENSITY
4 LB. DENSITY
6 LB. DENSITY
8 LB. DENSITY
THERMAL CONDUCTIVITY
MEAN TEMPERATURE °F
0
1
2
3
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
DRW. BY: PAJ
DATE: 7/7/67
TECH. DEPT. APPROVAL:
RB 4762
ETT0000637

THIS DRAWING IS THE PROPERTY OF
THE BABCOCK & WILCOX CO.
ETT0000638
AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHERS, OR FOR ANY OTHER PURPOSE DETRIMENTAL TO THE INTERESTS OF THE BABCOCK & WILCOX CO. AND IS TO BE RETURNED UPON REQUEST. THE EQUIPMENT SHOWN HEREON IS PROTECTED BY PATENTS OWNED OR CONTROLLED BY THE BABCOCK & WILCOX CO. AND ANY INFRINGER OF SUCH PATENTS IS LIABLE TO PROSECUTION. DO NOT SCALE, USE DIMENSIONS ONLY.



These curves are submitted for the Purchaser's convenience and the performance indicated thereon shall not be offered by the Company nor construed by the Purchaser as a proposal or contract obligation.

DRAWN BY PAI	CHK'D	THE BABCOCK & WILCOX CO.	SCALE IN. = 1 FT.
S. C.	APP'D		RB4907-0

RECORD ○○○○○

9" K-23 + 2" 4# KAOWOOL BLANKET ROOF

HOT FACE = 2300 °F

EXTERNAL CONDITIONS : STILL 80°F AMBIENT AIR

SURFACE EMISSIVITY = 0.95

HEAT FLOW CALCULATION (ASSUME COLD FACE OF 180°F / ASSUME INTERFACE OF 1070°F)

$$Q = \frac{2300 - 180}{\frac{9}{1.72} + \frac{2}{.53}} = \frac{2120}{5.23 + 3.78} = \frac{2120}{9.01} = 235 \ \frac{BTU}{SQ\,FT \times HR}$$

CHECK INTERFACE : $= 2300 - (235 \times 5.23) = 2300 - 1230 = 1070$ °F

CHECK COLDFACE : $1070 - (235 \times 3.78) = 1070 - 890 = 180$ °F

ON ATTACHED CURVE KK-683 A HEAT FLOW OF 235

CORRESPONDS TO A CASING TEMP. OF 183°F FOR A ROOF

ROD TEMP $= 1070 + \left(\frac{2}{4} \times 1230\right) = 1070 + 273 = 1343$ °F

THIS CONSTRUCTION TO BE USED THROUGH TUBE ROW 8

(TEMPS. 1750°F TO 2300°F)

ETT0000639

9" K-23 IFB ROOF

HOT FACE = 1750 °F (TEMP. AT TUBE ROW 8)

EXTERNAL CONDITIONS: STILL 80°F AMBIENT AIR
SURFACE EMISSIVITY = 0.95

HEAT FLOW CALCULATION (ASSUME COLD FACE OF 180°F).

$$Q = \frac{1750 - 180}{\frac{9 \text{ inches}}{1.3 \text{ thermal cond.}}} = \frac{1570}{6.92} = 227 \frac{BTU}{SQ\ FT \times HR}$$

ON ATTACHED CURVE RR-683 A HEAT FLOW OF 227 CORRESPONDS TO A CASING TEMP. OF 180°F FOR A ROOF.

ROD TEMP. = $180 + \left(\frac{2}{9} \times 1570\right) = 180 + 349 = 529$ °F

THIS CONSTRUCTION WILL BE USED FOR TUBE ROWS 8 THRU 16 (TEMP. OF 1750°F OR LESS)



PURCHASING FILE
CSP BFA ACW

May 29, 1972

QBLA Furnace Modification
Project - Convection Section
Roof - Addendum I - File C

Bigelow Liptok Corp., Box 998,
Gonzales, La. 70737
Babcock & Wilcox, Refract. Div., Box 923,
Augusta, Ga. Att: F. Fidler

Gentlemen:

Attached are two drawings showing the intermediate tube support in the convection section of our QBLA furnace. These drawings are offered to provide further clarification and details for the design of the new arch.

For information please call our Mr. D. C. Antrobus at Telephone (504) 359-7972.

Yours very truly,

J. A. POCHE
Buyer

JAP:lam

Attachment

bcc: D. C. Antrobus



ETT0000641

HUMBLE OIL & REFINING COMPANY
POST OFFICE BOX 481 • BATON ROUGE, LOUISIANA 70821

REFINING DEPARTMENT
BATON ROUGE REFINERY

C. S. PUGSLEY
HEAD - PURCHASING, TRAFFIC & GENERAL SERVICES DEPARTMENT

May 29, 1972

QBLA Furnace Modification
Project - Convection Section
Roof - Addendum I - File C

Gentlemen:

Attached are two drawings showing the intermediate tube support in the convection section of our QBLA furnace. These drawings are offered to provide further clarification and details for the design of the new arch.

For information please call our Mr. D. C. Antrobus at Telephone (504) 359-7972.

Yours very truly,

J. A. POCHE
Buyer

JAP:lam

Attachment



ETT0000642

520080

PURCHASING INFORMATION REQUEST

DATE May 26, 1972

SUBJECT QBLA Furnace Modification Project.
Convection Section Roof.
Addendum 1 - FILE C

TO PURCHASING DEPARTMENT FROM Project Development DEPARTMENT BY R. C. Antrobus

PLEASE CONTACT

☐ SUPPLIERS ☐ MANUFACTURERS

☐ FABRICATORS ☐ THE FOLLOWING FIRMS & ANY OTHERS YOU MAY WISH TO INCLUDE

~~(LE-1804)~~ Bigelow Liptak Corp. Box 498, Gonzales, La. 70737

~~(LE-1829)~~ Babcock & Wilcox Refractories Div. Box 923
Augusta, Ga. 30903 Attn: Mr. Fred Fidler

PLEASE OBTAIN THE FOLLOWING INFORMATION BY ☐ REGULAR MAIL ☒ AIRMAIL ☐ WIRE ☐ PHONE

☐ QUOTATIONS FOR TOTAL QUANTITY
☐ DELIVERY DATE IN REFINERY FROM DATE OF ORDER
☐ QUOTATIONS FOR INDIVIDUAL ITEMS
☐ DESCRIPTIVE LITERATURE
☐ PRICE LISTS
☐ DIMENSIONED DRAWINGS
☐ OTHER

(AVAILABLE SIZES, MATERIAL SPECIFICATIONS, ALLOWABLE WORKING CONDITIONS, ETC.)

FOR FURNISHING THE FOLLOWING ITEMS OR MATERIAL (QUANTITY, DESCRIPTION, SPECIFICATIONS, ATTACHED DRAWINGS, NPA RATINGS, ETC.)

GENTLEMEN:

Attached are two drawings showing the intermediate tube support in the convection section of ~~our QBLA furnace~~. These drawings are offered to provide further clarification and details for the design of the new arch.

For information please call ~~our~~ MR DC Antrobus AT TELEPHONE (504) 359-1972.

Y V T
J C Cook

ETT0000643

PLEASE SEND THIS INFORMATION TO THE ~~Project Development~~ DEPARTMENT FOR REVIEW.

cc: ~~RCA - SGT~~

bcc. MR DC ANTROBUS

PURCHASING FILE
CSP BFA ACW

March 13, 1972

QBLA Furnace Modification
Project Convection Section
Roof - File C

Bigelow-Liptak Corporation
P. O. Box 998
Gonzales, Louisiana 70737

Gentlemen:

Please let us have price and time required to effect delivery for your furnishing material and engineering for a suspended tile furnace arch, as described in our attached Specification CE-1804.

Materials should be quoted on a quantity basis and on an individual price basis for spare parts cost evaluation. You are requested to define the extent and limits of the engineering and drawing work offered.

Also, your proposal is to include the complete specifications (ASTM reference and manufacturer's data) for all materials offered, and shall include heat transfer calculations noted in this specification.

Your proposal is requested by March 24, 1972, in the attached "Seal Bid" envelope.

Yours very truly,

J. A. POCHE,
Buyer

JAP:lam

Attachments(2)

bcc: D. C. Antrobus



ETT0000644

580680

PURCHASING INFORMATION REQUEST DATE March 7, 1972 — Purchasing

SUBJECT QBLA Furnace Modification Project
Convection Section Roof - FILE C

LETTER

TO PURCHASING DEPARTMENT FROM Project Development DEPARTMENT BY D.C. Antrobus

PLEASE CONTACT

☐ SUPPLIERS ☐ MANUFACTURERS

☐ FABRICATORS ☐ THE FOLLOWING FIRMS & ANY OTHERS YOU MAY WISH TO INCLUDE

Bigelow-Liptak Corp., Box 998, Gonzales, La. 70737

NO Competition

PLEASE OBTAIN THE FOLLOWING INFORMATION BY ☐ REGULAR MAIL ☐ AIRMAIL ☐ WIRE ☐ PHONE

☐ QUOTATIONS FOR TOTAL QUANTITY ☐ DELIVERY DATE IN REFINERY FROM DATE OF ORDER

☐ QUOTATIONS FOR INDIVIDUAL ITEMS ☐ DESCRIPTIVE LITERATURE

☐ PRICE LISTS ☐ DIMENSIONED DRAWINGS

☐ OTHER GENTLEMEN:

(AVAILABLE SIZES, MATERIAL SPECIFICATIONS, ALLOWABLE WORKING CONDITIONS, ETC.)

PLEASE LET US HAVE PRICE AND TIME REQUIRED TO EFFECT

FOR FURNISHING THE FOLLOWING ITEMS OR MATERIAL (QUANTITY, DESCRIPTION, SPECIFICATIONS, ATTACHED DRAWINGS, NPA RATINGS, ETC.) DELIVERY FOR YOUR FURNISHING MATERIAL AND ENGINEERING

~~Please request a quotation from Bigelow-Liptak Corp~~. for a suspended tile furnace arch as described in ~~the~~ OUR attached specification CE-1804 ~~(three copies attached)~~

Materials ~~shall~~ SHOULD be quoted on a quantity basis and on an individual price basis for spare parts cost evaluation. YOU ARE

~~The vendor is~~ requested to define the extent and limits of the engineering and drawing work offered.

ALSO Your Proposals ~~shall~~ TO include the complete specifications (ASTM reference and manufacturer's data) for all materials offered and shall include heat transfer calculations noted in this specification.

YOUR PROPOSAL IS ~~Bids are~~ requested by March 24, 1972, IN THE ATTACHED "SEAL BID" ENVELOPE

PLEASE SEND THIS INFORMATION TO THE DEPARTMENT FOR REVIEW. VVT

cc: ~~DCA, SGT~~

bcc: D.C ANTROBUS

ETT0000645

QBLA FURNACE MODIFICATION PROJECT

Convection Section Roof

1. This specification covers the materials and engineering for the replacement of five convection section roofs in the QBLA steam cracking furnaces of Enjay Chemical Company, Baton Rouge, Louisiana.

2. Drawings and reference sketches are attached for use in preparing the roof design and support.



CE-1804-1 - Existing Steel Plan
CE-1804-2 - Existing Arch Sections
CE-1804-3 - Existing Steel Elevations
CE-1804-4a - New Convection Section Tube Layout
CE-1804-4b - New Convection Section Corbelling Detail.
CE-1804-5 - Convection Section Hot Face Design Temp.
CE-1804-6 - Existing Tile Hangers

3. Roof replacement involves designing the new system within the framework of existing steel members. Tiles shall be the same pattern as the existing members which are used in the radiant section of the furnaces, except as required for spacing and corbelling.

4. Tile hangers shall be the "tee" style hanger as presently installed in the radiant arch. These hangers are pattern No. 4498 (three tiles) and 4499 (two tiles) as shown on the enclosed drawing.

5. An insulating cover shall be provided over the tile consisting of a layer of castable and a layer of insulation block sufficient to provide a cold side surface temperature of 200°F. Heat loss calculations shall be submitted for approval with the bid.

6. Tile hanger metal tip temperatures shall be determined from the hot face design temperatures shown on Sketch CE-1804-5. Heat transfer calculations shall be submitted with the bid.

   Based on the hanger metal tip temperatures, materials shall be selected as follows:

Maximum Allowable Tip Temperature °F.	Material
850	Carbon Steel
1450	18-8 Chrome Nickel
Above 1450	25-20 Chrome Nickel

7. A portion of three of the five convection roofs has been repaired, consisting of an area measuring 5'6" x 10'0" in the northeast quadrant of the roof. This area will not require rebuilding.

8. All drawings, data and correspondence of an engineering nature shall be forwarded to Requisition Section, Room 4057, Mechanical Engineering Dept., Enjay Chemical Co., P. O. Box 241. A copy of cover letters forwarding this information should be sent to Owner's Purchasing Department, P. O. Box 481, Baton Rouge, La. 70821.

All information sent to Enjay or Humble shall be identified with the following data in the order given below. Each sheet of drawings and data or the cover or title page of bound manuals shall be identified separately. Drawings shall be white background with blue or black lines suitable for 35 MM microfilming.

Order No. - (As noted on face of order)

Appropriation - 8144

Job Title - QBLA Furnace Modifications

Equipment Item Nos. - F-17A, F-17B, F-18A, F-18B, F-19A

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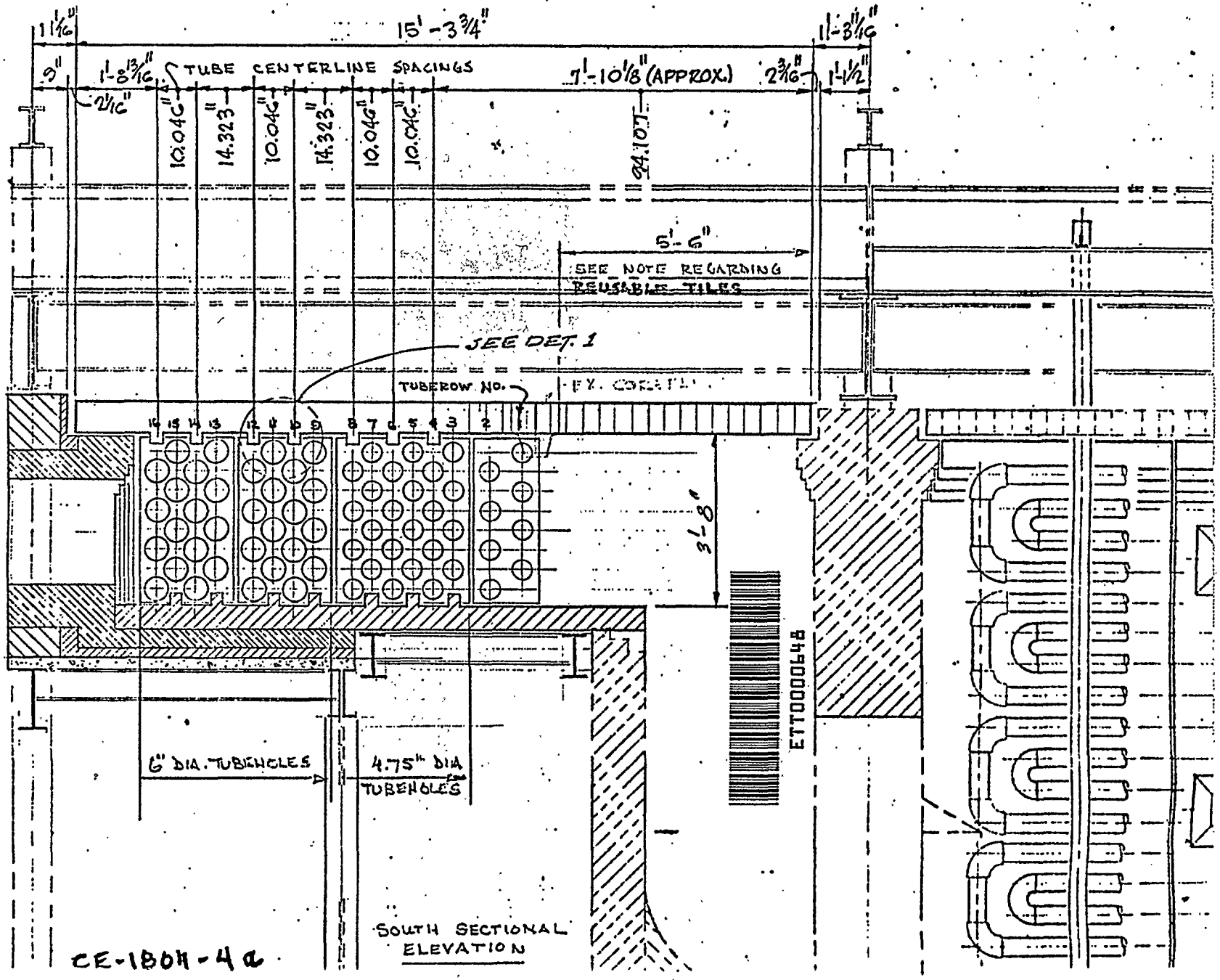
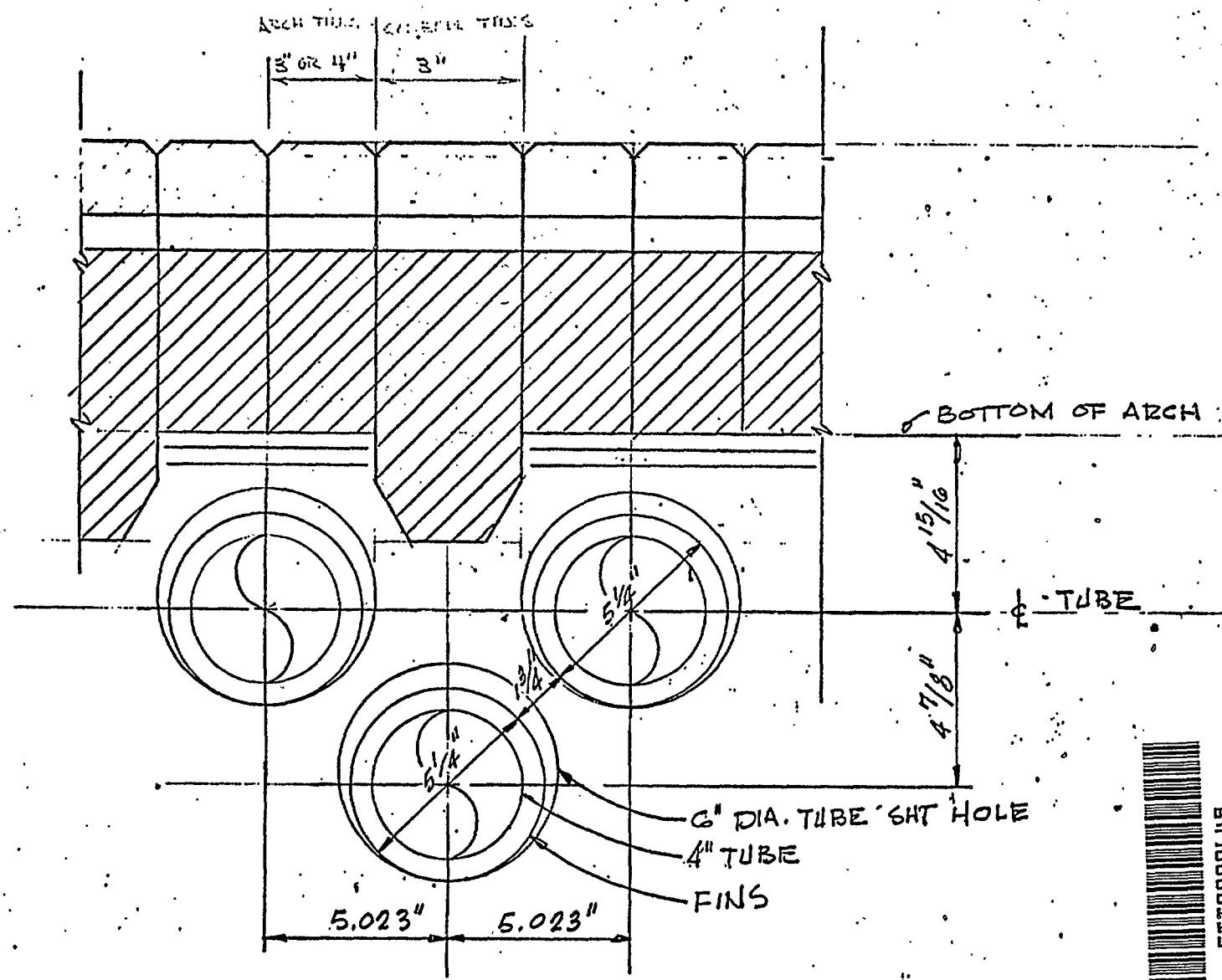
ETT0000647



15'-3 3/4"
1 1/16"
1'-3 11/16"
9"
1'-8 13/16"
TUBE CENTERLINE SPACINGS
7'-10 1/8" (APPROX.)
2 3/16"
1'-1 1/2"
2 1/16"
10.046"
14.323"
10.046"
14.323"
10.046"
10.046"
94.107
5'-6"
SEE NOTE REGARDING
REUSABLE TILES
SEE DET. 1
TUBEROW NO.
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2
3'-8"
6" DIA. TUBEHOLES
4.75" DIA
TUBEHOLES
ETT0000648
SOUTH SECTIONAL
ELEVATION
CE-1804-4a



DETAIL "1"

3" = 1'-0"

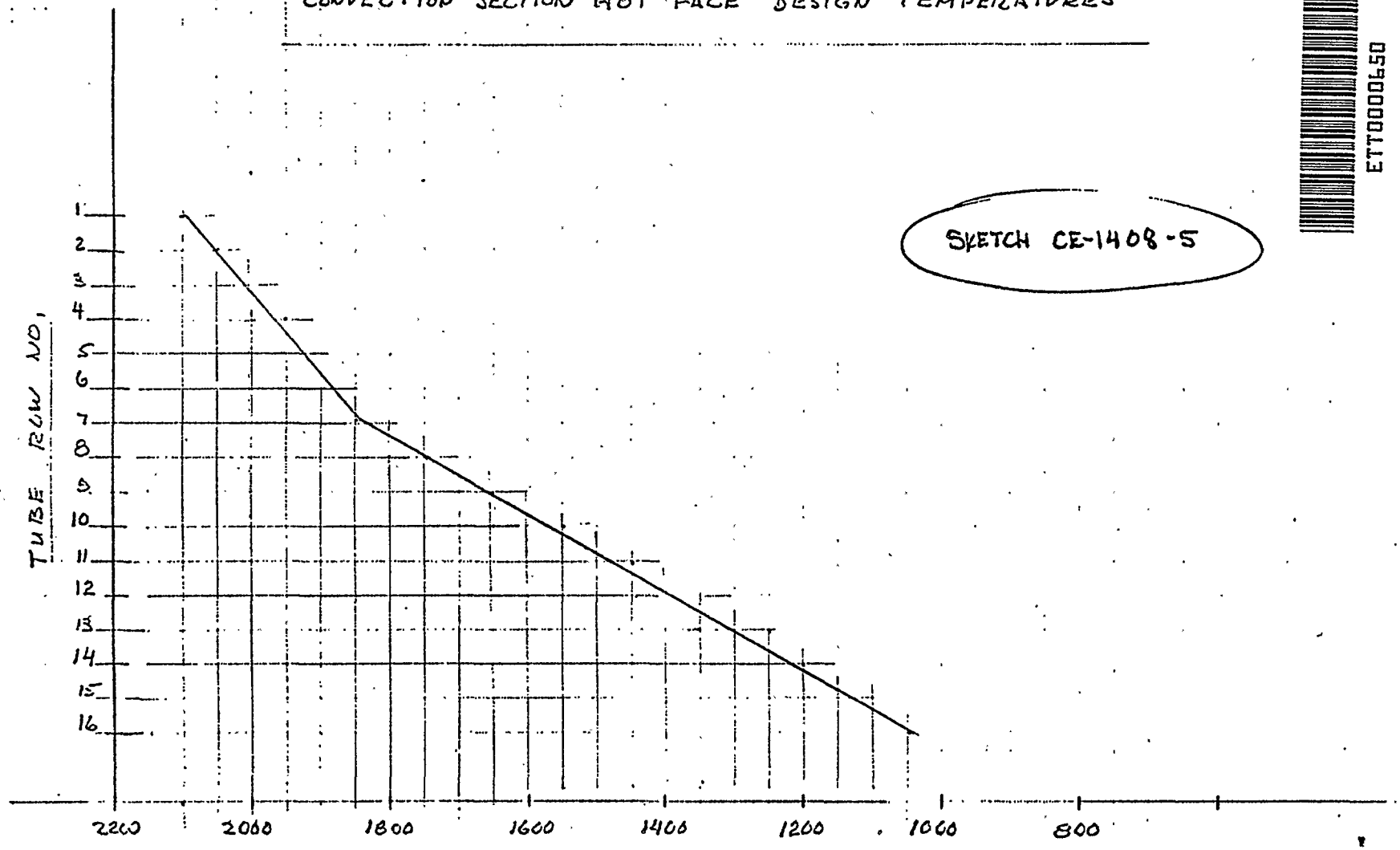
1 CE-1804 b

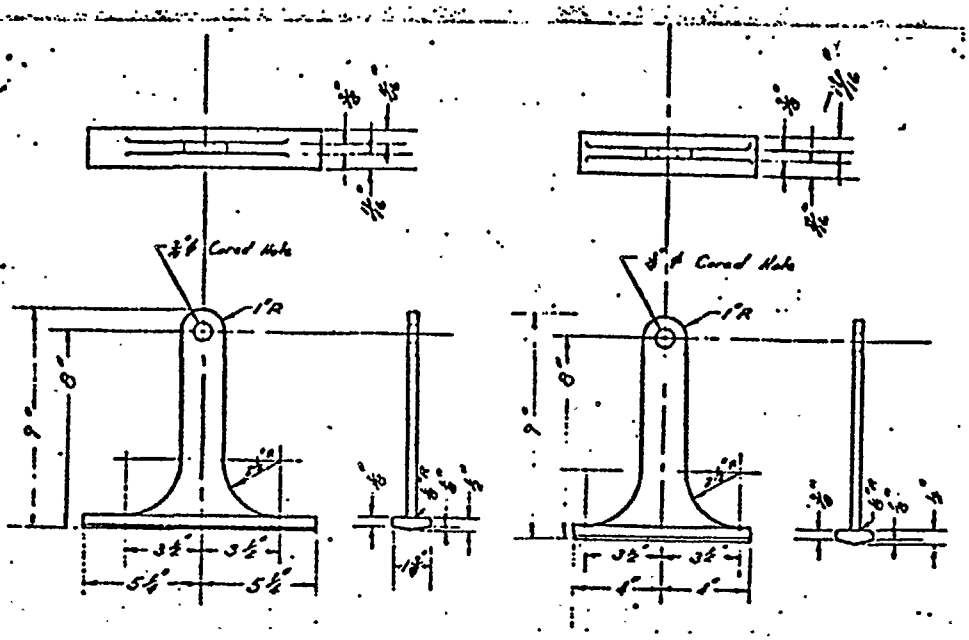
ETT00000649

CONVECTION SECTION HOT FACE DESIGN TEMPERATURES

ETT0000650

SKETCH CE-1408-5





Pattern 4498

Pattern 4499

(Material - 25-12 Cr. Ni Existing Only)

CE-1408-6

FABRICATION BY: ☐ N & C DEPT ☒ OTHERS

DIRECTION BY: ☒ N & C DEPT ☐ OTHERS

No 3 Steam Cracking Unit

Detail of Furnace Roof

Brick Hangers

ESSO STANDARD OIL C

LOUISIANA DIVISION

MECHANICAL ENGINEERING DEPARTMENT

BATON ROUGE LA.

FOR FURTHER INFORMATION IF REQUIRED PLEASE CALL J.S. Walker PHONE 430

DISTRIBUTION

NAME	DATE
J.S. Walker	
JRZ	

2509 | 1 of 1 | 23

260356000 2654

ETT0000651

440230

3/8/72 Antrobus -

The ABZA Jumper has Bigelow-hiptab tile. The modification will tie-in other Bigelow tile shapes.

It is doubtful that another manufacturer would quote. Dietrich is the only other mfg of tile only, others supply costables.

J Toshi

ETT0000652

BIGELOW-LIPTAK CORPORATION

HEAT ENCLOSURES

NORTHWESTERN HIGHWAY AND 10¼ MILE ROAD

SOUTHFIELD, MICHIGAN 48075

ADDRESS REPLY TO
P. O. BOX 998
GONZALES, LOUISIANA 70737
PHONE: 644-2874

February 18, 1972

Enjay Chemical Company
P. O. Box 241
Baton Rouge, Louisiana 70821

Attn: Mr. Charles Antrobus

Subj: Five Suspended Arches
Bigelow-Liptak Proposal PA-3132-A

see quote 3/1/72

Gentlemen:

We are enclosing two copies of our proposal for the above subject job. We are further enclosing marked-up Enjay sketch SK-8049-4 and copies of our typical tile and casting details.

The 4" projections in the flat arch construction will be provided on the locations shown on the enclosed sketch. You will note from the sketches and proposal we have included 310 alloy support castings in the hot zones, 304 alloy in the intermediate zone, and heat-resistant (or HX castings) in the cool zone.

We have quoted upon applying block insulation over the entire arch, however, in the hot zone it appears that the temperature on the block face will be nearer the maximum allowable point. If Enjay so desires, we can substitute a higher temperature material in the hot zones for no additional charge. This will probably be a castable insulation. In either instance, whether it be block insulation or castable insulation, it is important that the persons erecting this arch cut back the insulation away from the castings to prevent overheating of the casting tips.

We appreciate the opportunity of working with you, and trust the enclosed meets with your approval. Should you have any questions, or if we can be of any further service, do not hesitate to contact us.

Sincerely,

BIGELOW-LIPTAK CORPORATION

R. Stiles Dendy

R. Stiles Dendy
District Sales Manager

RSD/jt
Enclosures

ccs: B-L Southfield
Houston



ETT0000653

for cc Antrobus

PROPOSAL

BIGELOW-LIPTAK CORPORATION

HEAT ENCLOSURES

21201 CIVIC CENTER DRIVE
SOUTHFIELD, MICHIGAN 48075

TO ENJAY CHEMICAL COMPANY

OF BATON ROUGE, LOUISIANA

FOR SAME

Date February 15, 1972

PROPOSAL NO. PA-3132-A

Attn: Mr. R. Androbus

Bigelow-Liptak Corporation, hereinafter designated as the Company, hereby proposes to furnish the materials and services specified on the following pages, f. o. b. points of shipment with freight allowed to Baton Rouge, La based on the most economical routing and method of transportation,

for installation in or in connection with Five Suspended Arches

and in accordance with the preliminary drawing (s) Enjay Sketch SK-8049-4 and Bigelow-Liptak Typical Tile & Casting Detail Sheet

and the final drawings to be submitted by the Company and approved by the Purchaser.

CONDITIONS OF CONTRACT

If this proposal becomes an effective agreement as hereinafter provided, the Company shall cause the materials to be shipped within 8-10 weeks after the Purchaser furnishes complete data for and approves the final drawings and furnishes shipping instructions: Provided, however, that the Company shall not be liable for delays due to circumstances or acts beyond its control including, without limiting the generality of the foregoing, accident, strike or other labor troubles or disputes, flood, fire, war, civil commotion, lack of or inability to obtain labor or materials, embargo, delays in transportation, or federal, state or local action, requirements, regulations or restrictions. The materials may be shipped from different points and in separate allotments, and each shipment shall constitute a separate transaction with respect to the terms of payment specified herein. If the Purchaser delays shipments for more than sixty (60) days after notification that the Company is ready to proceed therewith, fifty per cent (50%) of the entire contract price shall immediately become due and payable. If the Purchaser delays shipments for more than thirty (30) days after any materials are ready for shipment under a schedule previously approved by the Purchaser, the entire balance of the contract price shall immediately become due and payable. If the Purchaser defaults in making payments as provided herein, the Company may, at its option, withhold further shipments until the default has been remedied.



ETT0000654

FORM 130-A WD

Includes five complete sets of 8" suspended arch construction with 4" projections as shown on Enjay sketch SK-8049-4. Arch construction to be constructed of Bigelow-Liptak first quality special refractory shapes, support castings in the grade of metal as shown on the above-mentioned sketch, carbon steel hooks and pipe.

Further included is necessary 1900 deg F block insulation to apply a 3½" layer over the entire arch.

This item does not include any structural supporting steel for the arch construction.

Estimated Weight of Refractories	142,800 lbs.
Estimated Weight of Metallics	7,900 lbs.
Estimated Weight of Insulation	9,700 lbs.

PRICE: Materials only - $34,000
THIRTY FOUR THOUSAND DOLLARS

ETT0000655

The Company warrants that all materials and/or workmanship supplied hereunder will be of good quality. The obligation of the Company under this warranty shall be limited to replacing any materials and/or remedying any workmanship furnished by it hereunder established to be of defective quality within a period of one (1) year from the time of the installation or performance thereof, and the Company shall not be liable for any damage to any other work. No claim of any kind hereunder shall exceed in amount the pro rata price of that part of the materials or workmanship established to be defective. The Purchaser shall give prompt written notice to the Company of observed defects. The Company shall not be liable for back charges incidental to field changes or corrections to materials or workmanship furnished hereunder unless ample opportunity is given the Company to inspect the materials or workmanship claimed to be defective, and then only after the field changes or corrections have been authorized in writing by the Company. This warranty is in lieu of all other warranties, express or implied. No person is authorized to assume for the Company any other liability.

The cost of any special chemical or physical tests or analyses required by the Purchaser shall be added to the contract price specified herein.

The prices quoted herein are based on costs and/or wage rates in effect on the date of this proposal, and in the event of any increase in such costs to the Company, said prices may be increased proportionately. Unless otherwise specified, quotations do not include any excise, use, privilege or sales tax or assessment or any other imposition, exaction or charge now or hereafter imposed by or under the authority of any federal, state or local law, rule or regulation. If any such tax, assessment, imposition, exaction or charge is paid by the Company the same shall, where not prohibited by law, be added to the contract prices. Quotations made with freight allowed are based on published freight rates in effect on the date of this proposal. Any increase therein shall be paid by the Purchaser. Any prepayment by the Company of freight charges shall not affect the obligation of the Company with respect to delivery, and the Company shall not be responsible for loss or damage after the delivery of materials in good order and condition to the carrier or carriers at any point of shipment at which point the risk of loss of the materials shall pass to the Purchaser.

TERMS:

Engineering – One hundred percent (100%) of the pro rata price of engineering services completed each calendar month on or before the tenth (10th) day of the following month.

Materials – Ninety percent (90%) of the pro rata price of materials shipped to the site during each calendar month on or before the tenth (10th) of the following month, and the balance of ten percent (10%) within thirty (30) days thereafter.

Installation – Ninety percent (90%) of the pro rata price of the erection services completed each calendar month on or before the tenth (10th) of the following month and the balance of ten percent (10%) within thirty (30) days after the completion of the work.

Interest at the rate of 1% per month shall become due and payable on any past due balance.

The Company is an equal opportunity employer in accordance with executive order 11246 of Sept. 24, 1965.

This is merely a quotation submitted for acceptance by the Purchaser within ten (10) days from the date hereof and shall not constitute an effective contract unless such acceptance is endorsed hereon and the same is delivered to the Company within said ten (10) day period and is subsequently approved in writing by an executive officer of the Company at its principal office at Southfield, Michigan. Any such acceptance shall be limited to the exact terms of this proposal, and only a consent signed by such an executive officer shall bind the Company to any different terms hereafter transmitted in any form of the Purchaser. Any action for breach of any contract resulting herefrom must be commenced within one (1) year from the date of any such breach.

Accepted:

_____ 19____

_____

_____

BIGELOW-LIPTAK CORPORATION

By R. Stiles Dendy

R. S. Dendy/ls

FORM 130-B WD

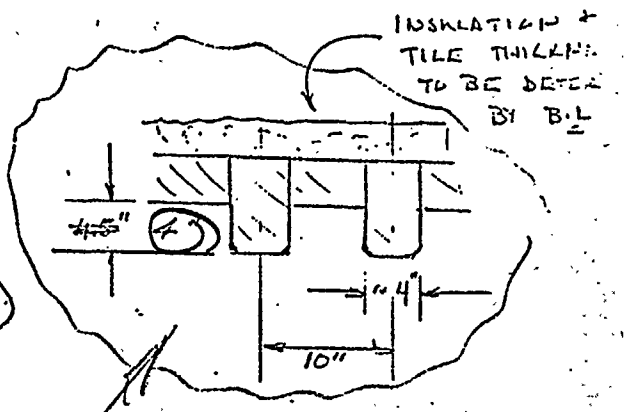
ETT0000656

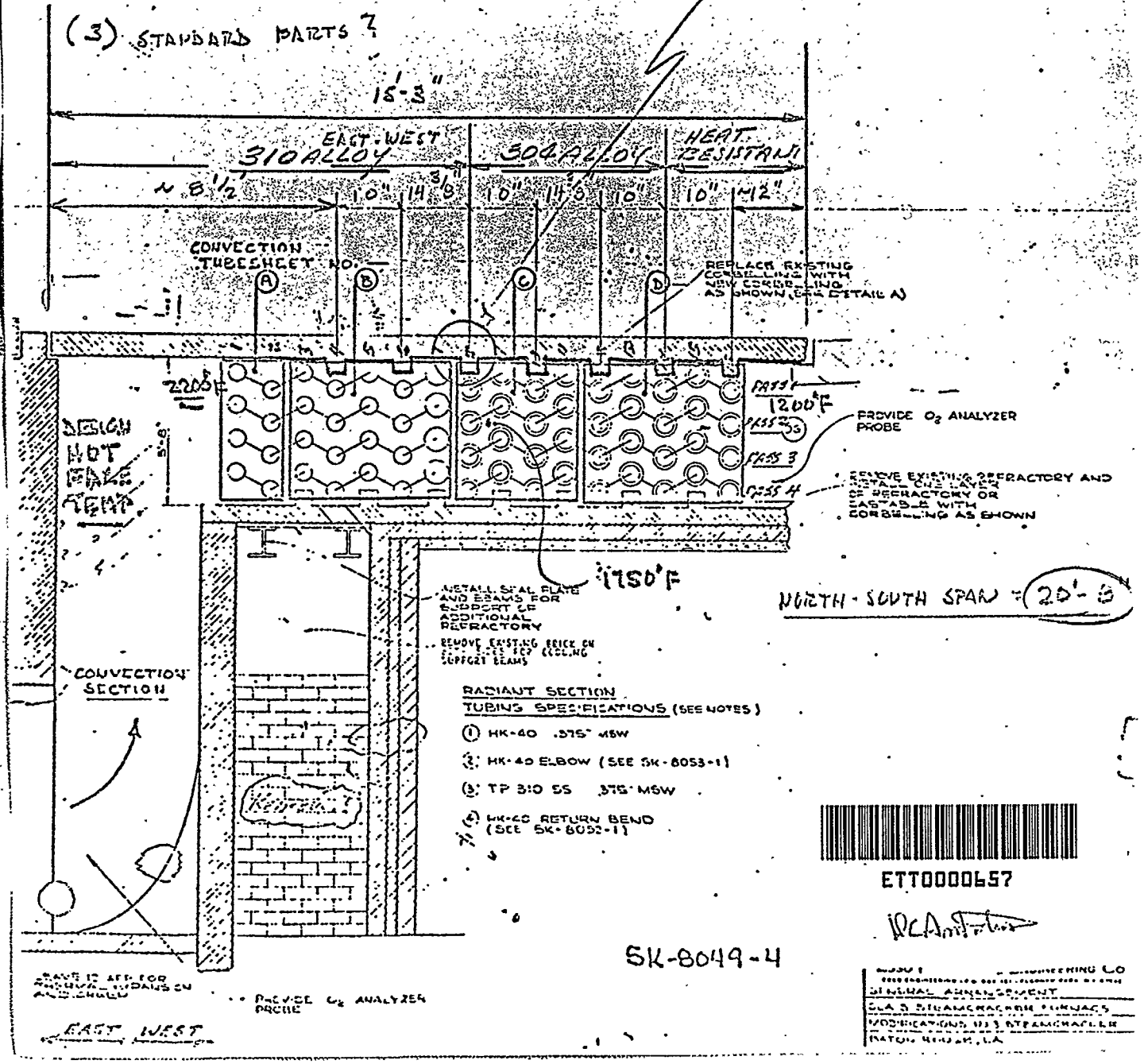
FIVE ARCHES =

(1) TOTAL EST. COST

(2) UNIT COST FOR:
- TILES
- HANGERS (C.S and 25-20 Cb) and 18-8.
- HOOKS
- PIPE

(3) STANDARD PARTS ?



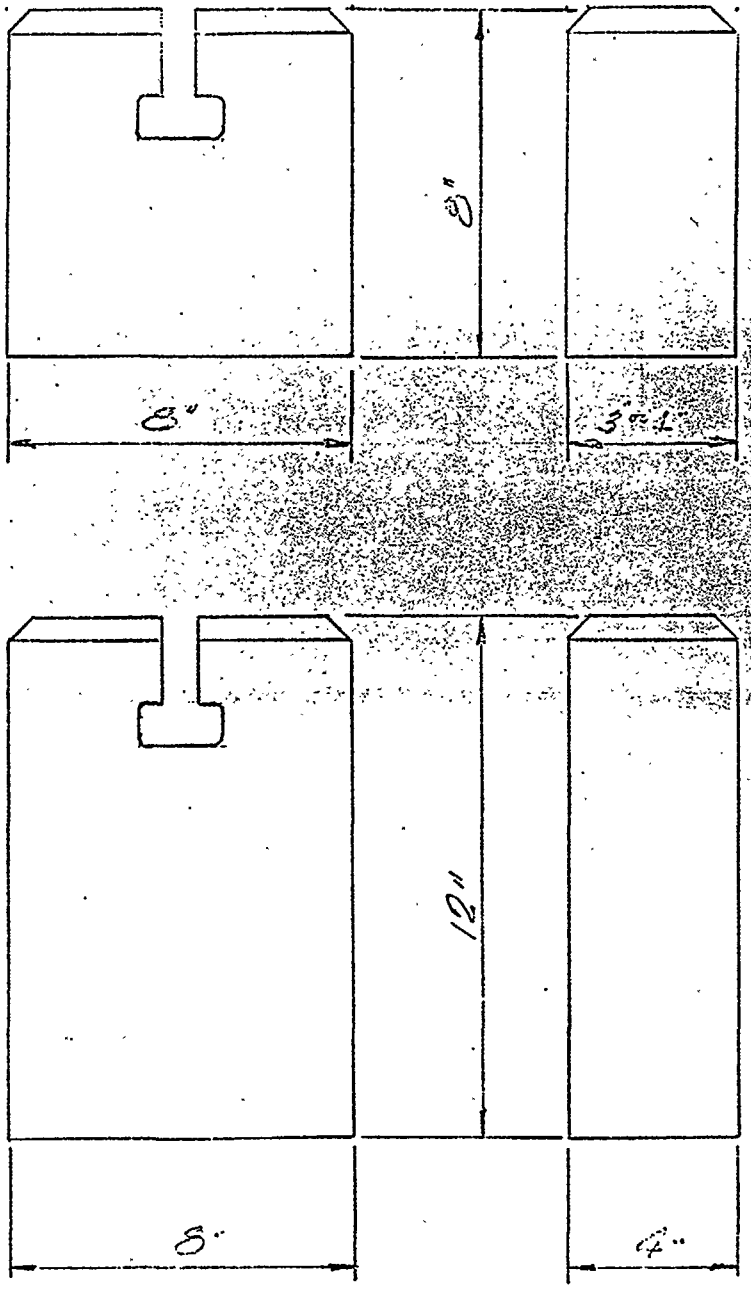


NORTH-SOUTH SPAN = 20'-6"

ETT0000657

SK-8049-4

GENERAL ARRANGEMENT
CLA-3 STEAMCRACKER FURNACES
MODIFICATIONS TO 3 STEAMCRACKER
BATON ROUGE, LA.



ETT0000658

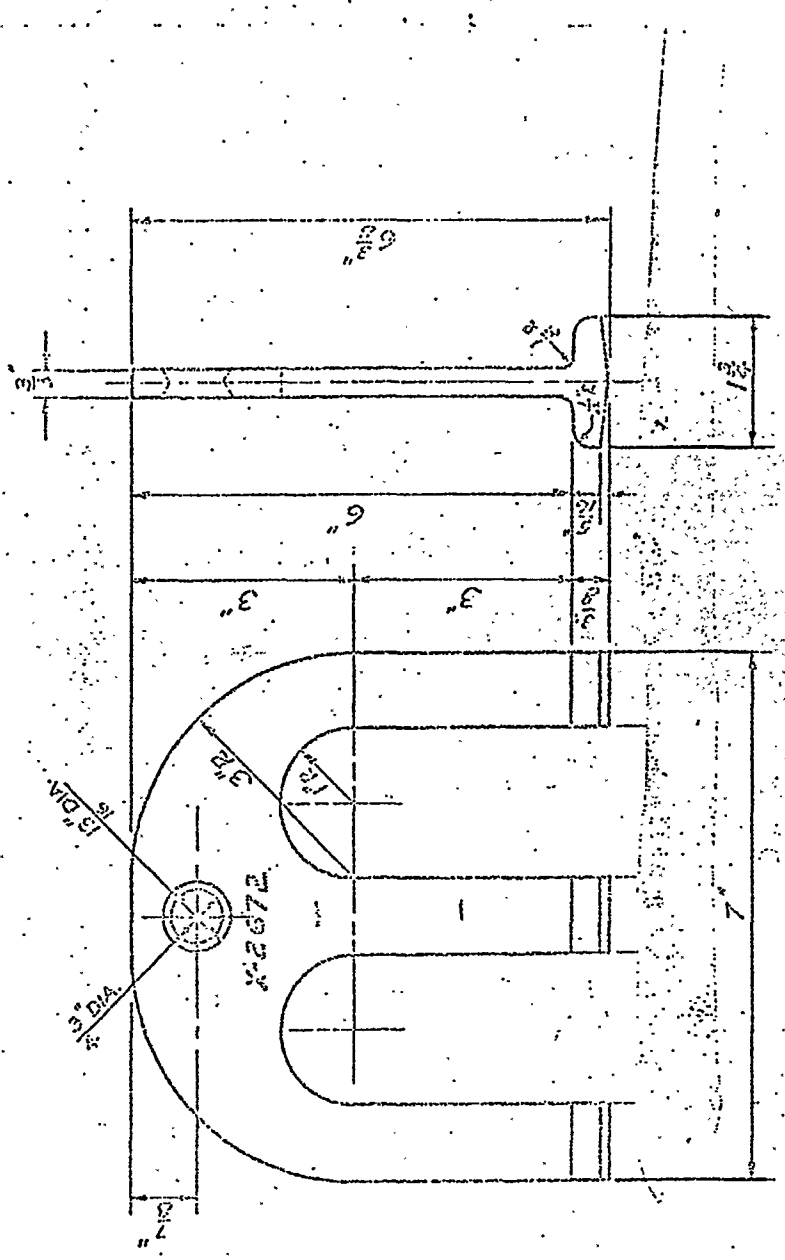
REF. NO.

SUBJECT BY DATE SHEET NO. OF

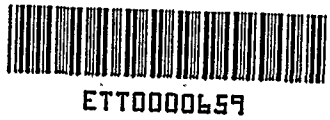
CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION. SOUTHFIELD, MICHIGAN 48075

SF 187724



TYPICAL HANGER DETAIL



May 11, 1972

Enjay Chemical Company
P. O. Box 507
Baton Rouge, Louisiana 70821

Attn: Mr. Charles Antrobus

Subj: Suspended Arches
Bigelow-Liptak Proposal PA-3132-A-1

Gentlemen:

We are pleased to confirm the price substitutions per your verbal request. The charge for drawings and bills of material only will be $2,100.00. The price for substituting Trident castings for Enjay design would be $960.00. The price for substituting 1" CI-22 and 3-1/2" B-L 19 for 4" of MTB Block presently quoted, would be a deduct of $350.00.

We trust this is the information you require, but should you have further questions, or if we could be of further service, do not hesitate contacting us.

Sincerely,

BIGELOW-LIPTAK CORPORATION

R. Stiles Dendy

R. Stiles Dendy
District Sales Manager

RSD/jt

cc: B-L Southfield
wm. Locke ✓



ETT0000660

BIGELOW-LIPTAK CORPORATION

HEAT ENCLOSURES

NORTHWESTERN HIGHWAY AND 10½ MILE ROAD

SOUTHFIELD, MICHIGAN 48075

ADDRESS REPLY TO
P. O. BOX 998
GONZALES, LOUISIANA 70737
PHONE: 644-2874

TELEX 58 6390

March 30, 1972

Enjay Chemical Company
P. O. Box 481
Baton Rouge, Louisiana 70821

Attn: Mr. J. A. Poche, Buyer

Subj: QBLA Furnace Modification
Project Convection Section
Roof - File C
Bigelow-Liptak Proposal No. PA-3132-A-1

Gentlemen:

Bigelow-Liptak is pleased to enclose three copies of our proposal for the subject job. Attached to these proposals are copies of tile and casting details, and temperature gradients for various parts of the lining per your request.

You will note in our proposal, we have taken exception to one of your requests; that is, the layer of castable between the tile and the block insulation.

Eagle-Picher manufactures a multiple thermal barrier consisting of 1900 degree block insulation and 2200 degree fiberboard. The fiberboard has a temperature rating of 2200 degrees and effectively knocks down the hot face temperature of the arch to allow the block insulation to live. We feel this would be a neater, more inexpensive application for you, and have taken the liberty of offering the same.

Also, you will note from our enclosed graph and temperature gradient calculations, we have varied the thickness of the insulation to meet your requirements of 200 degrees cool face. As you know, the temperature would drop through each of the 16 tubes and we feel we cannot vary the lining thickness throughout the entire setting, however we have made three adjustments to the insulation thickness over the arch to give you the most economical approach and still stay within the temperatures required.

The casting tip temperatures are calculated in such a manner as though they were to be buried in the insulation above the arch.



ETT0000661

We would request that the insulation be cut back away from the casting to allow for heat dissipation and therefore the tip temperature would be somewhat lower. We realize that through dusting or improper installation the casting could get buried so we have not tried to reflect this temperature difference as they may have to live under these conditions.

We do not have a casting exactly as shown on the Enjay specification, however, we have been able to come up with a similar casting and have made slight adjustments to some of the dimensions to arrive at a casting that would be interchangeable with that presently in service. The sketches of this casting and also of the tile that we are offering is enclosed.

We appreciate the opportunity of working with you and trust the enclosed meets with your approval. Should you have any questions or if we can be of any further service, please do not hesitate contacting us.

Sincerely,

BIGELOW-LIPTAK CORPORATION

R. Stiles Dendy

R. Stiles Dendy
District Sales Manager

RSD/jt

Enclosures

ccs: B-L Southfield
Houston



ETT0000662

PROPOSA

BIGELOW-LIPTAK CORPORATION
HEAT ENCLOSURE
21201 CIVIC CENTER DRIVE
SOUTHFIELD, MICHIGAN

Date Marc 72

PROPOSAL NO. 132-A-1

TO ENJAY CHEMICAL COMPANY
BATON ROUGE, LOUISIANA

Attn: Mr. J. A. Buyer
QHLA Furnace Modification

OF

FOR SAME

Bigelow-Liptak Corporation, hereinafter designated as the Company, hereby proposes to furnish materials and/or services specified on the following pages, f. o. b. points of shipment with freight allowed to Baton Rouge, La. based on the most economical routing and method of transportation,

for installation in or in connection with QHLA Furnace Modification Project Connection Section Roof - File C

and in accordance with the preliminary drawing (s) As Listed on Specification CE-1804 sheet 1

and the final drawings to be submitted by the Company and approved by the Purchaser.

CONDITIONS OF CONTRACT

If this proposal becomes an effective agreement as hereinafter provided, the Company shall cause the mate
shipped within 8-10 weeks after the Purchaser furnishes complete data for and a
final drawings and furnishes shipping instructions: Provided, however, that the Company shall not be liab
due to circumstances or acts beyond its control including, without limiting the generality of the foregr
strike or other labor troubles or disputes, flood, fire, war, civil commotion, lack of or inability to
materials, embargo, delays in transportation, or federal, state or local action, requirements, regulation
The materials may be shipped from different points and in separate allotments, and each shipment
separate transaction with respect to the terms of payment specified herein. If the Purchaser delays
than sixty (60) days after notification that the Company is ready to proceed therewith, fifty pe
entire contract price shall immediately become due and payable. If the Purchaser delays shipments
(30) days after any materials are ready for shipment under a schedule previously approved by t
balance of the contract price shall immediately become due and payable. If the Purchaser def
as provided herein, the Company may, at its option, withhold further shipments until the defa



ETT0000663

ITEM I - MATERIAL

Includes necessary tile and castings to construct five convection arches as shown on Enjay Sketch CE-1804-4A. Construction to consist of Bigelow-Liptak special refractory shapes, first quality material, alloy supporting hangers, carbon steel hooks and pipe. The arch hangers will be manufactured of 310 (25-20 chrome-nickel) alloy in the areas from the hot end through tube #10, and in 304 (18-8 chrome-nickel) alloy from tube #10 through the cool end.

Further included is necessary insulation over the entire arch construction consisting of 4" of MTB block (multiple thermal barrier) consisting of 3½" of 1900 deg F block insulation and 1/2" of 2200 deg F ceramic board from the hot zone through tube #6; 3" of 1900 deg F block insulation from tube #6 through tube #12, and 2" of 1900 deg F block insulation from tube #12 through the cool end.

Above quotation does not include any structural supporting steel for the arch construction.

PRICE: ITEM I - $30,680

NOTE: The above price takes into account that three areas 5'-6" x 10'-0" each, in the northeast end of the convection zone, will not be replaced.

Estimated Weight of Refractories	123,000 lbs.
Estimated Weight of Metallics	10,500 lbs.
Estimated Weight of Insulation	8,000 lbs.

For your convenience, we wish to list the following repair prices for the specialty items in the abovementioned arches:

8" Tile Shape - First Quality	$2.06 ea.
12" " "	3.10 ea.
304 Alloy two-tile Hangers	4.40 ea.
304 Alloy three-tile Hangers	5.00 ea.
310 Alloy two-tile Hangers	5.30 ea.
310 Alloy three-tile Hangers	5.90 ea.
Carbon Steel Hooks	.90 ea.

The above prices are FOB shipping points.

ETT0000644

FORM 130-C WD

The Company warrants that all materials and/or workmanship supplied hereunder will be of good quality. The obligation of the Company under this warranty shall be limited to replacing any materials and/or remedying any workmanship furnished by it hereunder established to be of defective quality within a period of one (1) year from the time of the installation or performance thereof, and the Company shall not be liable for any damage to any other work. No claim of any kind hereunder shall exceed in amount the pro rata price of that part of the materials or workmanship established to be defective. The Purchaser shall give prompt written notice to the Company of observed defects. The Company shall not be liable for back charges incidental to field changes or corrections to materials or workmanship furnished hereunder unless ample opportunity is given the Company to inspect the materials or workmanship claimed to be defective, and then only after the field changes or corrections have been authorized in writing by the Company. This warranty is in lieu of all other warranties, express or implied. No person is authorized to assume for the Company any other liability.

The cost of any special chemical or physical tests or analyses required by the Purchaser shall be added to the contract price specified herein.

The prices quoted herein are based on costs and/or wage rates in effect on the date of this proposal, and in the event of any increase in such costs to the Company, said prices may be increased proportionately. Unless otherwise specified, quotations do not include any excise, use, privilege or sales tax or assessment or any other imposition, exaction or charge now or hereafter imposed by or under the authority of any federal, state or local law, rule or regulation. If any such tax, assessment, imposition, exaction or charge is paid by the Company the same shall, where not prohibited by law, be added to the contract prices. Quotations made with freight allowed are based on published freight rates in effect on the date of this proposal. Any increase therein shall be paid by the Purchaser. Any prepayment by the Company of freight charges shall not affect the obligation of the Company with respect to delivery, and the Company shall not be responsible for loss or damage after the delivery of materials in good order and condition to the carrier or carriers at any point of shipment at which point the risk of loss of the materials shall pass to the Purchaser.

TERMS:

Engineering – One hundred percent (100%) of the pro rata price of engineering services completed each calendar month on or before the tenth (10th) day of the following month.

Materials – Ninety percent (90%) of the pro rata price of materials shipped to the site during each calendar month on or before the tenth (10th) of the following month, and the balance of ten percent (10%) within thirty (30) days thereafter.

Installation – Ninety percent (90%) of the pro rata price of the erection services completed each calendar month on or before the tenth (10th) of the following month and the balance of ten percent (10%) within thirty (30) days after the completion of the work.

Interest at the rate of 1% per month shall become due and payable on any past due balance.

The Company is an equal opportunity employer in accordance with executive order 11246 of Sept. 24, 1965.

This is merely a quotation submitted for acceptance by the Purchaser within ten (10) days from the date hereof and shall not constitute an effective contract unless such acceptance is endorsed hereon and the same is delivered to the Company within said ten (10) day period and is subsequently approved in writing by an executive officer of the Company at its principal office at Southfield, Michigan. Any such acceptance shall be limited to the exact terms of this proposal, and only a consent signed by such an executive officer shall bind the Company to any different terms hereafter transmitted in any form of the Purchaser. Any action for breach of any contract resulting herefrom must be commenced within one (1) year from the date of any such breach.

Accepted:

_____ 19____

_____

_____

BIGELOW-LIPTAK CORPORATION

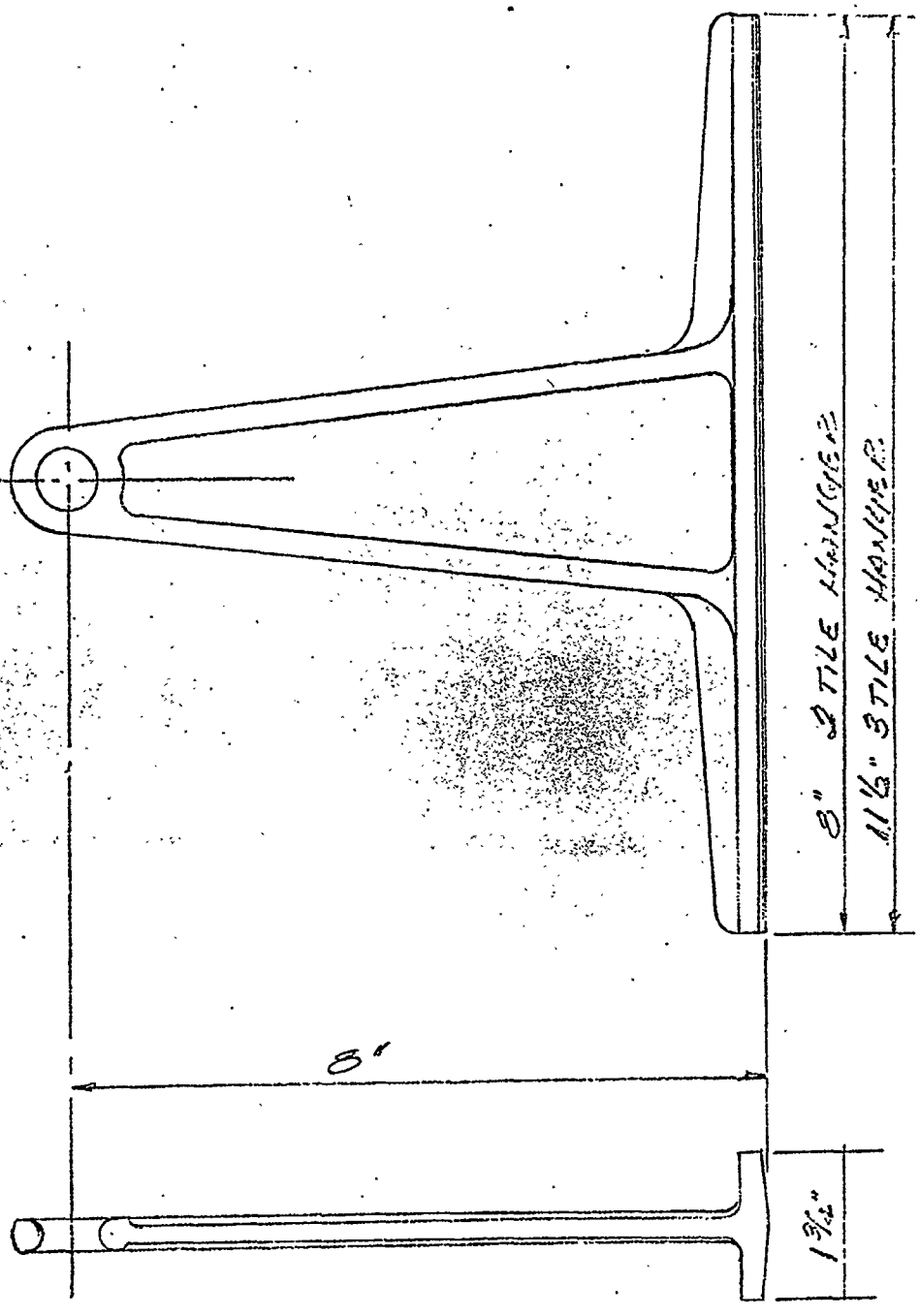
By R. Stelton Dendy

R. S. Dendy/ls

FORM 130-B WD



ETT0000665



ETT0000666

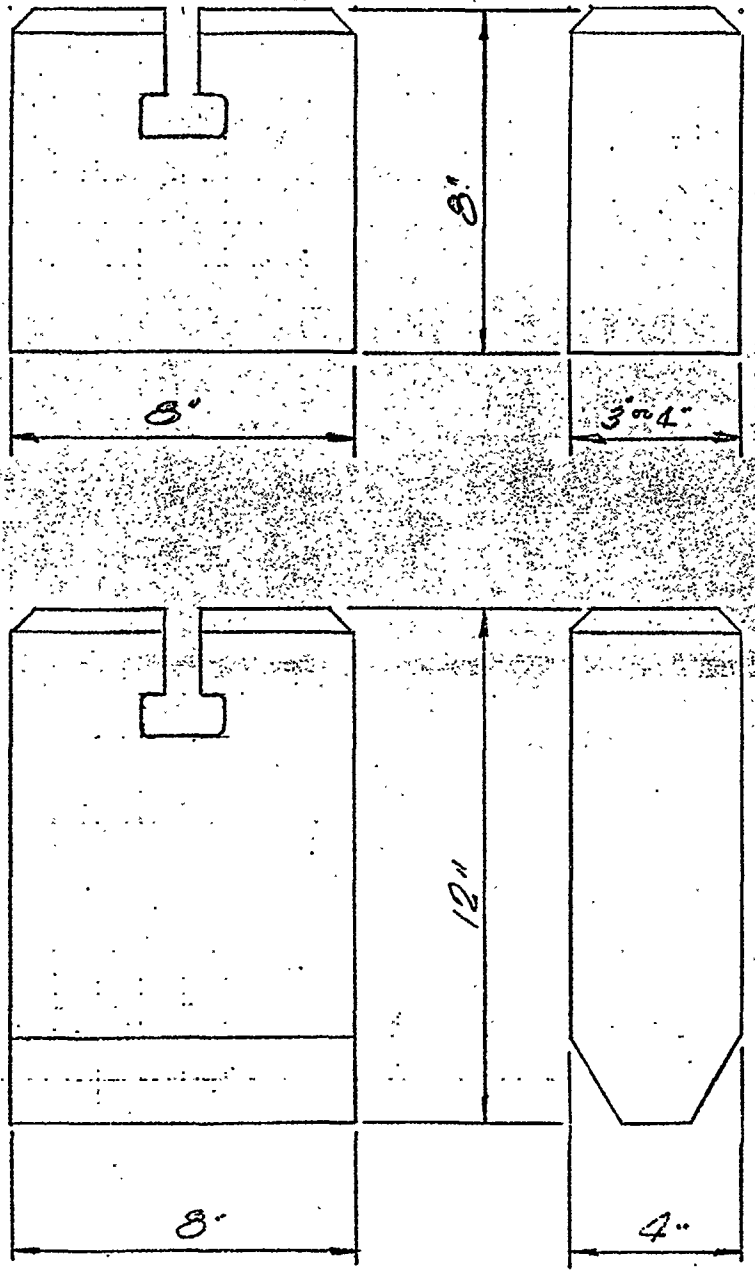
REF. NO. DA 3152-A-1

SUBJECT ENJAY CHEMICAL BY [illegible] DATE 3/26/72 SHEET NO. ____ OF ____

CHKD. BY ____ DATE ____ DRWG. NO. ____

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SF 10222A



ETT0000667

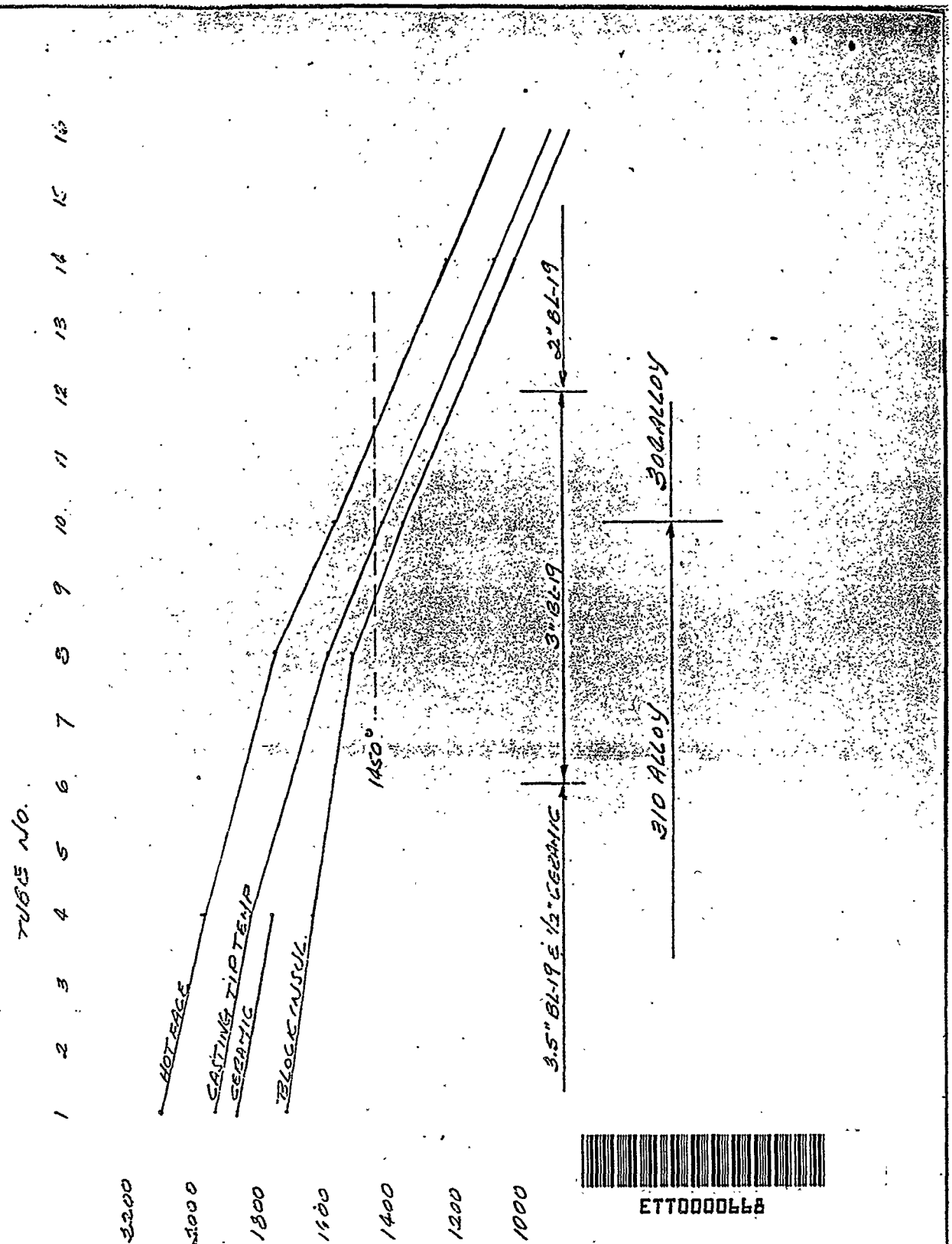
TYPICAL TILE DETAIL

SUBJECT ENJAY CHEMICAL BATON ROUGE BY OWS DATE 2/14/72 REF. NO. PA-3132-A-

CHKD. BY DATE SHEET NO. OF DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SF 10227A



ETT0000668

REF. NO.

SUBJECT BY DATE SHEET NO. OF

CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SP 107224

TEMPERATURE GRADIENT 70° AMBIENT NO WIND

LINING CONSISTS OF:-

8" SUSP. TILE LINING

4" MTB. BLOCK - 3.5" BL-19 & ½" CERAMIC

$$Q = \frac{2100 - 200^\circ}{\frac{8}{10} + \frac{.5}{1.09} + \frac{3.5}{.7}} = \frac{1900}{6.25} \quad 304 \text{ BTU/SQ FT/HR}$$

.8 .458 5.0

304 BTU/SQ FT/HR = 200°

HOT FACE		2100°
CER. FACE	2100 - (.8X304) 240°	1860°
BL-19 FACE	1860 - (.458X304) 140	1720°
COOL FACE	1720 - (5.0X304) 1520	200°

CASTING TIP TEMP

TEMP. LOSS THRU SERVICE LINING 240° ÷ 8" = 30°/INCH

CASTING TIP PENETRATES INTO TILE 2½" ∴

ADD 2.5" X 30° = 75° TO 1860° (CERAMIC FACE) · 1935° (LESS DRAINAGE)

CONDITION @ TUBE NO 1



ETT0000669

REF. NO. [illegible]

SUBJECT ENJAY CHEMICAL BY [illegible] DATE SHEET NO. 1 OF

BATON ROUGE CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SP 102774

TEMPERATURE GRADIENT 70° AMBIENT NO WIND

LINING CONSISTS OF
8" SUSP TILE LINING
4" MTB BLOCK - 3.5" BL-19 & ½" CERAMIC

$$Q = \frac{1975^\circ - 195^\circ}{8 + .5 + 3.5} = \frac{1780}{6.6} \quad 270 \text{ BTU}$$

9.9	1.07	.66
.81	.468	5.32

270 BTU/SQ FT/HR = 195°

HOT FACE			1975°
CER. FACE	1975 - (.81X270)	215°	1760°
BL-19 FACE	1760 - (.468X270)	125	1635°
COOL FACE	1635 - (5.32X270)	1440	195°

CASTING TIP TEMP.
TEMP. LOSS THRU SERVICE LINING 215°÷8" = 27°/IN.
CASTING TIP PENETRATES INTO TILE 2.5" ∴
ADD 2.5"X27° = 68° TO 1760° (CERAMIC FACE) 1828° (LESS DRAINAGE

CONDITION @ TUBE NO 4

ETT0000670

REF. NO. DA-3132-A-1
SUBJECT ENJAY CHEMICAL BY [illegible] DATE SHEET NO. 2 OF
BATON ROUGE CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SP 15272A

TEMPERATURE GRADIENT — 70° AMBIENT NO WIND

LINING CONSISTS OF

8" SUSP. TILE LINING

3" BL-19

$$\frac{D = 1750° - 190 = 1560°}{\frac{8.0}{9.6} \quad \frac{3.0}{.63}} \quad \frac{}{5.60} \cdot 280 \text{ BTU.}$$

.35 4.75

280 BTU/SQ FT/HR = 190°

HOT FACE		1750°
BL-19 FACE	1750 - (.85 × 280) 235	1515°
COOL FACE	1515 - (4.75 × 280) 1325	190°

CASTING TIP TEMP.

TEMP. LOSS THRU SERVICE LINING = 235° ÷ 8 = 30°/IN

CASTING TIP PENETRATES INTO TILE 2½" ∴

ADD 2.5 × 30 = 75° TO 1515° (BL-19 FACE) 1590° (LESS DRAINAGE)

CONDITION @ TUBE NO 8



ETT0000671

REF. NO. PA-5152-1-1

SUBJECT ENJAY CHEMICAL BY Reid DATE SHEET NO. 3 OF

BATON ROUGE CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SF 102274

TEMPERATURE GRADIENT 90° AMB NO WIND

LINING CONSISTS OF
8" SUSP. TILE LINING
3" BL-19

$$Q = \frac{1575° - 175°}{\frac{8.0}{9.0} + \frac{3.0}{.6}} = \frac{1400}{5.89} = 238 \text{ BTU}$$

.89 5.0

238 BTU/SQ FT/HR = 175°

HOT FACE		1575°
BL-19 FACE	1575° - (.89 x 238) 210	1365°
COOL FACE	1365° - (5.0 x 238) 1190	175°

CASTING TIP TEMP.
TEMP. LOSS THRU SERVICE LINING = 210° ÷ 8° 26°/IN.
CASTING TIP PENETRATES INTO TILE 2.5" ∴
ADD 2.5 x 26° = 65° TO 1365° (BL-19 FACE) 1430° (LESS DRAINAGE)

CONDITION @ TUBE NO 10

ETT0000672

REF. NO. PA-3182-A1

SUBJECT ENJAY CHEMICAL BY DAS DATE SHEET NO. 4 OF
BATON ROUGE CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SP 10272A

TEMPERATURE GRADIENT — 40°AMB NO WIND

LINING CONSISTS OF
8" SUSPENDED LINING
2" BL-19

$$Q = \frac{1225 - 170^\circ}{\frac{8.0}{8.2} + \frac{2.0}{.51}} = \frac{1055}{4.89} = 215$$

.975 3.92

215 BTU/SQ FT/HR = 170°

HOT FACE		1225°
BL-19 FACE	1225 - (.975 x 215) 210	1015°
COOL FACE	1015 - (3.92 x 215) 845	170°

CASTING TIP TEMP
TEMP. LOSS THRU SERVICE LINING = 210° ÷ 8" = 26°/IN
CASTING TIP PENETRATES INTO TILE 2½" ∴
ADD 2.5" x 26° = 65° TO 1015' (BL-19 FACE) = 1080° (LESS DRAINAGE)

CONDITION @ TUBE NO 14



ETT0000673

REF. NO. PA-5152-A-1
SUBJECT ENJAY CHEMICAL BY [illegible] DATE SHEET NO. 5 OF
BATON ROUGE CHKD. BY DATE DRWG. NO.

BIGELOW-LIPTAK CORPORATION, SOUTHFIELD, MICHIGAN 48075

SP 102724