



I, PAUL SCHERER, residing at 644 7th Avenue, Carlstadt, New Jersey, hereby certifies as follows:

1. I am a former employee and estimator with the Robert A. Keasbey Company from April 15, 1948 to June 30, 1987.

2. Exhibits A through S, attached hereto and referred to herein are true and accurate copies of the originals which were either created or received by Robert A. Keasbey during the course of my employment with Robert A. Keasbey. These exhibits were created or received at or about the time reflected therein, and were received by me in the normal course of Robert A. Keasbey business. Further, I was authorized by Robert A. Keasbey to either create or receive these exhibits.

3. Exhibit A is a standard Babcock & Wilcox type of specification, which is furnished with every job detailing insulation, refractory material, lagging materials, etc. While certain aspects of these specifications may change from job to job, the standard portions do not.

4. Exhibit B is a true and accurate copy of a Baldwin Ehret Hill 1964 catalogue received by me while I was working with Robert A. Keasbey.

5. Exhibit C is a true and accurate copy of a 1950 catalogue of Detrick Insulations.

6. Exhibit D is a true and accurate copy of a Ruberoid catalogue entitled, "Ruberoid Pressure Molded Calsilite."

7. Exhibit E is a true and accurate copy of a R & I catalogue entitled, "Super #3000 Refractory Cement."

8. Exhibit F is a true and accurate copy of a 1953 Refractories and Insulations catalogue for Refractory & Insulation Corporation.

9. Exhibit G is a true and accurate copy of a 1946-1947 catalogue of Philip Carey entitled, "Heat Insulation for Industry." This catalogue was handed to me when I first started working for Robert A. Keasbey in 1948.

10. Exhibit H is a true and accurate copy of a reference data brochure of The Philip Carey Mfg. Company used by me during the course of my employment at Robert A. Keasbey.

11. Exhibit I is a true and accurate copy of a Keasbey & Mattison catalogue entitled, "Fiberglas Pipe-Blanket-Duct Liner Insulations."

12. Exhibit J is a true and accurate copy of the Carey Industrial Insulation Manual of The Philip Carey Mfg. Company which I used during the course of my employment at Robert A. Keasbey.

13. Exhibit K is a true and accurate copy of the Johns-Manville catalogue entitled, "Thermobestos Pipe and Block Insulation," which I referred to during the course of my employment as an estimator for Robert A. Keasbey.

14. Exhibit L is a true and accurate copy of the 1983 edition of Commercial and Industrial Insulation Standards.

15. Exhibit M is a true and accurate copy of the Carey brochure entitled, "Insulating Cements and Weatherproof Coating."

16. Exhibit N is a true and accurate copy of a Philip Carey brochure entitled, "Carey Asbestos Fiber and Shorts."

17. Exhibit O is a true and accurate copy of a portion of a Philip Carey brochure entitled, "Asbestos Paper and Rollboard."

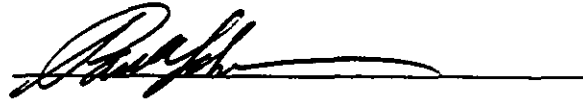
18. Exhibit P is a true and accurate copy of a portion of a Philip Carey brochure entitled, "Pipefittings and Flanges."

19. Exhibit Q is a true and accurate copy of a portion of an engineering data sheet, dated April, 1970 from Owens Corning entitled, "Kaylo 10 and Kaylo 20 Thickness Standards, Nesting Sizes."

20. Exhibit R is a true and accurate copy of a Babcock & Wilcox September 1, 1956 catalogue of insulation instructions.

21. Exhibit S is a true and accurate copy of a brochure entitled, "Scale Model Powerplant."

I hereby certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements made by me are wilfully false, I am subject to punishment.


PAUL SCHERER

DATED: FEBRUARY 23 , 1990

SPECIFICATIONS & DRAWINGS

Contract 586-0447 (UPGD) 546-0881 (IPGD)

Existing (PFI-2845)

Customer P.O. No. 3-03497

for

Consolidated Edison Co. of New York, Inc.

59th Street Station

New York, New York

see L&L C 2814 for previous unit

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

TAB INDEX INSULATION LAGGING

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

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THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION
ENGINEERING DEPARTMENT

TO: CONSOLIDATED EDISON CO. OF
NEW YORK, INC.

DATE: JULY 17, 1984

BRIL SPECIFICATIONS for: One (1) B&W PFI-28-28, indoor installation, 775 PSI design, 750°F S.H. outlet temperature.

Existing PFI-2845

586-0447 (UPGD)

Contract No.: 546-0881 (IPGD)

Customer & Plant Location Consolidated Edison Co. of
New York, Inc.
59th St. Station
New York, New York

Customer P.O. No. 3-03497

SCOPE:

No Mat'l., No Labor

These specifications cover the furnishing of material only by others for complete application of insulation for surfaces outlined on the following pages and in accordance with the reference drawings listed and represent The Babcock & Wilcox Company's standard and best recommendations. However, since this application is not in B&W's contract, these specifications are only intended as a guide to the Erection Superintendent.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

SETTINGS
310111E
310112E
310113E
310114E
310115E
310116E

NOTE: For Key Arrangement,
Section and Applica
tion Dwgs. Numbers,
Refer to Index to
Drawings in Folder
Pages.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

INSULATION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

MATERIALS SPECIFICATIONS

For areas requiring materials to be considered in this specification, refer to attached prints of the drawings which constitute a part of this specification.

Attached hereto, as part of this requirement, are some general material specifications marked "M" for all types of boilers. From this "M" specification, only the paragraphs:

1M, 2M, 3M, 4M, 5M, 6M, 7M, 9M, 10M, 12M, 12Ma, 14M, 15M, 16M, 19M, 21M, 23M, 25M, 28M, 29M, 30M, 31M, 31Ma, 33M, 35M, 38M, 45M, 47M, 48M, 49M, 50M, 51M, 52M, 54M, 55M, 55Mb, 56M, 56Ma, 57M, 58M, 59M, 60M, 61M, 63M, and 65M.

are to be considered applicable and required for this specific job.

BABCOCK & WILCOX
INDUSTRIAL & MARINE DIVISION

370022
IAS-7
1-10-8-80

SPECIFICATIONS FOR INSULATION MATERIALS

GENERAL

- 1M These specifications are to provide an economical and well designed insulation job. The Company will consider suggested changes in material offered for the purpose of improving or making the design more economical. The base specification as shown, should be quoted with changes quoted as alternates. The Company reserves the right to approve suggested changes before their inclusion in this contract. The Contractor must submit sketch showing attachment detail and procedure for approval before contract is awarded.

CONTRACT

- 2M Questions concerning materials as specified in this contract are to be resolved with the Company prior to the signing of this contract.
- 3M The Contractor upon signing this contract, covenants and agrees to the requirements of this contract.
- 4M The Contractor shall not be entitled to any monetary compensation over and above that stipulated in the contract as the result of not having fully understood the requirements as defined in this contract. The Contractor shall at no time proceed to make changes to the specified requirements of this contract without written authority from the Company.

MATERIAL

- 5M Where application drawings differ from contract drawings, written specifications drawings, key arrangement drawings, section number drawings, follow the latter.
- 6M All insulating material shall be of such quality to be suitable for the purpose intended by the contract and of such durability as to be capable of giving effective and reliable service under normal operating conditions.
- 7M No substitutions for material specified shall be made without approval of the Company.
- 8M It is not permitted to substitute medium temperature blocks for high temperature blocks.
- 9M The Contractor shall provide weather protection and insurance for the storage of all insulation materials at the job site prior to application of same where such protection is necessary,

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION
SPECIFICATIONS FOR INSULATION MATERIALS

BY (IPGD)
1A5-I
2a/2-14-83

CLASS	TYPE	SPECIFICATIONS	
		MATERIAL SPECIFICATIONS	TEMP. USE LIMIT - °F
BLOCK OR BLANKET		B&W APPROVED	
17H High-Temperature Block	Diatomaceous Earth	ASTM C-517 (Type 2)	1900
18H High-Temperature Block	Mineral Fiber	ASTM C-612 (Class 5)	1800
19H Medium Temp. Block	Calcium Silicate	ASTM C-533	1200
20H Medium Temp. Block	Expanded Perlite	ASTM C-610	1200
21H Medium Temp. Block	Mineral Fiber	ASTM C-612 (Class 5)	1200
22H DELETED			
23H Intermediate Temp. Block	Mineral Fiber 8 lb/ft ³ NOM	ASTM C-612 (Class 3)	850
23Ha Intermediate Temp. Block	Mineral Fiber 3 lb/ft ³ NOM	ASTM C-612 (Class 3)	850
24H Blanket Insulation (TIV)	Mineral Fiber 1.08/ft ³ NOM	TIV - Type I	1000
25H Blanket Insulation	Mineral Fiber 8 lb/ft ³ NOM	ASTM C-592 (Class II)	1200
26H Blanket Insulation	B&W Lanowool		2300
26Ha DELETED			
PIPE INSULATION		B&W APPROVED	
27H Medium Temp. P/C	Expanded Perlite	ASTM C-610	1200
28H Medium Temp. P/C	Calcium Silicate	ASTM C-533	1200
29H Medium Temp. P/C	Mineral Fiber (Preformed)	ASTM C-547 (Class 3)	1200
30H Medium Temp. P/C	Mineral Fiber (Mat faced) 12#/ft ³	ASTM C-592 (Class II)	1200
30Ha Low Temp. P/C	Glass Fiber (Preformed)	ASTM C-547 (Class I)	370
CEMENTS		B&W APPROVED	
31H High Temp. Plastic Insulating Cement	Mineral Fiber	ASTM C-195	1800
31Ha Medium Temp. Insulating and Finished Cement	Mineral Fiber	ASTM C-649	1200

ASTM classes and specifications taken from ASTM Part 18, 1977

* Maximum cold face use limit - 300°F

† For Package Boilers

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

BY (IPGD)
IAS-1
3a 6-29-78

SPECIFICATIONS FOR INSULATION MATERIALS

CLASS	TYPE	SPECIFICATIONS	
		MAT'L SPECS.	TEMP. USE LIMIT - F
COVERINGS			
40M Glass Cloth for Seal Coats	Glass Fabric - Open Weave, 26x12 Lino Weave w/Syton Finish		500
41M Insulation Jacketing Fabrics for Piping	Canvas	8 oz/sq. yd. Min. Wt.	200
42M DELETED			
43M DELETED			
44M Mastic Coating	Emulsion or Cutback Type		250
45M Mastic Coating	Synthetic Type	B&W Approved Material	250

- 46M Contractor shall list in detail the square foot quantities and size of all materials necessary to insulate each specific area designated on the various section drawings. This is necessary to enable us to evaluate the bids, and the applicator to install the material on the areas designated by the materials.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

BY (IPGD)
IAS-I
4/10-8-82

SPECIFICATIONS FOR INSULATION MATERIALS

- 47M All materials required for proper support and fastening of insulation to all surfaces shall be provided by the contractor. The fastener description must be submitted with the quotation.
- 48M All damper frames integral with insulated flues or ducts, require insulating. The damper bearing shall not be covered with insulation.
- 49M When flat insulation block has a compressive strength of less than 50 psi at 10 per cent deformation, (including all mineral wool base block), it is required that light sheet metal plates or angles shall be used under lacing wire, where the wire tends to cut into the block.
- 50M Multiple layers of insulation block are required where so shown on drawings, or so specified by this contract.
- 51M When two layers of insulation block, as well as two layer sectional and/or segmental insulation of different temperature limits are used on the same area, the material having the higher limit of temperature must be placed against the hottest surface so that the lower limit material is protected at all points, and the blocks of outer layer shall stagger vertically and longitudinally the blocks of the inner layer. If lacing wires are used for support of insulation block same are to be applied over outer layer of block only unless otherwise stated.
- 52M Inner insulation support for insulation shall be furnished by the insulation contractor. It shall be 22 M.S.G. cold rolled finished corrugated sheet steel (not galvanized) for temperatures up to 850°F and 22 M.S.G. stainless steel corrugated sheet of any 300, 400 or 500 alloy for temperatures above 850°F. Supports for inner insulation support to be 6'-0" maximum centers. The inner insulation support shall be fastened with three (3) plug welds per width of sheet. An alternate system shall be Hilti-Fastener system or equivalent. Corrugated sheet shall have corrugations at a pitch of 2-1/2" and a depth of 1/2".
- 53M All surfaces of boiler flues, ducts, hopper, housings, etc. shall have clips welded studs or other suitable means, spaced on proper centers for attachment of the insulation and inner insulation supports. All materials required for proper support and fastening of the insulation and inner insulation supports shall be provided by the Contract.
- 54M Where insulating block is applied to inner insulation support over stiffeners, insulating block is also required to be applied at full depth back to the casing at expansion joints and all openings such as doors, etc.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPGD)
1A5-I
5/10-28-81

SPECIFICATIONS FOR INSULATION MATERIALS

- 56M All expansion joints integral with insulated flues and ducts shall be insulated. Except Non-Metallic Expansion Joints.
- 56Ma Thermal barriers are required in all open areas or voids, between insulation and hot surfaces, to limit any vertical height of the space to a maximum of 10'. Minimum vertical distance between thermal barriers shall be 5'. Maximum vertical distance between thermal barriers shall be 10'.

TUBES & PIPE

- 57M Refer to B&W charts 3Y-3U-2/ & 3/ for insulation to be applied on exposed piping, tubes, valves, bend, flanges and fitting when this information is not shown on the insulation drawings. Pin studding to tube or pipe bend radii surface other than to the neutral axis is not permitted.
- 58M Where tubes or pipes are insulated as a group and vertical runs are 10'-0" or more, thermal barriers will be required on 10' maximum centers. Barriers will consist of blanket insulation packed tightly between and around all pipes and tubes and supported by lath, annealed carbon steel wire or annealed wire, copper wash coated wire laced between and around the pipes or tubes.
- 59M Provide insulation for all Company connections to the Company terminals including mountings, nozzles, valves, flanges, fittings, pipe bends and piping for lines or connections where temperature of such lines or connections require insulating. See attached prints of insulation drawings, setting drawings, reference drawings, etc., and/or this insulation contract for indication of lines and/or connections with mountings, nozzles, valves, flanges, fittings and piping. Insulation shall be applied in two layers where so specified. Drum mountings: lines, valves, and instruments must be insulated as shown on specific mounting drawings for proper function of instruments, even if their location is beyond B&W Company's terminal Ref. 3Y-6A-1U.
- 60M Fittings, flanges and valves on pipe sizes 3-1/2" or less, are covered with high temperature asbestos free insulating cement, bringing the total thickness to that of the insulation on the adjacent piping. Fittings, flanges and valves on pipe sizes 4" or over are insulated with block or pipe insulation with a finish coat of hydraulic setting finishing cement to create a smooth finish.
- 61M For IPS diameters up to and including 18" diameter, the block insulation can be of the molded, sectional or segmental type. Above 18" IPS diameter, the block insulation can be of the flat type.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION
ENGINEERING DEPARTMENT

TO: CONSOLIDATED EDISON CO. OF
NEW YORK, INC.

DATE: JULY 17, 1984

BRIL SPECIFICATIONS for: One (1) B&W PFI-28-28, indoor
installation, 775 PSI design, 750° F S.H. outlet temperature.

Existing PFI-2845
586-0447 (UPGD)

Contract No.: 546-0881 (IPGD)

Customer & Plant Location	Consolidated Edison Co. of New York, Inc. 59th St. Station New York, New York
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Customer P.O. No. 3-03497

SCOPE:

No Mat'l., No Labor

These specifications cover the furnishing of labor by others for complete application of insulation for surfaces outlined on the following pages and in accordance with the reference drawings listed and represent The Babcock & Wilcox Company's standard and best recommendations. However, since this application is not in B&W's contract, these specifications are only intended as a guide to the Erection Superintendent.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

INSULATION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

LABOR SPECIFICATION

For areas requiring application labor to be considered in this specification, refer to attached prints of the drawings which constitute a part of this specification.

Attached hereto, as part of this requirement, are some general labor specifications marked "L" for all types of boilers. From this "L" specification, only the paragraphs:

1L, 2L, 3L, 4L, 5L, 6L, 7L, 8L, 9L, 10L, 11L, 12L, 13L, 14L, 15L, 16L, 17L, 19L, 20L, 21L, 22L, 23L, 24L, 25L, 26L, 27L, 28L, 29L, 30L, 31L, 32L, 34L, 35L, 36L, 37L, 38L, 39L, 40L, 41L, 42L, 43L, 44L, 45L, 47L, 49L, 50L, 51L, 53L, 54L, 56L, 57L, 58L, 59L, 60L, 61L, 62L, 63L, and 64L

are to be considered applicable and required for this specific job.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

BY (IPGD)
1A5-11
1/10-8-82

SPECIFICATIONS FOR INSULATION LABOR

GENERAL

- 1L These specifications are to provide for the economical application of insulation material. The Company will consider suggested changes in application methods offered for the purpose of improving the design or making the application more economical. The base specification as shown, should be quoted with the changes quoted as alternates. The Company reserves the right to approve suggested changes before their inclusion in this contract. The Contractor must submit sketch showing attachment detail and procedure for approval before contract is awarded.
- 2L Questions concerning application methods as specified in this contract are to be resolved with the Company prior to the signing of this contract.
- 3L The Contractor upon signing this contract, covenants and agrees to the requirements of this contract.
- 4L The Contractor shall not be entitled to any monetary compensation over and above that stipulated in the contract as the result of not having fully understood the requirements as defined in this contract. The Contractor shall at no time proceed to make changes to the specified requirements of this contract without written authority from the Company.
- 5L Where application drawings differ from contract drawings, written specification pages, key arrangement drawings, section number drawings, follow the latter.
- 6L All materials required for proper support and fastening of the insulation shall be installed by the Contractor. This will include clips, insulation pins, speed clips, welded studs, tie wire, or other suitable means. All attachments shall be on proper or specified centers for supporting insulation.
- 7L Inner insulation support for insulation shall be installed by the Contractor. Side lap of corrugations is not required, but sheets must be tightly butted. End laps, where required, should be a minimum of 3". Inner insulation support should be plug welded three (3) times per width of sheet to supports installed on six foot maximum centers. An alternate system shall be the Hilti-Fastener system or equivalent based on fastener location same as above.
- 8L All fasteners and intermediate supports for mounting the inner insulation support shall be installed by the insulation contractor.

BABCOCK & WILCOX
INDUSTRIAL & MARINE DIVISION

SY (182)
IAS-II
2a, 10-8-61

SPECIFICATIONS FOR INSULATION LABOR

- 19L Insulation block next to flue, duct, and casing stiffeners or flanges should be slotted to fit over and close up voids. To prevent breakage, block over angle or channel stiffeners shall not be less than 1" thick. Block over bar stiffeners may be 1/2" thick.
- 20L All field welds on inner pressure casing (for boiler units with pressure furnace only) must remain uncovered creating a slot of approximately 2" wide full depth in insulation until after casing tightness test work is complete. Upon completion of casing test, this slot void is to be filled full depth with high temperature plastic insulation or insulation of the same material as adjoining area.
- 21L All finished insulation block application and method of supporting same is required to be approved by B&W Co. representative before starting insulation block of finish coat, sealing compound, lagging, or casing.
- 22L All open joints, voids, holes or cracks appearing after application of insulation block must be filled full depth of opening, with insulating cement made from the same material (or equal) as insulating block.
- 23L An outer metal lagging supplied and applied by others will cover the insulation in areas designated on the drawings. On all areas, except boiler and furnace walls between buckstays and piping, this lagging will be supported by pins, studs, or other approved supports welded on appropriate centers for the loading requirements. The supports will be supplied and applied by others. The insulation is to be applied over the lagging supports so as to permit them to protrude for lagging attachment.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y (IPGD)
1A5-II
3/2-14-81

SPECIFICATIONS FOR INSULATION LABOR

- 24L Where insulating block is applied over inner insulation support outside of stiffeners, insulating block is also required to be applied at full depth back to the casing at expansion joint and all openings, such as doors, etc.
- 25L The top surfaces of insulation on top of all horizontal flues and ducts, etc., on outdoor areas, where water can lay must be sloped 1/4 inch per foot to permit drainage construction. This may be accomplished by maintaining minimum required thickness of insulation at the lowest points and increasing insulation thickness to provide a 1/4 inch per foot slope or by providing a built up inner insulation support under the insulation at a slope of 1/4 inch per foot and using a uniform thickness of insulation. When the top plates of flues and ducts are already sloped, no change occurs in the thickness of insulation blocks on same.
- 26L All stiffeners or flanges of casing, flues or ducts shall be covered with insulation. Outstanding legs of stiffeners, flanges or other metal parts projecting beyond the outside of the insulation face shall be covered with insulation of not less than 1 inch thickness at all points. For flues and ducts requiring 1 inch of insulation, see appropriate application drawing for approved installation.
- 27L For flues or ducts, 33 inch diameter and greater, the block insulation is to be applied the same as to flat flues and ducts.
- 28L For ducts, flues, etc., if insulation drawings do not specify exact areas for insulation next to plate, and exact areas for insulation on inner insulation support outside of stiffeners; then refer to details and arrangements of ducts and/or flues etc., (prints attached hereto) which clarify these two classifications.
- 29L All damper frames integral with insulated flues or ducts, require insulating. The damper bearings shall not be covered with insulation. The insulation around the bearings shall be tapered away from the bearing, packing gland or air seal thereby providing access to these components for maintenance or adjustment.
- 30L Insulation on headers is to cover over cup type welded handhole fittings, level with adjacent insulation. The insulation shall be arranged to provide a removable plug or block of sufficient size to provide access for removal and rewelding of the handhole fittings.
- 31L Gasketed handholes in headers, and man holes in drums, are to be left uncovered.
- 31La Thermal barriers are required in all open areas or voids, between insulation and hot surfaces, to limit any vertical height of the space to a maximum of 10'. Minimum vertical distance between thermal barriers shall be 5'. Maximum vertical distance between thermal barriers shall be 10'.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION
SPECIFICATIONS FOR INSULATION LABOR

2Y(IPG)
1A5-II
4a/12-1-81

- 38L Fittings, flanges, and valves on pipe sizes 3-1/2 inch or less, are covered with high temperature insulating cement, bringing the total thickness to that of the insulation on the adjacent piping. Fittings, flanges and valves on pipe sizes 4 inch or over are insulated with block or pipe insulation with a finish coat of hydraulic setting finishing cement to create a smooth finish.
- 39L All rods, pipes or tubes piercing through enclosure casings of boiler are to be insulated at the casing such as to be air infiltration leak-proof, or heat leak-proof, depending on which case applies to specific enclosure.
- 40L Where supply tubes are routed through insulation of boiler walls, square off around each tube with high temperature insulating cement.
- 41L When completed, the insulation on all piping shall be entirely weather protected, and shall be capable of accommodating any thermal movements without destruction or distortion of the insulation or weather protection.
- 42L For IPS diameters up to and including 18 inch diameter, the pipe insulation can be of the molded, sectional or segmental type. Above 18 inch IPS diameter the pipe insulation can be of the flat type.
- 43L As far as possible all pipe or tube insulation shall be applied in sectional or segmental form. Cracks 1/16 inch and over which occur after application shall be filled with high temperature plastic insulation.
- 44L Covering on vertical pipes should be supported in such a manner as to prevent slipping or contraction.
- 45L For 10 inch IPS or over (pipe and/or tubes) there is required in the insulation proper heat leak-proof expansion joints for every 9 feet - 0 inch of straight run and for each bend to correspond with 1 inch thermal expansion of tube or pipe.

RABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPC)
1A5-II
5/6-30-78

SPECIFICATIONS FOR INSULATION LABOR

- 46L There will be electric cable or steam pipe "tracing" on piping as specified. The contractor shall provide insulation having proper inside diameter to accommodate same.
- 47L Permanent thermocouples must be insulated per Dwg. 97101A.

ALUMINUM METAL JACKETING FOR PIPING

- 48L Metal jacketing for all runs of tubes and pipes shall be corrosion resistant aluminum alloy .016" thick jacketing with a plain mill or smooth finish. The jacketing shall have a factory applied polyethylene and kraft moisture barrier or an approved equal attached to the inside. 3/8" x #7 self-tapping aluminum sheet metal screws shall be used on 6" centers when attaching the metal jacketing. Bends, fittings and valves shall be covered with similar metal jacketing.

SHEET METAL JACKETING FOR PIPING

- 49L Metal jacketing for all runs of tubes and pipes shall be corrosion resistant steel .010" thick jacketing with a plain mill or smooth finish. The jacketing shall have a factory applied polyethylene and kraft moisture barrier or an approved equal attached to the inside. 3/8" x #7 self-tapping cadmium plated carbon steel sheet metal screws shall be used on 6" centers when attaching the metal jacketing. Bends, fittings and valves shall be covered with similar metal jacketing.
- 50L All bundled piping and tubes are to have a metal lagging finish that will be supplied and applied by others.
- 51L A vapor barrier is required over insulation which will be covered by metal lagging less than .032" aluminum or #20 Msg galvanized steel.

FINISH COATS

- 52L When finish cement coat is under lagging, grooving in finish cement is not required.

COVERINGS

- 53L For exposed to weather rounds up to and including 14" OD, all joints in the covering shall be lapped at least 3" and all horizontal laps shall be turned downward to shed water. Side laps on vertical piping are to be sealed with cement.
- 54L All insulation shall be thoroughly dry prior to application of any weather protection material.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPG)
1A5-11
7/10-11-82

SPECIFICATIONS FOR INSULATION LABOR

- 64L Boiler and other equipment to be covered may be hot at the time of application; however, the following areas must be covered prior to initial firing and prior to continuous service as noted:

1. PRESSURE PARTS

1.1 Areas to be covered prior to initial firing of the unit:

- 1.1.1 All boilers - the principal factor to be considered for insulating boiler pressure parts prior to initial firing is personnel safety. From this standpoint, all pressure parts should be covered. Functional or thermal expansion requirements of the boiler pressure parts do not require the completion of insulation prior to initial firing. Accordingly, the Erection Contractor can be given some leeway in this requirement and the Erector can exercise his judgement.

1.2 Areas to be covered prior to continuous service of the unit:

- 1.2.1 All pressure parts are to be covered.

2. NON-PRESSURE PARTS

2.1 Areas to be covered prior to initial firing of the unit:

- 2.1.1 Entire penthouse
2.1.2 Entire plenums and vestibules
2.1.3 Entire windbox
2.1.4 All plate within three feet of pressure parts
2.1.5 All bellows seals, and plate seal areas
2.1.6 All flue and duct expansion joints, as specified.
2.1.7 Entire precipitator, including flue transitions or nozzles up to the first expansion joint.
2.1.8 Deleted.
2.1.9 Airheater tubular, entire periphery of exterior airheater casing.

2.2 Areas to be covered prior to continuous service of the unit:

- 2.2.1 All non-pressure parts are to be covered.



THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION
ENGINEERING DEPARTMENT

TO: CONSOLIDATED EDISON CO.
OF NEW YORK, INC.

DATE: JULY 17, 1964

BRIL SPECIFICATIONS for: One (1) B&W PFI-28-28, indoor
installation, 775 PSI design, 750°F S.H. outlet temperature.

Existing PFI-2845

586-0447 (UPGD)

Contract No.: 546-0881 (IPGD)

Customer & Plant Location Consolidated Edison Co. of
New York, Inc.
59th Street Station
New York, New York

Customer P.O. No. 3-03497

SCOPE:

No Mat'l., No Labor

These specifications cover the furnishing of material only by others for complete application of lagging for surfaces outlined on the following pages and in accordance with the reference drawings listed and represent The Babcock & Wilcox Company's standard and best recommendations. However, since this application is not in B&W's contract, these specifications are only intended as a guide to the Erection Superintendent.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

LAGGING

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

MATERIALS SPECIFICATIONS

For areas requiring materials to be considered in this specification, refer to attached prints of the drawings which constitute a part of this specification.

Attached hereto, as part of this requirement, are some general material specifications marked "M" for all types of boilers. From this "M" specification, only the paragraphs:

101M, 102M, 103M, 104M, 107M, 108M, 110M, 114M, 115M.

are to be considered applicable and required for this specific job.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPG)
1A5-III
1/12-1-82

SPECIFICATIONS FOR LAGGING MATERIALS - STEEL

GENERAL

201M These specifications are to provide an economical and well designed lagging job. The Company will consider suggested changes in material offered for the purpose of improving or making the design more economical. The base specification as shown, should be quoted with changes quoted as alternates. The Company reserves the right to approve suggested changes before their inclusion in this contract. The Contractor must submit sketches showing attachment detail and procedure for approval before the contract is awarded.

CONTRACT

202M Questions concerning materials as specified in this contract are to be resolved with the Company prior to the signing of this contract.

203M The Contractor upon signing this contract, covenants and agrees to the requirements of this contract.

204M The Contractor shall not be entitled to any monetary compensation over and above that stipulated in the contract as the result of not having fully understood the requirement as defined in their contract. The Contractor shall at no time proceed to make changes to the specified requirements of this Contract without written authority from the Company.

205M Where application drawings differ from the contract drawings, written specification pages, key arrangement drawings or section numbered drawings, follow the latter.

206M All lagging material shall be of such quality to be suitable for the purpose intended by the Contract, and of such durability as to be capable of giving effective and reliable service under normal operating conditions.

207M No substitutions for materials specified shall be made without approval of the Company.

208M The Contractor shall provide weather protection for the storage of all lagging materials at the jobsite prior to application of same where such protection is necessary.

209M Lagging materials are to be packed for shipment to jobsite in such a manner as to protect same against breakage and weather conditions until actually applied. The Contractor shall be responsible for the proper packing to afford this protection and safe arrival of the material in good condition as acceptable for use.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPGD)
1A5-III
3/2-14-83

SPECIFICATIONS FOR LAGGING MATERIALS - STEEL

PIPING - "BUNDLES" - STEEL

220M Piping in "bundles" shall be lagged of 20 Msg galvanized flat sheet.

ATTACHMENTS

221M All attachments such as clips, bands, screws, etc. shall be supplied by the Contractor. The metal screws used shall be cadmium-plated or stainless steel with Neoprene composite, Neoprene aluminum or vinyl washers. Sizes of attachments may be determined by the Contractor from drawings of the insulation to be covered which are supplied as part of this contract.

PENTHOUSE ROOF

222M Outdoor Units

The penthouse roof is to be covered with 18 Msg. galvanized steel lagging. (ASTM Specification A525-76) for a commercial zinc coating of 1.25 oz/ft. The lagging is to be installed in a manner that will keep the panels flat and provide water run-off at all points. Joints between roof panels and roof penetrations are to be sealed by welding and or soldering. Roof gutters, when required by customer, to be furnished by lagging contractor. Downspouts furnished by customer.

222Ma Indoor Units

The penthouse roof is to be covered with ribbed lagging with subgirts and subgirt supports on 2'-0" maximum centers. Additional support should be added at penetrations or if the footing is spongy.

PREPACKED PANELS - STEEL

223M The use of pre-insulated panels or "packed panels" lagging systems shall be of a design and support arrangement as approved by B&W. In general, the above specifications for metal thickness and attachments shall be adhered to. Insulation material and thickness thereof shall be as approved by B&W.

FLASHING - BOILER TO BUILDING

224M The flashing between building structure and boiler lagging shall be equivalent to "Expand-o-Flash" where applicable. All joints and changes of direction shall be suitably lapped and closed to prevent rain leakage.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION
ENGINEERING DEPARTMENT

TO: CONSOLIDATED EDISON CO.
OF NEW YORK, INC.

DATE: JULY 17, 1984

BRIL SPECIFICATIONS for: One (1) B&W PFI-28-28, indoor
installation, 775 PSI design, 750°F S.H. outlet temperature.

Existing PFI-2845
586-0447 (UPGD)

Contract No.: 546-0881 (IPGD)

Customer & Plant Location Consolidated Edison Co. of
New York, Inc.
59th Street Station
New York, New York

Customer P.O. No. 3-03497

SCOPE:

No Mat'l., No Labor

These specifications cover the furnishing of labor by others for complete application of lagging for surfaces outlined on the following pages and in accordance with the reference drawings listed and represent The Babcock & Wilcox Company's standard and best recommendations. However, since this application is not in B&W's contract, these specifications are only intended as a guide to the Erection Superintendent.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

LAGGING

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

LABOR SPECIFICATION

For areas requiring application labor to be considered in this specification, refer to attached prints of the drawings which constitute a part of this specification.

Attached hereto, as part of this requirement, are some general labor specifications marked "L" for all types of boilers. From this "L" specification, only the paragraphs:

101L, 102L, 103L, 104L, 105L, 106L

are to be considered applicable and required for this specific job.

BABCOCK & WILCOX
INDUSTRIAL POWER GENERATION DIVISION

3Y(IPGD)
1A5-V
1/12-1-82

SPECIFICATIONS FOR LAGGING LABOR

DESIGN

101L It is not the intention to specify exact construction in all locations as this is the responsibility of the contractor. However, the designs used by the contractor should have at least the equivalent provision for expansion, strength, and weather tightness as that shown on the drawings.

The Contractor upon signing this contract, covenants and agrees to the requirements of this contract.

The Contractor shall not be entitled to any monetary compensation over and above the stipulated in the contract as the result of not having fully understood the requirements as defined in this contract. The Contractor shall at no time proceed to make changes to the specified requirements of this contract without the written authority from the Company.

When application drawings differ from contract drawings, written specification pages, key arrangement drawings, numbered section drawings, follow the latter.

Standard B&W drawings on metal lagging for various areas are included as a guide to the lagging contractor.

In general, the insulation will present a flat unbroken surface except for wall openings and support rods. It should be recognized by the lagging contractor; however, that stiffeners will sometimes occur to break up the flat surfaces. The lagging must extend over these stiffeners if they are insulated.

The necessary provisions for expansion and contraction is to be provided in the design of the lagging.

Small easily removed panels are to be provided in the metal lagging to allow the removal of handhole closure fittings in all headers that are to be lagged.

Damper bearings shall not be covered with lagging. Lagging around damper bearings shall be arranged so that maintenance or adjustment to the bearing, packing gland or air seal can be accomplished without removing any portion of the lagging.

APPEARANCE

102L It is the responsibility of the lagging contractor to arrange the flanges and ribs of the lagging in consistent vertical lines from top to bottom.

BABCOCK & WILCOX
INDUSTRIAL & MARINE DIVISION

3Y(I&M)
1A5-V
3/10-8-82

SPECIFICATIONS FOR LAGGING LABOR

It is the responsibility of the lagging contractor to maintain satisfactory labor relations on the job.

When instructed by the Company, the contractor shall proceed at the job site with the performance of this contract.

It is agreed by the contractor not to sublet any portion of this contract or assign the same for any money which may become due thereunder.

GENERAL

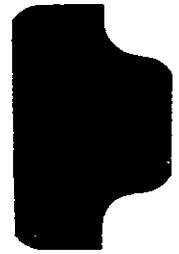
106L Due to job scheduling, portions or all of the metal lagging may have to be installed with the boiler in operation.

107L Welding to Non-pressure Parts.

All welding shall meet minimum acceptable standards of quality workmanship as determined by visual inspection, proper cleaning and/or slag removal should proceed inspection of welds. Welds may be considered unacceptable for any of the following reasons:

- A. Cracks in weld or base material caused by welding.
- B. Incomplete or non-fusion between weld and base metal.
- C. Craters not filled to the full cross section of the weld.
- D. Undercut exceeding 1/32".
- E. Any excessive porosity or spatter which will cause a probable reduction in the expected service life of the weldment.

Welding to pressure parts is to be covered under pressure vessel codes.



THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION
ENGINEERING DEPARTMENT

TO: CONSOLIDATED EDISON CO. OF
NEW YORK, INC.

DATE: JULY 17, 1984

BRIL SPECIFICATIONS for: One (1) B&W PFI-28-28, indoor
installation, 775 PSI design, 750°F S.H. outlet temperature.

Existing PFI-2845
586-0447 (UPGD)

Contract No.: 546-0881 (IPGD)

Customer & Plant Location Consolidated Edison Co. of
New York, Inc.
59th St. Station
New York, New York

Customers P.O. No. 3-03497

SCOPE:

No Mat'l., No Labor

These specifications cover the material and labor for brickwork and refractory for surfaces outlined on the following pages and in accordance with the reference drawings listed and represent The Babcock & Wilcox Company's standard and best recommendations. However, since this material application is not in B&W's contract, these specifications are only intended as a guide to the Erection Superintendent.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

BRICKWORK AND REFRACTORY

MATERIALS AND LABOR SPECIFICATIONS

For areas requiring materials and application labor to be considered in this specification, refer to attached prints of the drawings which constitute a part of this specification.

Attached hereto, as part of this requirement, are some general material and labor specifications marked "M" for all types of boilers. From this "M" specification, only the paragraphs:

301M, 302M, 303M, 304M, 305M, 306M, 307M, 308M, 309M, 311M.

are to be considered applicable and required for this specific job.

BABCOCK & WILCOX
INDUSTRIAL & MARINE DIVISION

ST(L&M)
1A5-VI
1/10-8-82

SPECIFICATIONS FOR BRICKWORK AND REFRACTORY

GENERAL

- 301M The Contractor shall perform all phases of work and supply all materials in an acceptable manner as shown on the drawings submitted with these specifications. The scope of work shall include that shown on revisions to these drawings or additional drawings supplied for clarification or engineering detail. Where drawings are not complete as to detail and a complete closure is not shown because of the lack of such detail it shall be the Contractor responsibility to ascertain such detailed information prior to his submission of a quotation.
- 302M Material furnished by the Contractor shall be unloaded, stored and protected by the Contractor until properly applied.
- 303M The Contractor shall furnish all supervision, labor, tools and equipment including compressed air, scaffolding, dry storage, office and change room facilities necessary to install all materials furnished under these specifications and drawings.
- 304M Water and electricity for construction purposes will be made available to the Contractor. The Contractor is to supply his own extension cords, lamps, water hoses and other equipment needed to use these facilities.
- 305M The Contractor shall furnish all material and labor necessary to fabricate, install and remove any forms necessary to properly apply any materials covered under these specifications.
- 306M All materials furnished must be asbestos free.
- 307M The correct installation, inspection, curing, drying and repairing of the castable installation shall be the responsibility of the installation Contractor.
- 308M The approval or acceptance of the installation by a Company inspector or representative does not relieve the installation contractor of any responsibility, warranty, or guarantee.
- 309M The customer's premises must be kept reasonably clean during construction and left broom clean prior to leaving the job at completion.
- 310M Export jobs are to receive special packing considerations to withstand extra handling necessary on these jobs. For packing instructions contact the Company.
- 311M Rapid Fired Technology Castables are approved for initial installations as well as for installation for retrofit applications.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

<u>TAB #4</u> <u>DWG. NO.</u>	<u>INDEX OF DRAWINGS IN FOLDER</u>	<u>INSUL.</u>	<u>LAG.</u>	<u>REFR.</u>
28459A-3	Section A-A	x	x	
28456A-8	Section B-B	x	x	x
44453A-1	Section B1-B1	x	x	
28457A-4	Section C-C	x	x	
77889A-2	Section C1-C1	x	x	
3707A-10	Section D-D			x
28458A-3	Section E-E	x	x	
28455A-5	Section F-F	x	x	x
28454A-4	Section G-G	x	x	x
23593A-5	Section H-H			x
23596A-7	Section J-J	x		x
28453A-2	Section K-K	x	x	
23597A-2	Section L-L	x	x	x
3730A-4	Section M-M	x	x	x
63530A-0	Section M1-M1			x
23594A-2	Section N-N	x		x
28402A-4	Section P-P			x
23598A-2	Section Q-Q	x		x
28452A-5	Section R-R	x	x	x
28406A-4	Section S-S	x	x	
29255A-2	Section T-T	x		x
29256A-2	Section U-U	x	x	
39796A-2	Section V-V	x	x	
201253A-0	Piping - Insul & Lagging	x	x	



THE LADDOCK & WILCOX COMPANY
ROILER DIVISION

K23C

31

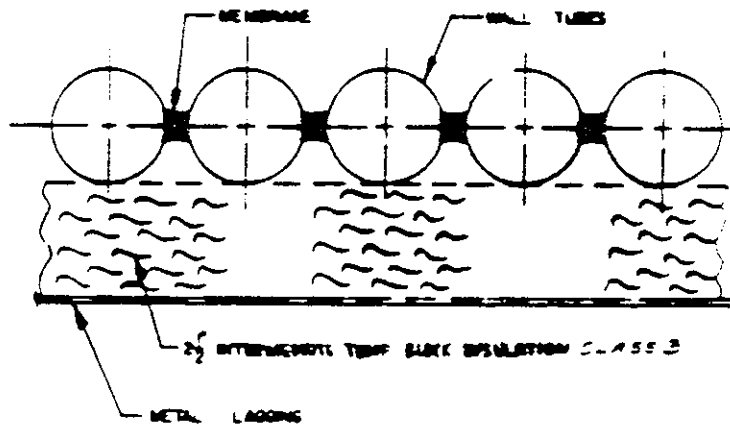
2/2-5-73

INTEGRAL FURNACE ROILER - TYPE PFI

INSULATION

FURNACE SIDEWALL INSULATION

NO.	DESCRIPTION	QTY.
1	ORG. TYPE BRICK 4"	
2	INS. FIBER BRICK 70-100	
3	DELETED CONT. SYMBOLS INSTEAD OF BLOCK INSULATION TO CLASS 3	



SECTION A-A

NO. OF TUBES	NO. OF TUBES	INSULATION DETAILS	28459
NO. E 17 02	NO. 002		

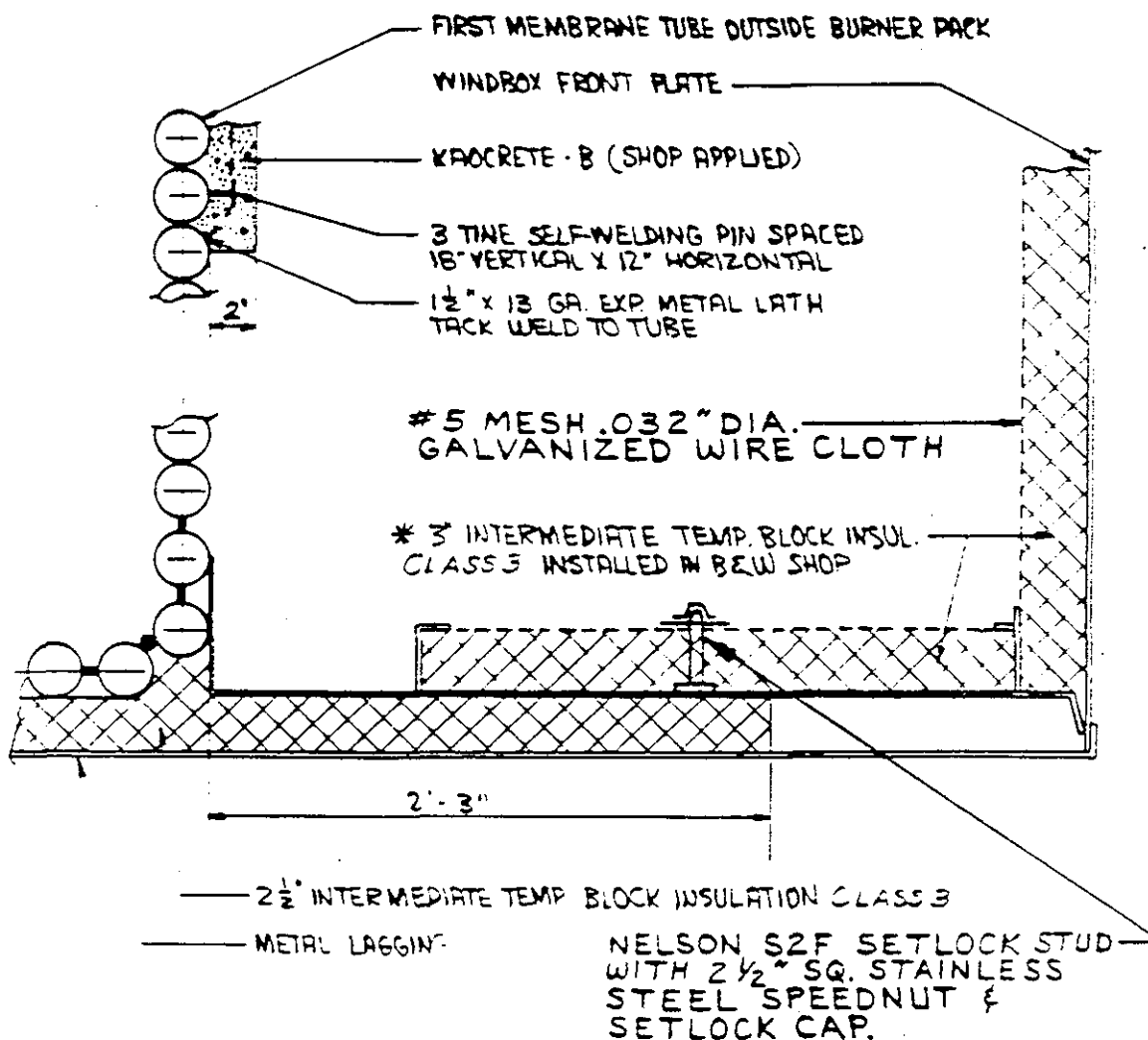
THE BABCOCK & WILCOX COMPANY
BOILER DIVISION
INTEGRAL FURNACE BOILER - TYPE PFI

1K 2312
BY

3/12-9-81

INSULATION
BURNER WINDBOX

REVISIONS			
DATE	BY	DESCRIPTION	ORIGIN
5	12/11/80	REVISION - LUG HARDWARE ALL TO LOWER LATH BENCH	
6	12/11/80	ADDED NOTE B57 / LUG	
7	12/11/80	REVISION - SET STUDS CHG TO 2" SQ. STAINLESS TO CLASS 3	
8	12/11/80	CHG. METAL LATH FLYSCREEN CONSTRUCTION	



* FOR AIR TEMPERATURES UP TO 600 F
USE 4" FOR AIR TEMPERATURES 601 F TO 700 F

SECTION B-B

DWN BY WILLIAMS ONE'S ERS

PASSED BY APP'D REL

INSULATION DETAILS

SCALE DATE 12-19-80

DRW NO 28456 A-8

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

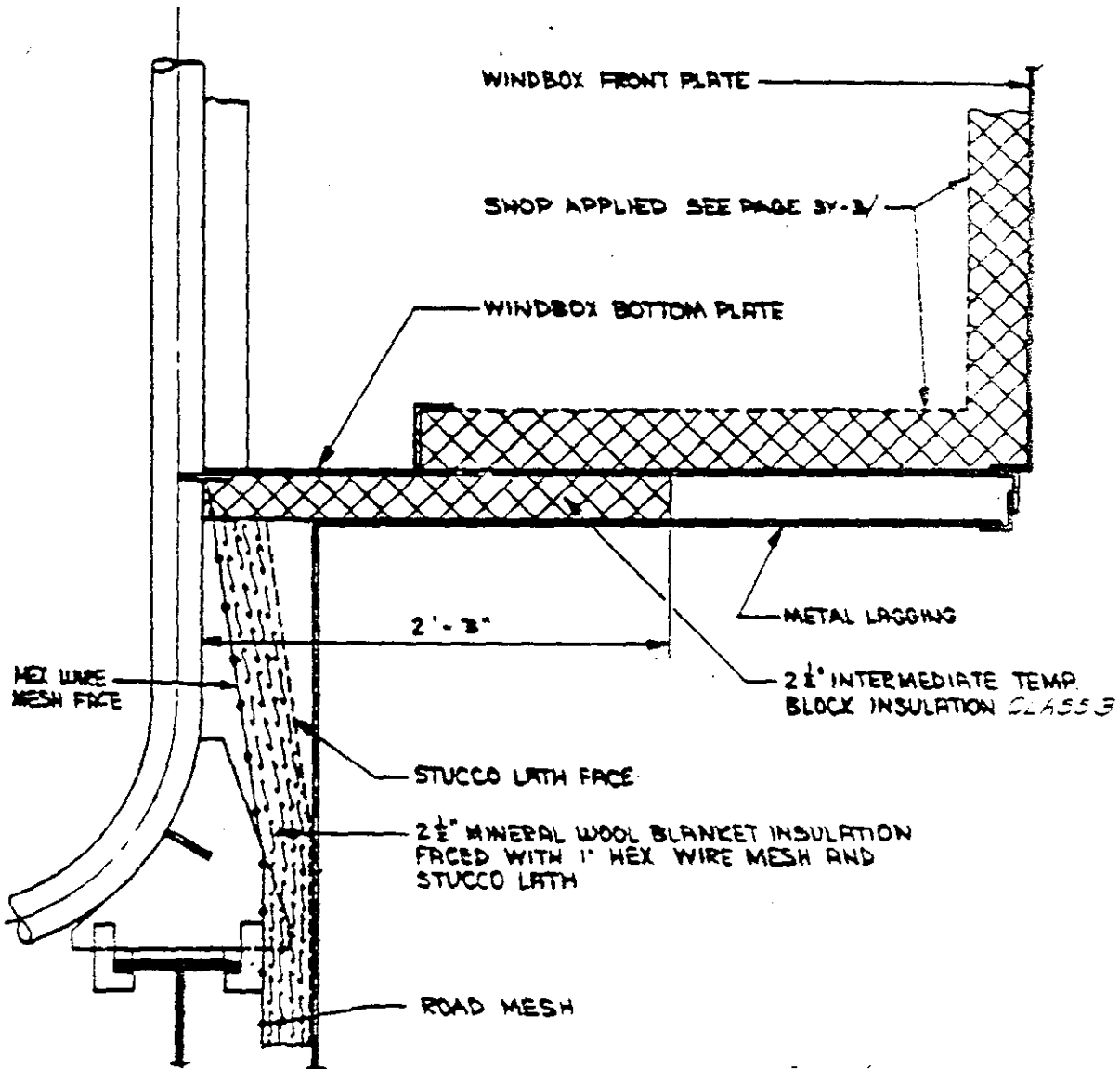
1K 2312
3Y
38/2-5-73

BURNER WINDBOX

REVISIONS

DATE	DESCRIPTION	BY	CHK.
1/1/73	DELETED CONT SYMBOL		
	CHANGED TO CLASS 3		
	TO CLASS 3		

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SECTION B₁-B₁

DESIGNED BY E. S. P. DATE 12-5-63
CHECKED BY APP-6

INSULATION DETAILS

PROJECT NO. 44453 A-1

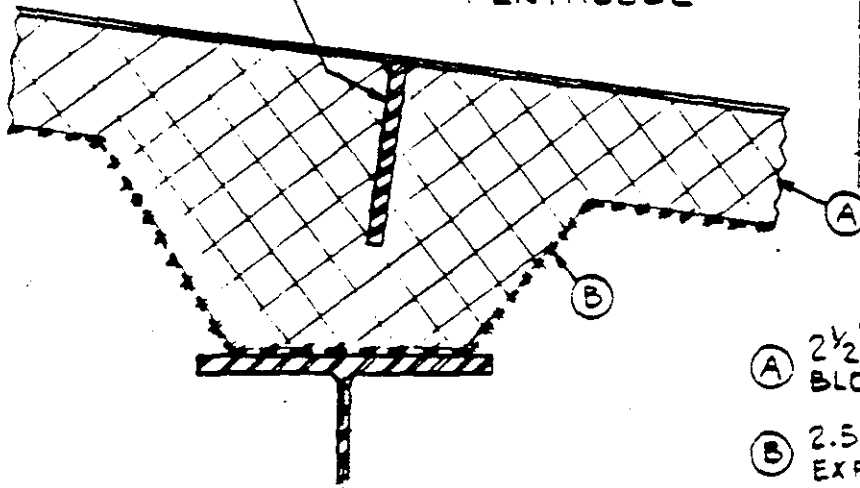
PREFERRED STANDARD

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

1K 23 C
BY
4/4-11-80

4" x 1/2" BAR

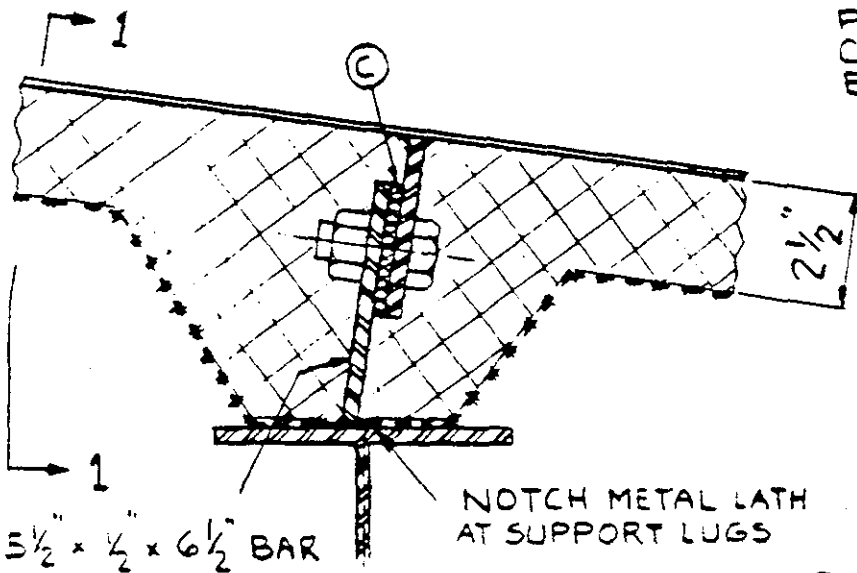
INSULATION
PENTHOUSE



REVISIONS			
DRAWN	DATE	DESCRIPTION	BY
1	4/11/80	REDRAWN	BGL
2	4/11/80	REDRAWN ADD SEC	
3		3-3 CHGd SMC LUGS	
4		TEMP MAT FOR GLASS INSULATION 3"x1/2"x6" PER 70591A COMPRESS TO 1/4" THK. B&W SHOP SUPPLY	

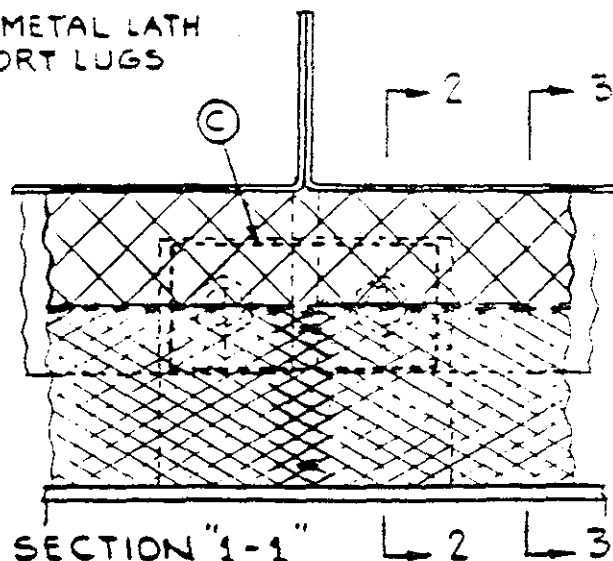
- (A) 2 1/2" INTERMEDIATE TEMP. BLOCK INSUL. CLASS E
- (B) 2.5" / 50 YD. COPPER BEARING EXPANDED METAL LATH
- (C) TEMP MAT FOR GLASS INSULATION 3" x 1/2" x 6" PER 70591A COMPRESS TO 1/4" THK. B&W SHOP SUPPLY

SECTION "3-3"



SECTION "2-2"

SECTION "C-C"



SECTION "1-1" L 2 L 3

DWN. BY WILLIAMS' CHG'D EBS
PASSED BY APP'D REL

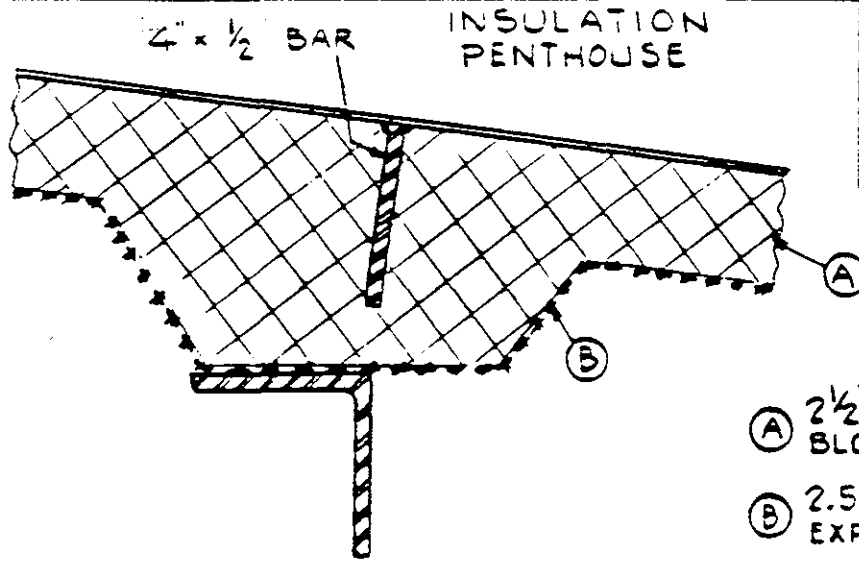
INSULATION DETAILS

SCALE DATE 12-17-80
DWG NO. 28457 A-4

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

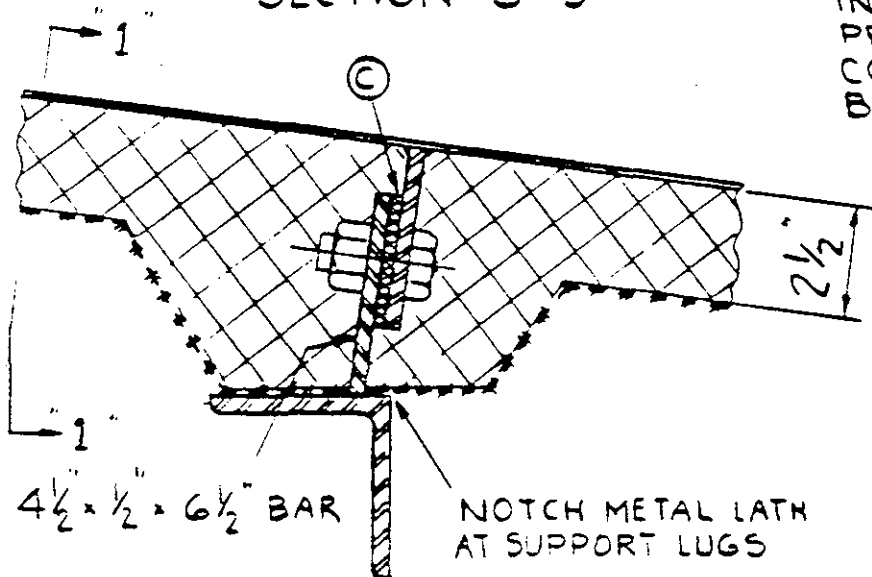
1K 23.2
BY
42,4-11-80

REVISIONS				INCH- PUL.
DATE	BY	DESCRIPTION	CHK.	
1	4/23/80	7-1-50		
		7-1-50		
2	4/23/80	CHGD MATERIAL		

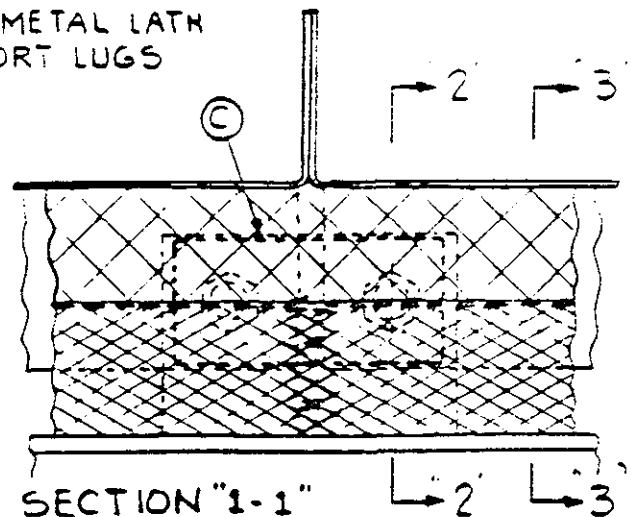


- (A) 2 1/2" INTERMEDIATE TEMP. BLOCK INSUL. CLASS 3
- (B) 2.5#/SQ YD. COPPER BEARING EXPANDED METAL LATH
- (C) TEMP. MAT FBR GLASS INSULATION 3" x 1/2" x 6" PER 70591A COMPRESS TO 1/4" THK. B & W SHOP SUPPLY

SECTION '3-3'



SECTION '2-2'



SECTION '1-1'

SECTION 'C'-C'

DWR. BY 543 CH'S
PASSED BY APP'D

INSULATION DETAILS

SCALE DATE 3-1-68
77889 A-2

LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR
FOR ANY OTHER PURPOSE DISSENTIAL TO THE INTERESTS OF
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THE BABCOCK & WILCOX COMPANY, AND IS TO BE RETURNED UPON REQUEST

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

14.2312
3Y
5/7-12-77

REVISIONS			DRAWN BY
DASH NO.	DATE	DESCRIPTION	BY
10	7/8/78	REDRAWN TO UPDATE CONE ANGLE 42	

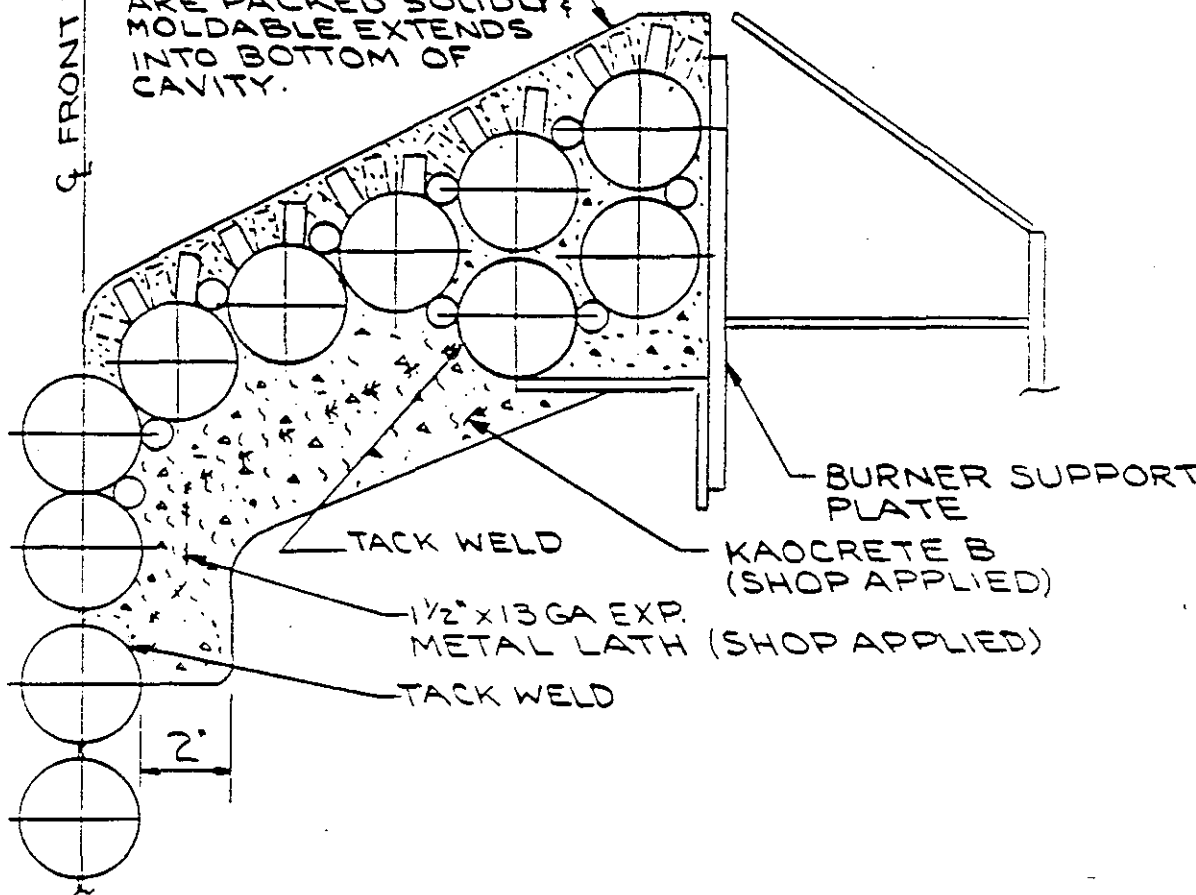
LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR
FOR ANY OTHER PURPOSES PERMITTING TO THE INTERESTS OF
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D. IN WHICH OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHER
BABCOCK & WILCOX COMPANY, AND IS TO BE RETURNED UPON REQUEST.

FURNACE SIDE

4 FRONT WALL TUBES

B&W APPROVED
PLASTIC MOLDABLE
TO BE CAREFULLY
POUNDED IN TO
INSURE ALL VOIDS
ARE PACKED SOLIDLY.
MOLDABLE EXTENDS
INTO BOTTOM OF
CAVITY.



NOTE -
USE SWEEP WHEN FORMING THROAT
TO INSURE CONCENTRIC OPENING.

SECTION D-D

DWN BY WILLIAMS CHK'D SPERALE
PASSED BY APP'D AND

INSULATION DETAILS

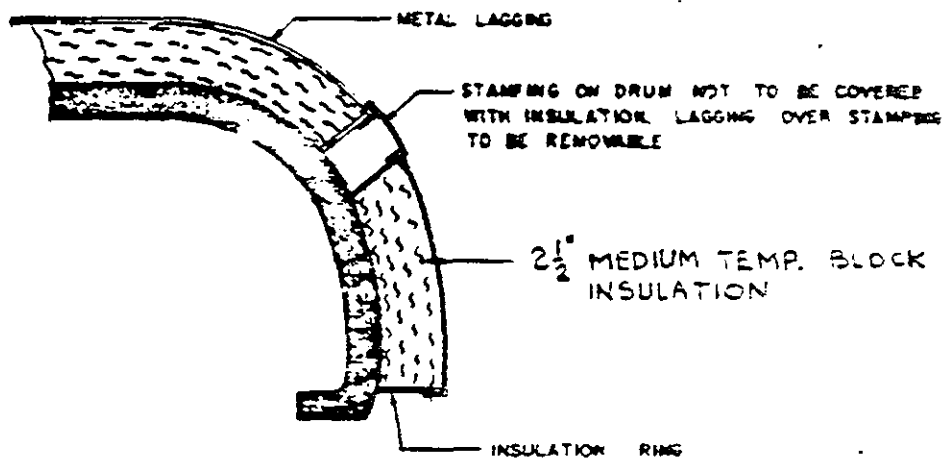
SCALE DATE 11-6-81
DASH NO. 3707 A-10

6-2-5-2

INSULATION

EXPOSED DRUM HEAD

REVENUE		
DATE	DESCRIPTION	AMOUNT
1	CAN FLEX BLOCK TO MS.	
	TOTAL BLOCK RES 9.000	
2	CARD TO MED EMPLOY	
3		



SECTION E-E

28458 A-53

NAME OF WILLIAMS NUMBER 668

REF ID: A66461

INSULATION DETAILS

REPRO. FROM APERTURE CARD ORIGINAL LOST

PREFILED STAND/

LOCKED DRAWER DRYING

TO: DIRECTOR, FBI
FROM: SAC, NEW YORK
SUBJECT: [Illegible]
[Illegible text follows]

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION
INTEGRAL FURNACE BOILER-TYPE FF1

156216

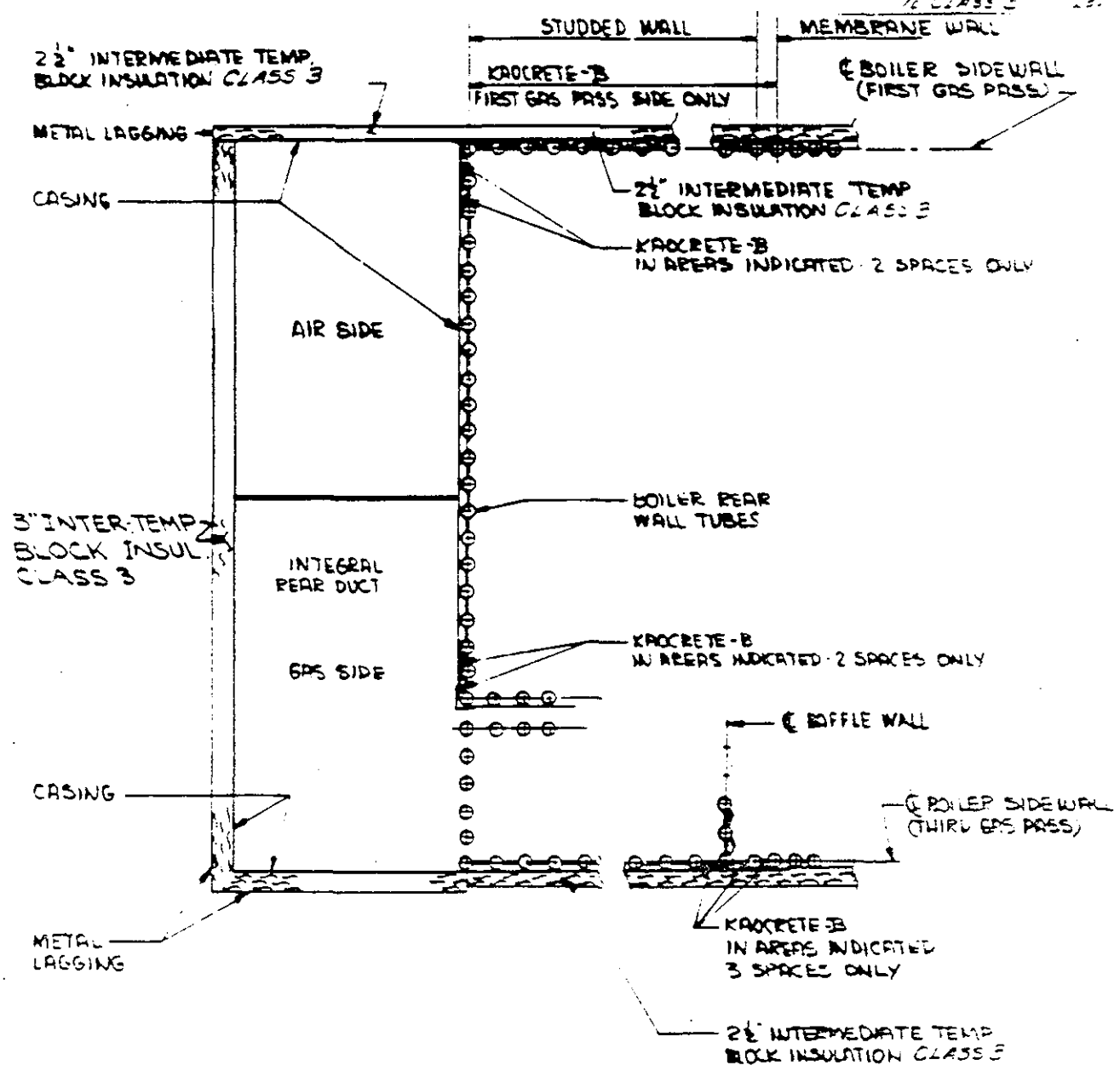
7/1-6-77

REVISIONS				APPROVED
NO.	DATE	DESCRIPTION	ORIG.	
5		1/4" CWGD 3" MIN. WOOL BLANKET ON RW		
		OUTER CSS TO 3" IT		
		BLOCK WL		

INSULATION

REVISIONS				APPROVED
NO.	DATE	DESCRIPTION	ORIG.	
3		3/4" MIN. WOOL BLANKET ON TUBES & NOTES		
4		4" MIN. DELETED ON 5" SPACES		
		KNOWLEDGE OF CLASS 3		

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SECTION - FF

INSULATION DETAILS

SCALE	DATE 5-1-65
28455	45

REPRODUCED FROM ORIGINAL

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

1K2312

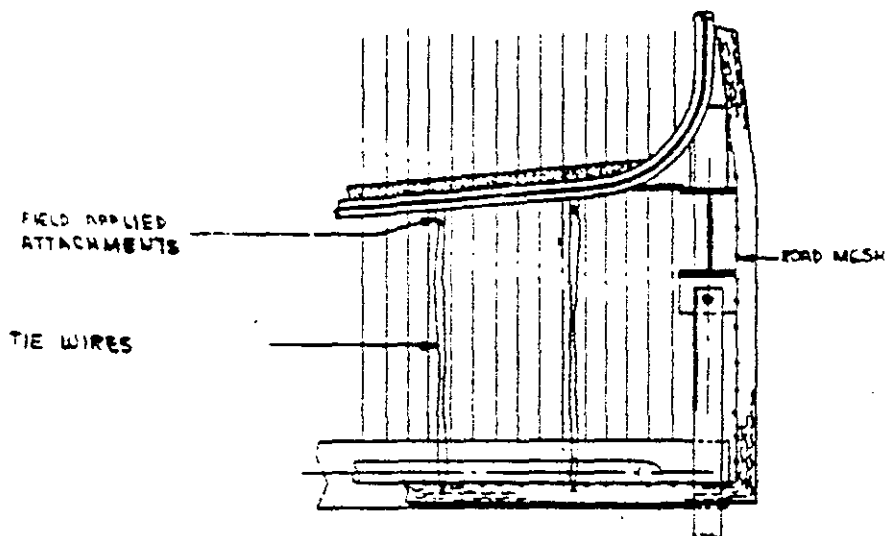
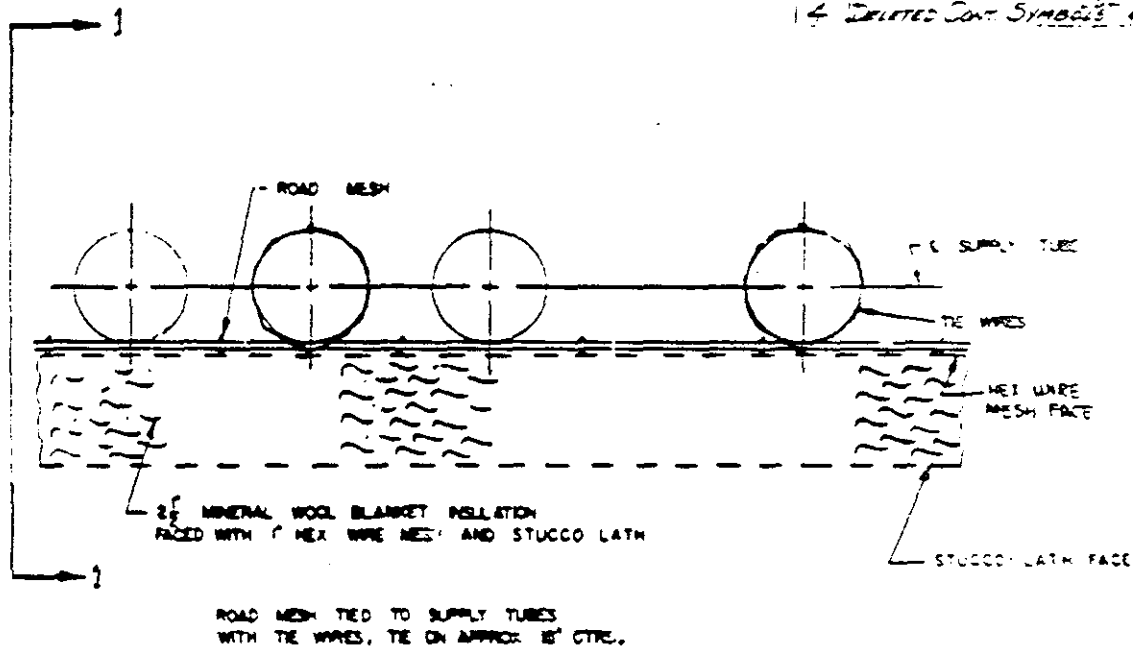
31

8/2-5-73

INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

FURNACE FLOOR INSULATION



METHOD OF ROAD MESH ATTACHMENT WHERE SUPPLY TUBES ARE MORE THAN 18" APART.

SECTION 1-1

SECTION G-G

DRWN. BY WILLIAMS	ENGR. EBS	INSULATION DETAILS	SCALE: NTS	SECTION G-G
DATE 12 15 58	APPR. REL		28454	Rev 4

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

K0310

34

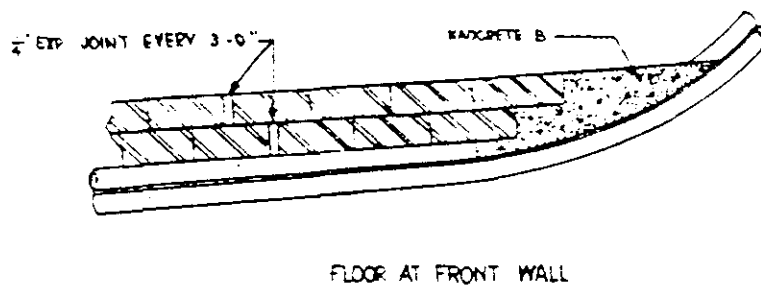
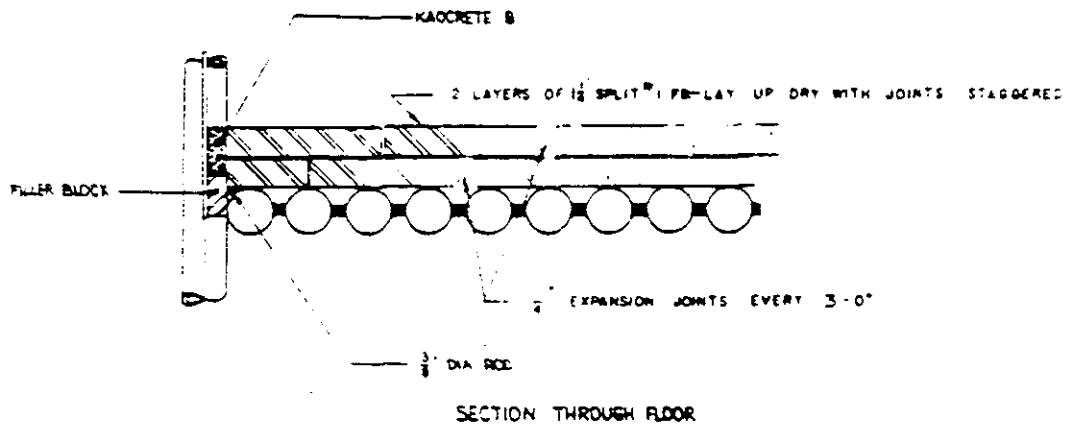
INTEGRAL FURNACE BOILER - TYPE PF

0/2-5-73

INSULATION

FURNACE FLOOR

REVISIONS		
NO.	DESCRIPTION	DATE
1	REVISED SECTION FROM P. 1000 SKETCH	
2	ADDED BLOCK AT FRONT WALL	
3	SKETCH FROM 11-10-62	
4	2" EXP. JOINT EVERY 3'-0"	
5	3" DIA. ROD	
6	2" EXP. JOINT EVERY 3'-0"	
7	3" DIA. ROD	
8	2" EXP. JOINT EVERY 3'-0"	
9	3" DIA. ROD	
10	2" EXP. JOINT EVERY 3'-0"	
11	3" DIA. ROD	
12	2" EXP. JOINT EVERY 3'-0"	
13	3" DIA. ROD	
14	2" EXP. JOINT EVERY 3'-0"	
15	3" DIA. ROD	



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LOCKED DRAWER DRAWING

SECTION H-H

DESIGN BY EBS	CHECKED EBS	INSULATION DETAILS	SCALE: NTS	DESIGNED BY EBS
DATE: 12-11-58	APPROVED: REL		23593	A-5

0.000

1.

INSULATION

REVISIONS		
BASIC	DESCRIPTION	DATE
1	ADDED 5- NOTES	
2	ADDED 7- NOTES	
3	ADDED 8- NOTES	
4	ADDED 9- NOTES	
5	ADDED 10- NOTES	
6	ADDED 11- NOTES	

1/4" DIA RODS TO MARK DRAWING

10 GA X 2" SCALLOPED PLATES

TACK WELD TO TUBES

(FOR BOILERS WITHOUT SUPERHEATERS USE 22 GA SHEET METAL)

THE CARDBOARD
BOXES ON DECK
LOCATED ON FLOOR
BETWEEN S. & STEW
PASSAGE WITH MAIL
CENTERS OF 4-0-
SEE SETTING

246.

FILL WITH KADCPETE B

1/2" CARDBOARD EXPANSION JOINTS 3'-0" CENTERS

1 1/2" x 13 GA EXP METAL LATH

22 54 5-25-77
MEAL

4 SIDE WALL TUBES

SECTION 1-1

BOILER WITH SUPERHEATER

SECTION 1-1

BOILER WITHOUT SUPERHEATER

SECTION 2-2

SECTION J-J

DRW BY EPS	CHKD EBS
DATE 12-14-88	APPR PLL

INSULATION DETAILS

23599 A-7

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

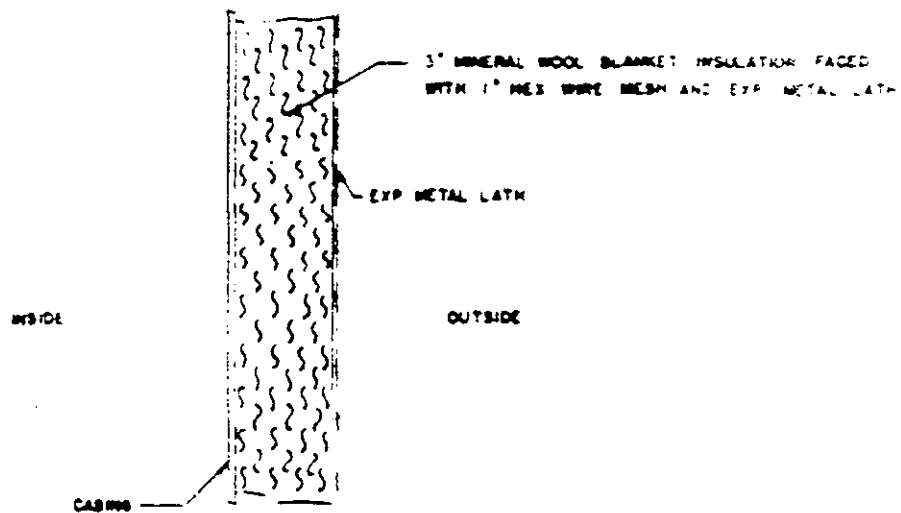
KELC
SY
11-2-5-72

INTEGRAL FURNACE BOILER - TYPE - PF1

INSULATION

REVISION	DATE
1. CHANGE DETAIL TO SHOW	
APR 7-19-52	
2. CHANGE DETAIL TO SHOW	

SUPERHEATER VESTIBULE



SECTION K-K

DESIGN BY E.B.R.	CHECKED E.B.R.	INSULATION DETAILS	ONLY KTS
DATE 12-14-59	APPROV. R.E.L.		28453 A-2

DETAILED STANDARD 1/2" X 1/2" BOILER

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

4-0310
3-

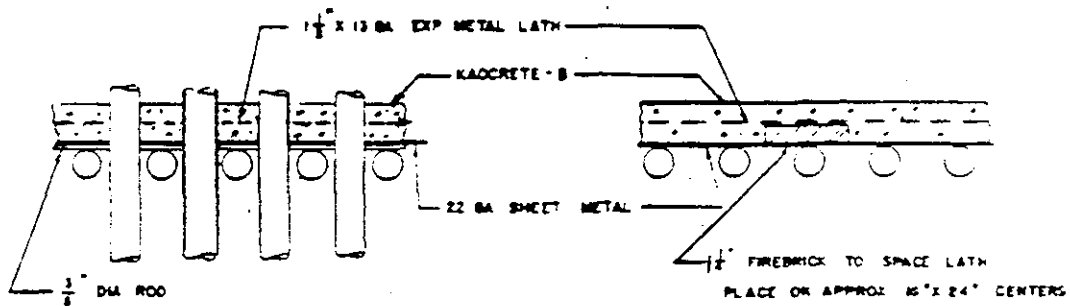
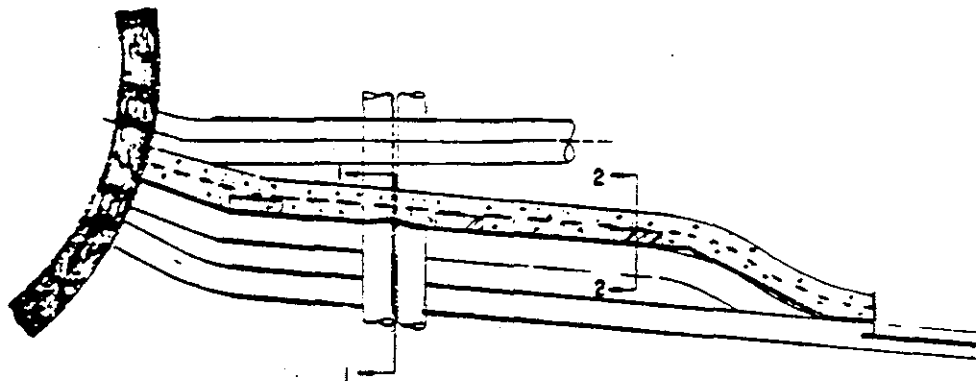
2-5-73

INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

REVISIONS		NO.
DATE	DESCRIPTION	BY
	PROVED SECT DESIGNATION	
	APP 7-10-62	27
	2. DRAFTED BY SHARPE	28

FURNACE CLOSURE AT STEAM DRUM
REFRACTORY



SECTION 1-1

SECTION 2-2

SECTION L-L

DRWN. BY EBS	CHCKD. EBS	INSULATION DETAILS	SCALE: N.T.S.	SHOWN: 1 FOOT
DATE: 12 14 68	APPD. REL		23597	A-2

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THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

IK2312
3Y
13/2-5-73

INTEGRAL FURNACE BOILER - TYPE PF1

4 DELETED CONT. SYMBOLS

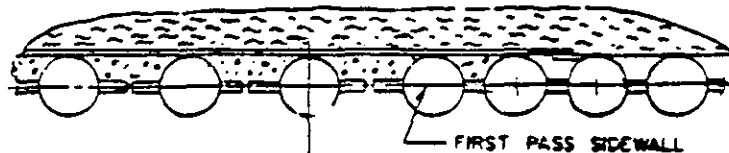
CHGD. T.T. BLOCK INSUL.
TO CLASS B. 251



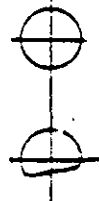
INSULATION

BAFFLE WALL

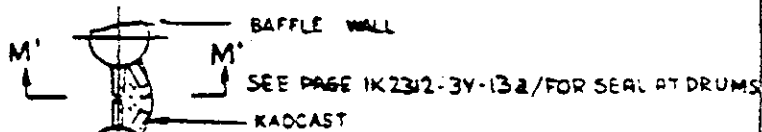
REVISION	DATE
1	10/4/57
2	10/4/57
3	10/4/57



FIRST PASS SIDEWALL



FURNACE SIDE



BAFFLE WALL

SEE PAGE IK2312-3Y-132 FOR SEAL AT DRUMS

KADCAST

KADCRETE - B

THIRD PASS SIDEWALL

CASING

2" INTERMEDIATE TEMP. BLOCK INSULATION CLASS B

METAL LAGGING

SECTION M-M

DESIGNER EBS	CHECKED EBS	INSULATION DETAILS	SCALE 1/8" = 1'-0"
DATE 1-2-59	APP. PEL		3730 A-4

LOCKED DRAWER DRAWING

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

IK 2312
3Y
3a/3-24-67

INSULATION
BAFFLE WALL

REVISIONS

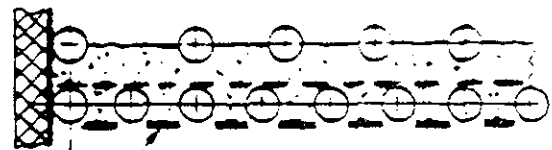
DASH NO	DATE	DESCRIPTION	ORIG

STEAM DRUM?

1 1/2" x 13 GA. EXPANDED METAL
LATH 6" WIDE.
TACK WELD TO DRUM ON
18" CTRS.

KAOCRETE B

TACK WELD EXPANDED METAL
LATH TO BAFFLE WALL TUBES



SECTION "A-A"

2" x 10 GA. x 4" PLATES WELDED TO
DRUM (1/8" x 1") PRIOR TO ERECTING
BAFFLE WALL TUBES. LOCATE, IN BE-
TWEEN AND FLUSH WITH BAFFLE
WALL TUBE HOLES.

SEE PAGE
IK 2312 3Y 13/

KAOCAST

KAOCRETE B

SECTION M'-M'

DWN. BY SAS CHK'D
PASSED BY CCV/1 APP'D

INSULATION DETAILS

SCALE DATE 3-20-67
DWG NO 63530 A-0

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THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

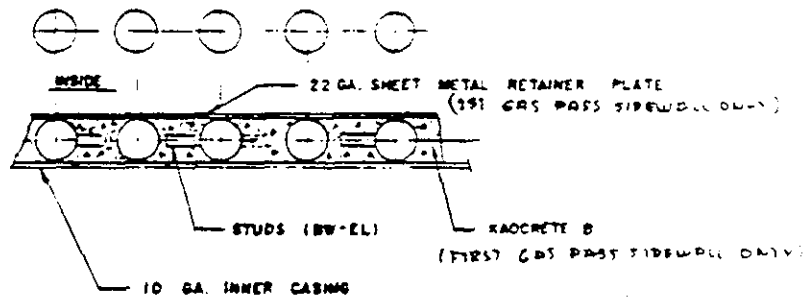
IN 0310
31
1412-3-78

INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

REVISIONS		WORK FILE
DASH	DESCRIPTION	DATE
1	MOVED SECT DESIGNATION	
	R.F. 3-30-67	
2	REVISION	

BOILER BANK SIDEWALL



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SECTION N-N

DESIGN BY EBS	DATE EBS	INSULATION DETAILS	SCALE NTS	INCHES = 1 FOOT
DATE 12 14 58	APP'D. REL		23594	A-2

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

1625-7

37

1625-7

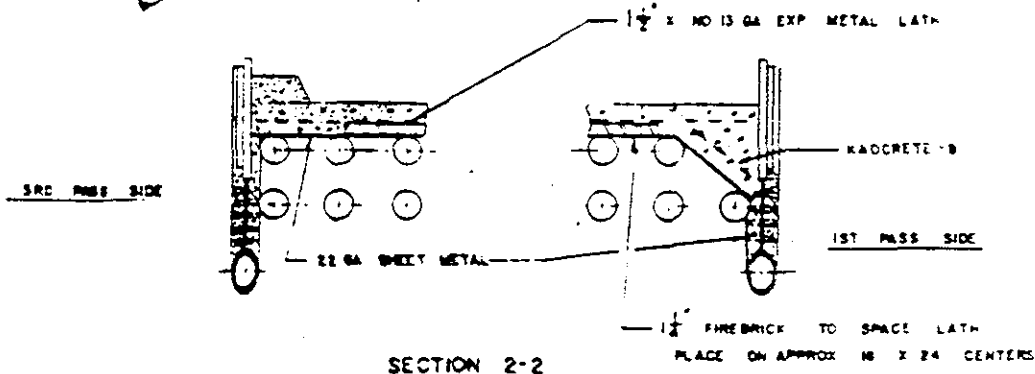
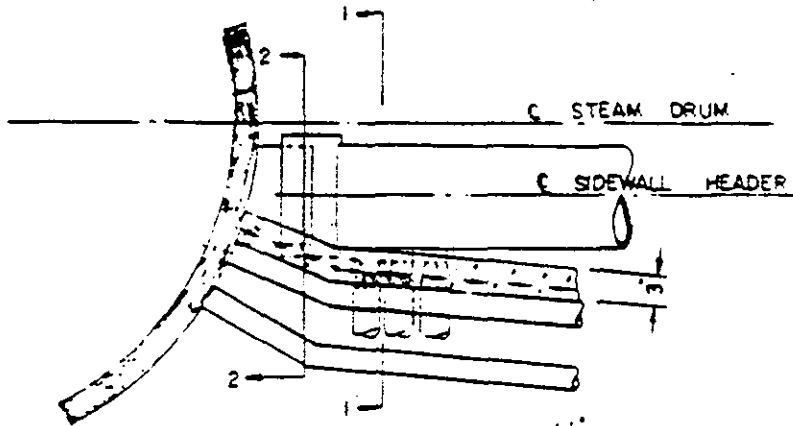
INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

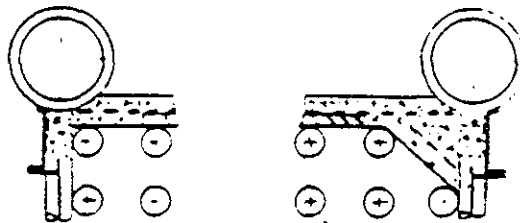
UPPER FURNACE
 CLOSURE AT SIDEWALLS

PFI 22 B 28

REVISIONS	DATE
1. ADDED THE REVISIONS	
2. CHG. SRT. 1-1	
3. TRUCK DUCT & PIPING	
4. DELETED CONT. SYMBOLS	



SECTION 2-2



SECTION 1-1

SECTION P-P

DESIGN BY EBS	CHIEF EBS	INSULATION DETAILS	SCALE NTS	PROPOSED - 1 FOOT
DRAWN 3-4-69	APPROV. REL		28402	A-4

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THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

IN 33-2

34

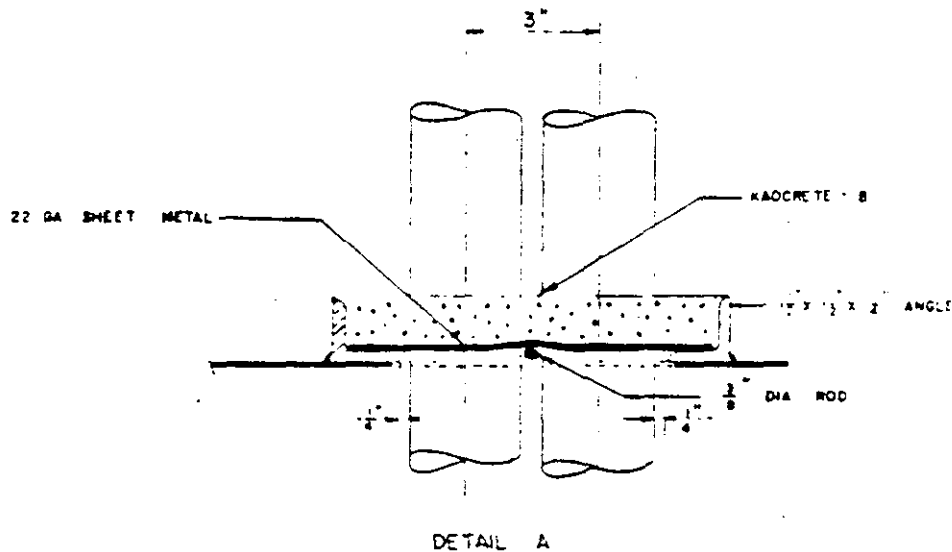
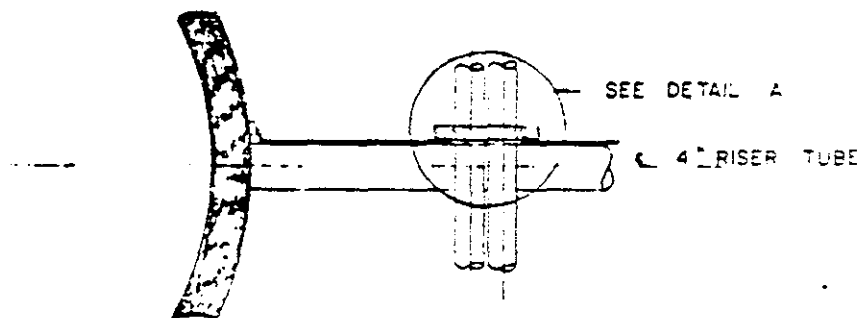
10/2-5-73

INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

REVISIONS		INSTR.
NO.	DESCRIPTION	DATE
1	MOVED SEE DETAIL A	
	B.R. 330-62	
	R. D. Smith, Chief Engineer	

CLOSURE AT SATURATED CONNECTING TUBES



SECTION Q-Q

DESIGNED BY EBS	CHECKED BY EBS	INSULATION DETAILS	SCALE NTS	INCHES = 1 FOOT
DATE 12 13 58	APPROVED REL		23598	A-2

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THE BASCOCK & WILCOX COMPANY
BOILER DIVISION

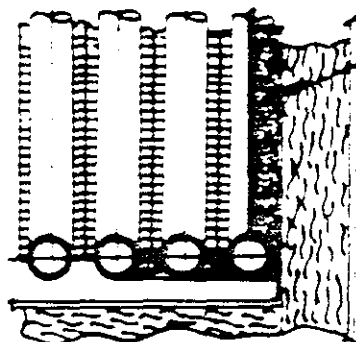
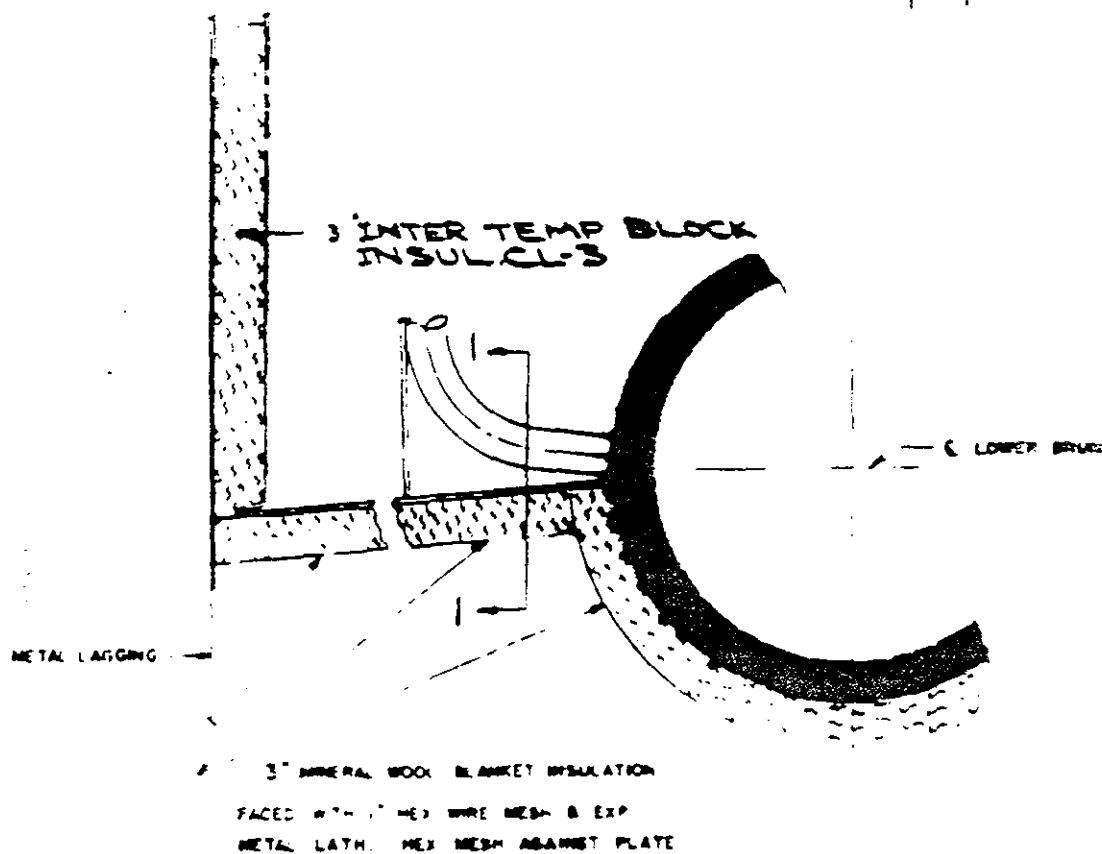
2252
E/7-12-77

INTEGRAL - FURNACE BOILER - TYPE PFI

INSULATION

REAR WALL CAVITY
AT
LOWER DRUM

NO.	DESCRIPTION	REV.
1	CHG. REEL. TIE	
2	ADD SECTION 1-1	
	FROM REV. 1-1-62	
3	REMOVE 1" MINERAL WOOL	
	SEE 1-1-62	
4	DELETED CONT. SYMBOLES	
5	ADD MINERAL WOOL TO IT BLOCK ON R.W. CASING	



CONCRETE B
SECTION 1-1

SECTION R-R

DESIGNED BY EBS	DESIGNED BY EBS	INSULATION DETAILS	28452	6-5
DATE 2-20-94	APPROVED REL			

BOILER DIVISION

4230

37

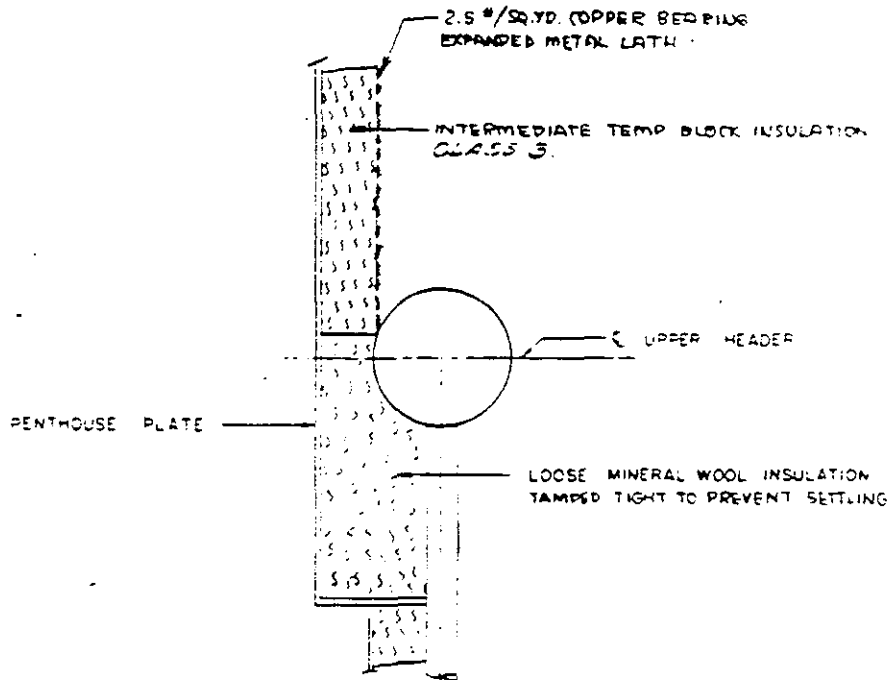
1912-5-73

INTEGRAL FURNACE BOILER - TYPE PFI

INSULATION

PENTHOUSE SIDEWALL AT
UPPER HEADERS

REVISIONS		NO.
DATE	DESCRIPTION	DATE
	1. PFI - PFI	
	2. PFI - PFI	
	3. PFI - PFI	
	4. PFI - PFI	
	5. PFI - PFI	



SECTION S-S

DRWN BY EBS	CHKD EBS
DATE 2-20-59	APPD REL

INSULATION DETAILS

SCALE NTS INCHES = 1 FOOT

28406

A-4

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THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

INTEGRAL FURNACE BOILER - TYPE FFI

112512

BY

22/2-5-73

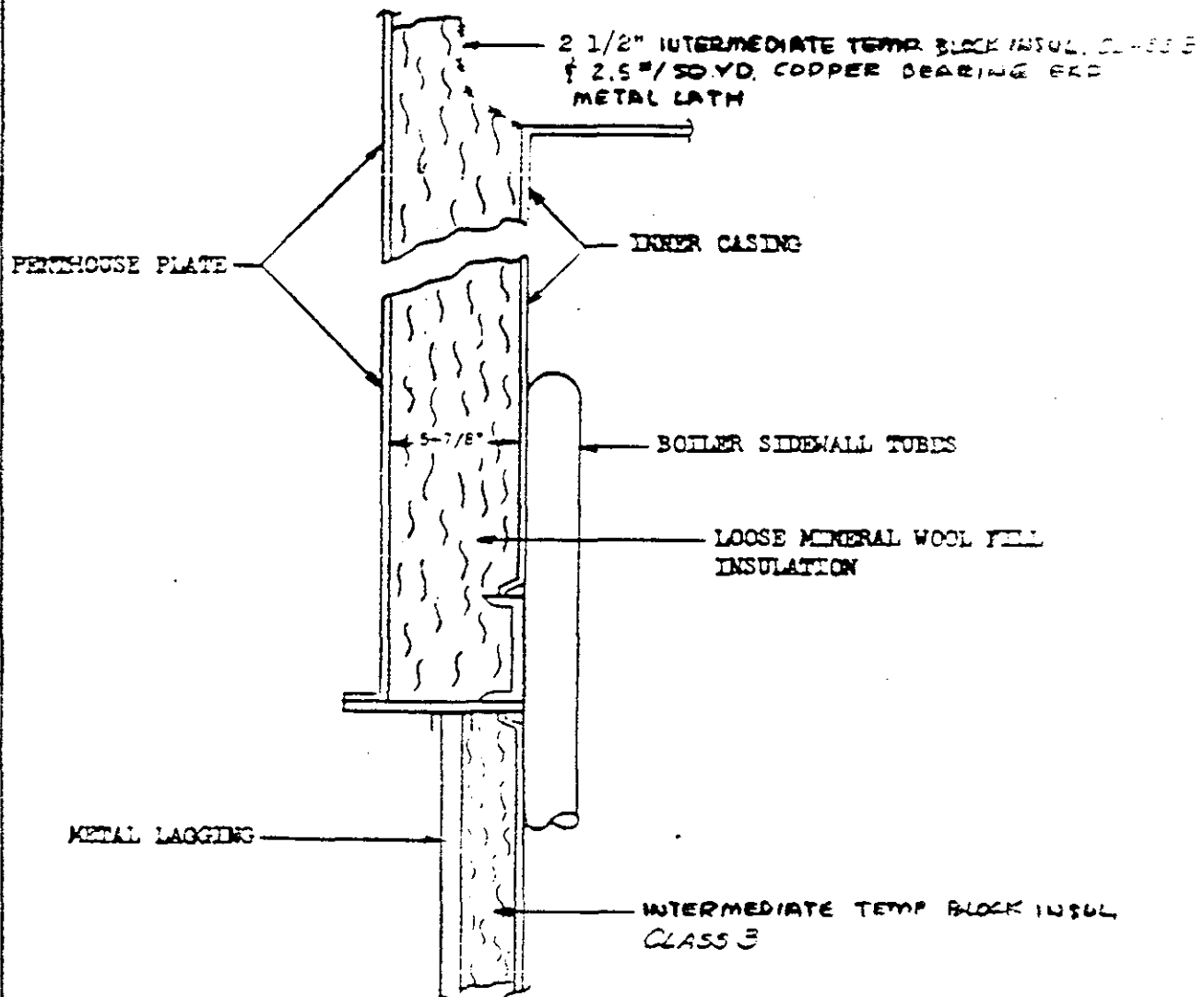
INSULATION

PERCHHOUSE SIDE AT

DRUM AREA

GAS SIDE

REVISION	DATE
1	CHGD. FOR BLOCK F
2	CHGD. FOR BLOCK F
3	CHGD. FOR BLOCK F
4	CHGD. FOR BLOCK F
5	CHGD. FOR BLOCK F
6	CHGD. FOR BLOCK F
7	CHGD. FOR BLOCK F
8	CHGD. FOR BLOCK F
9	CHGD. FOR BLOCK F
10	CHGD. FOR BLOCK F



SECTION T-T

FWL BY ADW 1 10-20-59
DATE 10-20-59

INSULATION DETAILS

SCALE 1" = 1'-0"
29255

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

INTEGRAL-FURNACE BOILER-TYPE PFI

1K23.2

3Y

23/2-5-75

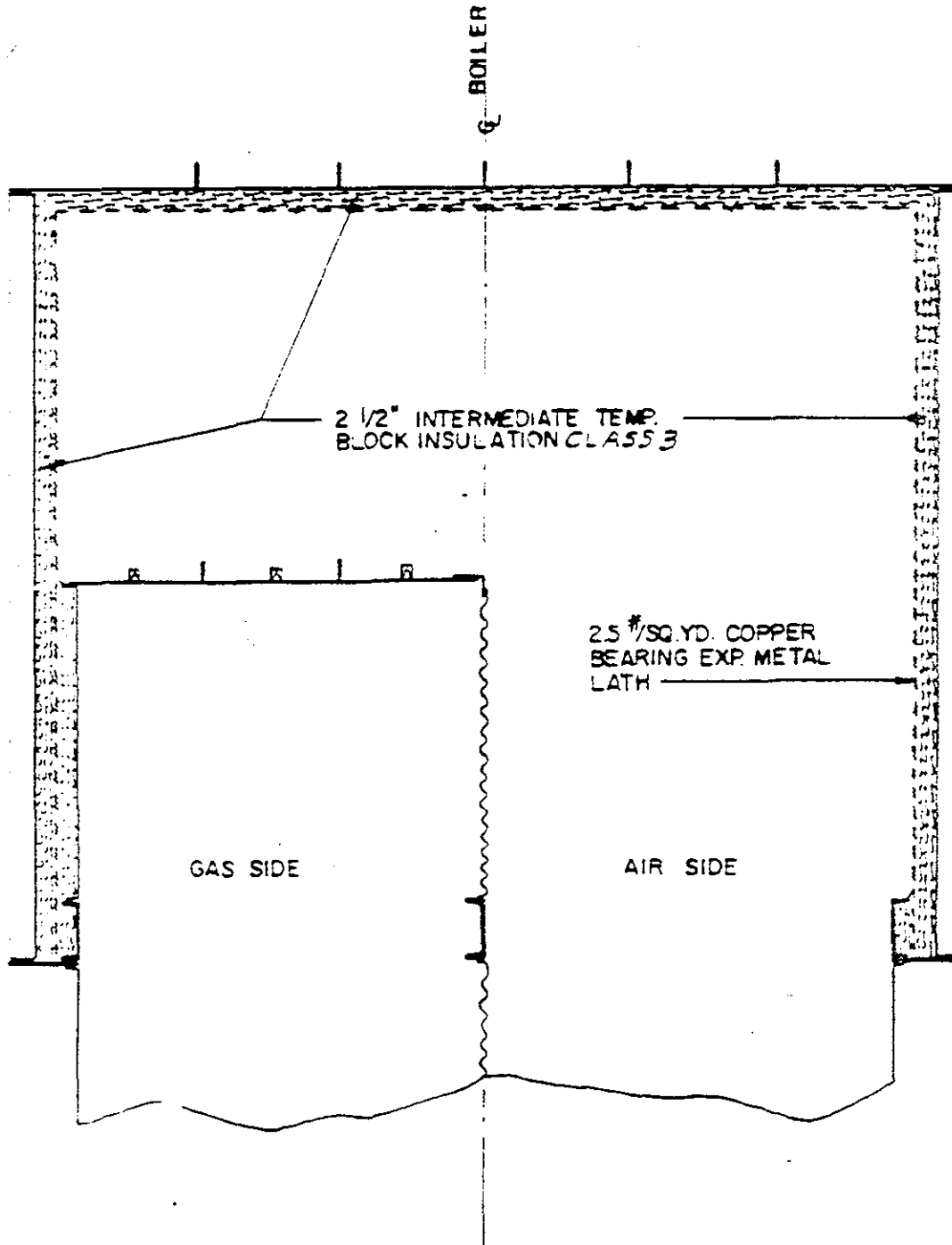
INSULATION

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	4/4/66	REDRAWN B.B.F	
2	4/4/66	CHANGED TO PFI	
		TO CLASS 3	

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SECTION U-U

DWN. BY	EDW	CHK'D	ERS
PASSED BY	APP'D	REL	

INSULATION DETAILS

SCALE	DATE	C-23-55
29256	A-2	

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

INTEGRAL FURNACE BOILER-TYPE PFI

IN 2312
BY

25/2-E-73

INSULATION
BURNER WINDBOX

2.5#/SQ.YD. COPPER BEARING
EXP. METAL LATH

INTERMEDIATE TEMP. BLOCK INSUL.
FIELD APPLIED

2 1/2"

2 1/2" INTERMEDIATE TEMP. BLOCK
INSULATION-CLASS 3

SHOP APPLIED ON
ALL UNITS

12 MESH GALVANIZED FLYSCREEN

2.5# COPPER BEARING EXP. METAL
LATH (PLASTERERS LATH)

REVISIONS

REVISION NO.	DATE	DESCRIPTION	ORIGINATOR
1		WORKING WIRE MESH TO 25#	
		KORNER BE LATH	
2		WITH LIFTED CONT. SURFACES	
		ADD 1" BRICKS	
		CLASS 3 LS	

2 1/2" INTERMEDIATE TEMP BLOCK
INSULATION-CLASS 3

2.5#/SQ.YD. COPPER BEARING
EXP. METAL LATH

INTERMEDIATE TEMP BLOCK INSUL.
FIELD APPLIED

SHOP APPLIED

INSULATE TO BACK OF CHANNEL

3" INTERMEDIATE TEMP BLOCK
INSULATION CLASS 3

12 MESH GALVANIZED FLYSCREEN

2.5# COPPER BEARING EXP.
METAL LATH (PLASTERERS
LATH)

SECTION V-V

OWN. BY B.P.F. CHG'D JJZ
PASSED BY LWF APP'D ERS

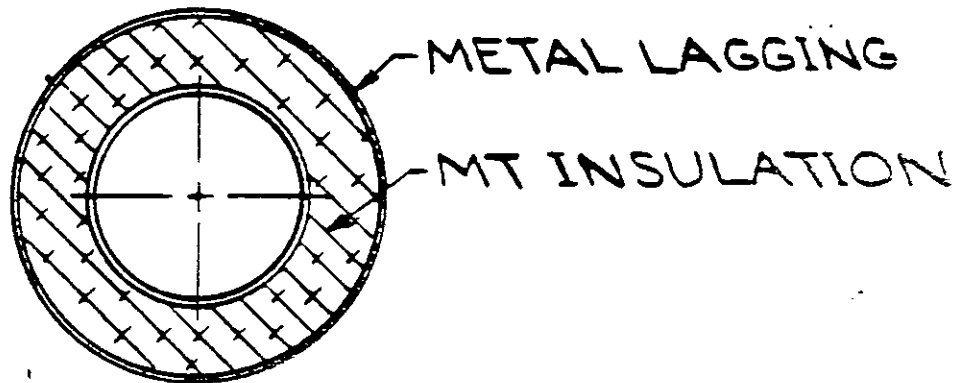
INSULATION DETAILS

SCALE DATE 1-30-62
DWG. NO. 39796 A-2

THE BARCOCK & WILCOX COMPANY
POWER GENERATION GROUP

TUBES & PIPE
METAL LAGGING FINISH

REVISIONS			DATE
NO.	DATE	DESCRIPTION	BY



1 1/2" WATER COLUMN PIPING - 2" MT INSUL
1/2" & 3/4" WATER COL & GAGE DRAIN PIPING - 2" MT INSUL
1" STEAM GAGE & REMOTE LEVEL INDICATOR - 2" MT INSUL
1 1/2" BLOW-OFF PIPING - 2" MT INSUL
1" CONT BLOWDOWN & WATER SAMPLING - 2" MT INSUL
16" SUPERHEATER INLET-OUTLET HEADER - *4" MT INSUL
10" ATTEMPERATOR PIPING - 4" MT INSUL **
6" FEED PIPING ECON TO STEAM DRUM - 2" MT INSUL
2" ATTEMPERATOR INLET PIPING - 1" MT INSUL
8' CROSSOVER PIPE & EXPOSED ECON HDRS - 2" MT INSUL

* USE DOUBLE LAYER CONSTRUCTION
** LAGGING NOT REQD ON PIPING I.S. BLR CLOSURE

293-3198-10

MINER	JB
BECK	KELLAR

INSULATION DETAILS

DATE	7/2	DATE	9-25-75
NO.	201253	NO.	4.0

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REVISION 20946



THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

TAB #5				
<u>DWG. NO.</u>	<u>APPLICATION DRAWINGS</u>	<u>INSUL.</u>	<u>LAG.</u>	<u>REFR.</u>
3729A-8	Insul. - Applic. barriers	x		
3731A-4	Insul. - Applic. over stiffeners	x		
23579A-3	Insul. - Applic. tubes and pipes	x		
28405A-3	Insul. - Applic. blanket		x	
28438A-5	Lagging - Applic. over tubes & pipe		x	
28445A-2	Lagging - Applic. over drum ends	x	x	
29091A-0	Arrangement removable type air vents			
29092A-0	Arrangement permanent type air vents			
39732A-2	Lagging - Arrangement around access doors		x	
39734A-9	Lagging attachments			
39738A-5	Applic. of inner lagging	x	x	
44433A-3	Lagging - Applic. handhole covers	x	x	
64419A-4	Insul. - Applic. over safety valve	x	x	
77804A-10	Insul. - Applic. I.T. block	x	x	
97085A-2	Insul. - Applic @ access door	x	x	x
97088A-2	Lagging - Buckstay end conn's	x		
97091A-3	Applic. horiz. barrier and inner lagging corner constr.	x	x	
97101A-0	Insul. - Applic. over thermocouples	x		
101955A-0	Applic. refractory in access doors			x
101956A-2	Applic. refractory in access doors			x
101957A-0	Insul. - Applic. @ access door	x	x	x
101960A-0	Insul. - Applic. @ sootblower wallboxes	x	x	x
101963A-1	Insul. - Applic @ buckstay	x	x	x
101964A-0	Insul. - Applic @ buckstay	x	x	x
101965A-2	Insul. - Applic. I.T. block inside vestibules etc.	x		
101997A-2	Insul. - Applic. @ 15" x 21" access door	x	x	x
200007A-0	Lagging - Applic. @ buckstay conn.	x	x	
203022A-0	Insul. - Applic. inter. temp. block on inner casing, membrane wall, flue or duct & inner insul. support	x	x	
3Y3U2	Insul. thickness chart for tubes & pipe			
3Y3U3	Insul. thickness chart for tubes & pipe			

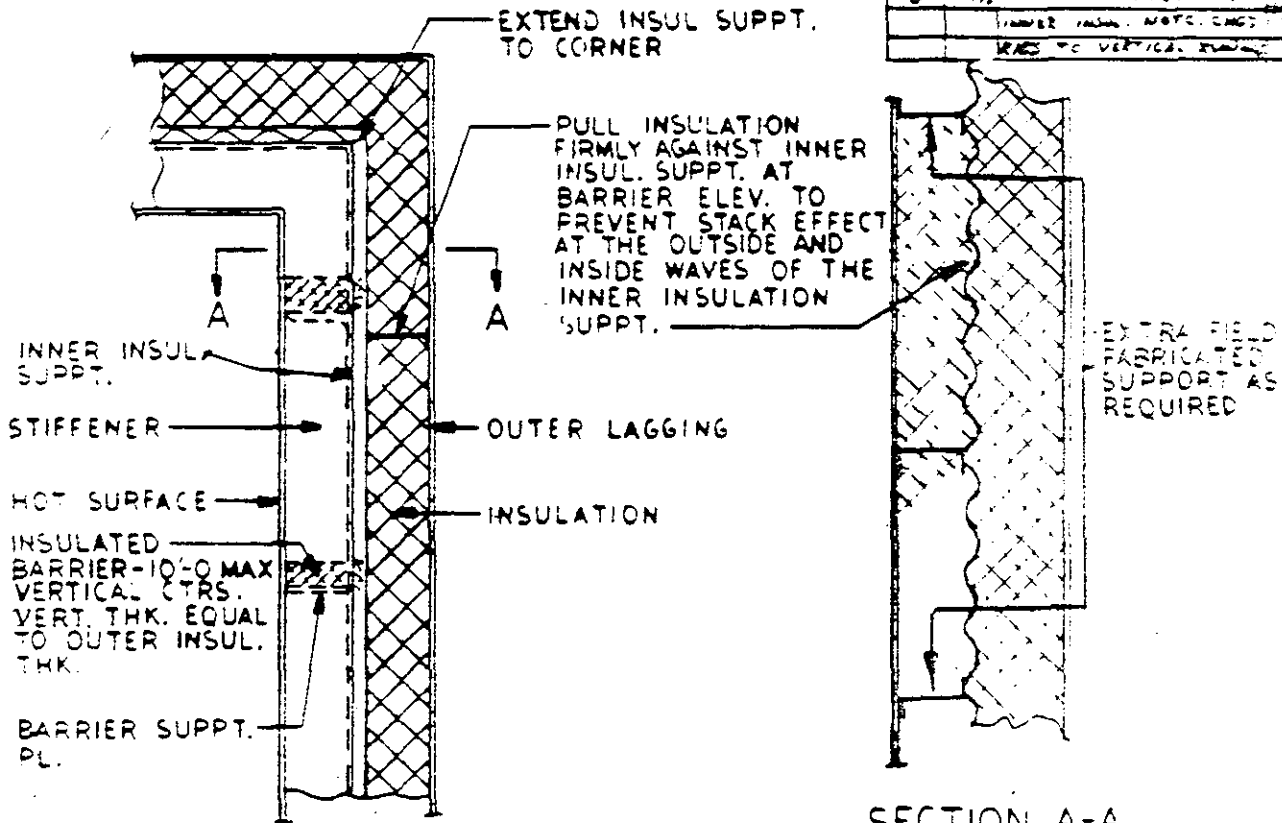
TAB #6				
<u>DWG. NO.</u>		<u>INSUL.</u>	<u>LAG.</u>	<u>REFR.</u>
207951A-0	Insul. Key Arrangement Boiler	x	x	x

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

3Y
6A
11R
2/E-6-78

INSULATION APPLICATION
FLUES, DUCTS, PRECIPITATORS
AND OTHER HOT EQUIPMENT

REVISIONS			
REVISION NO.	DATE	DESCRIPTION	BY
7	11/11/50	REDRAWN 25/ACS	11/11/50
8	11/11/50	REVISED NOTE 1, 2 AND 3	11/11/50
REVISION 11/11/50			
REVISION 11/11/50			



SECTION A-A

1. USE THERMAL BARRIERS ON VERTICAL HOT SURFACES WHOSE SIDES ARE 10'-0" OR MORE IN HEIGHT.
2. THERMAL BARRIERS ARE REQUIRED ON ALL TOP AND BOTTOM SURFACES WITH 15° RISE OR GREATER-SPACE ON APPROX. 10'-0" VERTICAL CTRS.-BARRIERS MUST FORM CONTINUOUS BAND AROUND HOT SURFACE, INCLUDING CLOSURE OF ALL CORNERS.

OWN: EBS	CHK'D: EBS	THERMAL BARRIERS ON HOT INSULATED EQUIPMENT	SCALE: 1/4" = 1'-0"	DATE: 12-10-50
DRAWN BY:	APPROVED: REL		DRAWN NO: 3729	A-2

ON 11/11/50 DRAWING 67

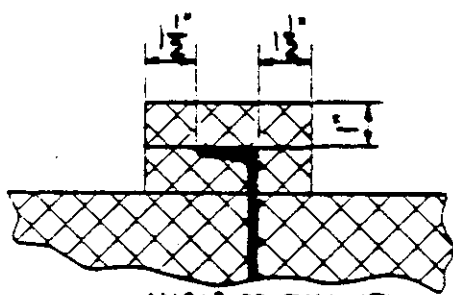
11/11/50

THE BARCOCK & WILCOX COMPANY
BOILER DIVISION
INSULATION

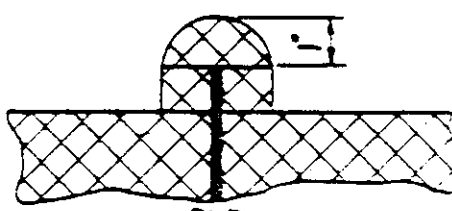
3Y
6A
11R
1/25-79

APPLICATION
FLUES & DUCTS

REVISIONS			APPROVED
NO.	DATE	DESCRIPTION	FILE
2		REDRAWN - C.K. INSUL	
3		THICKNESS REF. 11/11/79	
4		REEL TITLE REF. 11/11/79	
4		DELETE REF. TO WIRING IN	
		21/11/79 LAST DRAWING J.C.	

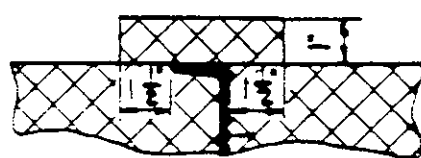


ANGLE OR CHANNEL



BAR

STIFFENER HEIGHT GREATER THAN ADJACENT INSULATION THICKNESS

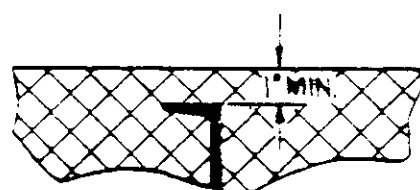


ANGLE OR CHANNEL

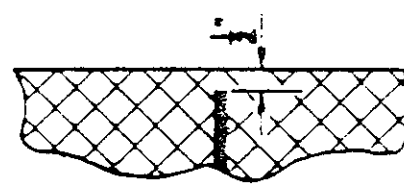


BAR

STIFFENER HEIGHT EQUAL TO ADJACENT INSULATION THICKNESS



ANGLE OR CHANNEL



BAR

STIFFENER HEIGHT LESS THAN ADJACENT INSULATION THICKNESS

NOTES -

PLASTIC FINISH COATS ARE NOT TO BE CONSIDERED PART OF INSULATION THICKNESS SPECIFIED.

BLOCK OVER STIFFENERS SHALL BE FASTENED BY LACING WIRE, OR PIN STUDS.

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STANDARD
LOCKED DRAWING

DESIGNED BY E.B.S.	DRAWN BY C.B.S.	BLOCK INSULATION OVER STIFFENERS	DATE 1-2-79
APPROVED BY	APPROVED REL.		3731 12

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

INSULATION

APPLICATION

ST (12M)

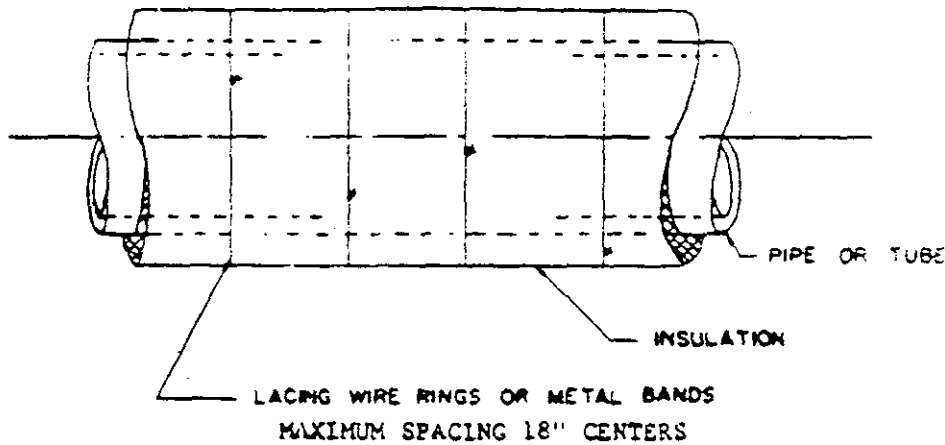
SA

STL

5/2-25-72

BLOCK INSULATION

REVISION	DATE
1	CHG. TITLE
2	CHG. Note
3	KWS TITLE CHG. PER. JWS



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THE BABCOCK

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DO NOT REAR. USE UNDERSTANDING ONLY

DESIGN BY EBS

DATE: EBS

DATE: 12-5-58

APPRO: R.T.L.

TUBES & PIPES UNDER 33" O.D.

SCALE: N.T.S.

23579 A-3

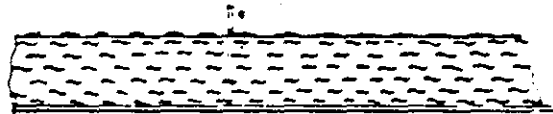
LOCKED - DO NOT REMOVE

21. 3. 30 - 5.

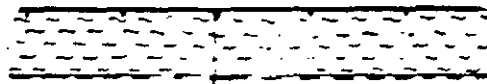
INSULATION

REVISIONS		DATE
SERIAL	DESCRIPTION	
1	FOR THE PROPOSED METHOD OF CONSTRUCTION	
2	METHOD TO BE USED FOR THE REMOVAL OF THE EXISTING CONCRETE	
3	CORRECTION IN THE APPLICATION OF THE METHOD	

INSULATION MUST BE SECURELY FASTENED ON 12" CENTERS ON OVERHEAD SURFACES - 18" CENTERS ON ALL OTHER SURFACES

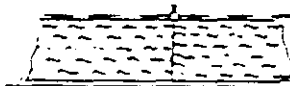


BLANKET ON PLATE



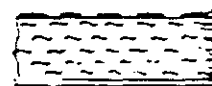
BLANKET ON ROAD MESH

JAM BLANKET TOGETHER FOR MAXIMUM SEALING AND TIE FACING ON 6" CENTERS.



JUNCTION OF BLANKET

WRAP MESH AROUND END OF BLANKET
AND TIE TO OUTER FACING ON 6" CENTERS

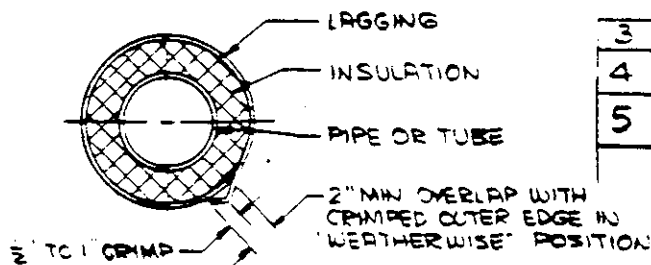


TERMINATION OF BLANKET

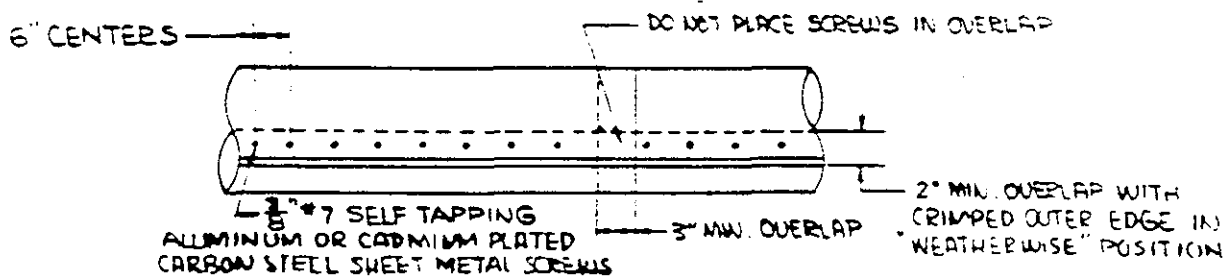
3
64
37 33
7/6-8-79

REVISIONS

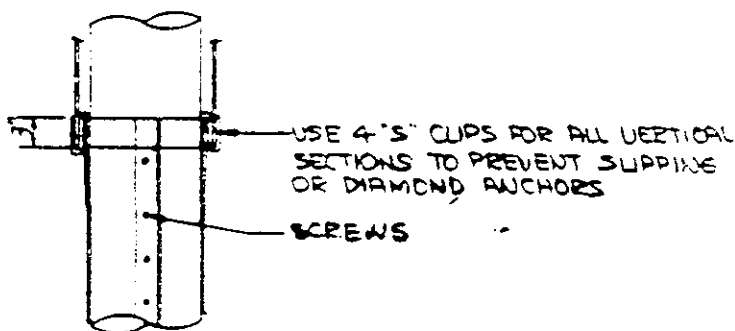
DATE	DATE	DESCRIPTION	DEG.	FILE
2	1/10/75	RECEIVED - OK MAT. OF		
3	1/10/75	RECEIVED - OK MAT. OF		
4	1/10/75	DELETED STAFF RECORDS -		
5	1/10/75	ADDED STAFF RECORDS -		
6	1/10/75	REV'D MAT'L SPEC. FOR		
7	1/10/75	3/8" S&P TAP SCREENS DOP		



HORIZONTAL RUN



HORIZONTAL RUN WITH SCREWED OVERLAP



VERTICAL RUNS

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STANDARD
LOCKED DECK WITH CRAWLING

DATE BY	JUN	CHG'D	ERS
PAID BY		AMT	REL

TUBES AND PIPES

SCALE DATE 8-7-56
SERIAL 26438 1-5

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

INSULATION

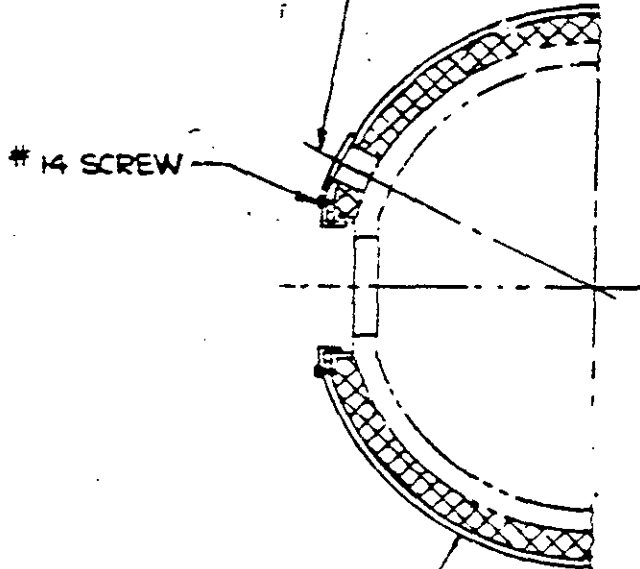
APPLICATION

METAL LAGGING

3Y
6A
3Y23
5/6-14-82

REV.	DESCRIPTION	DATE
1	KW TITLE (DDED PMSK) --	
	3-19-71 BRF/LWC	
2	RELOCATED CODE STAMP	
	6-14-82 BRF/WK	

CUT HOLE IN LAGGING TO SUIT
OPENING FOR DRUM STAMPING.
COVER IS TO BE REMOVABLE FOR
INSPECTION & STENCILED
"CODE STAMP"



HEAD TO BE COVERED WITH
ORANGE PEEL CONSTRUCTION

THE PATENT OF THE COMPANY OF
THE BABCOCK & WILCOX CO.
AND ITS SUCCESSORS SHALL BE IN FULL FORCE AND EFFECT IN ALL COUNTRIES WHERE THE SAME ARE IN FORCE AND EFFECT AT THE DATE OF THE FIRST PUBLICATION OF THIS DRAWING. THE COMPANY OF THE BABCOCK & WILCOX CO. AND ITS SUCCESSORS SHALL BE IN FULL FORCE AND EFFECT IN ALL COUNTRIES WHERE THE SAME ARE IN FORCE AND EFFECT AT THE DATE OF THE FIRST PUBLICATION OF THIS DRAWING. THE COMPANY OF THE BABCOCK & WILCOX CO. AND ITS SUCCESSORS SHALL BE IN FULL FORCE AND EFFECT IN ALL COUNTRIES WHERE THE SAME ARE IN FORCE AND EFFECT AT THE DATE OF THE FIRST PUBLICATION OF THIS DRAWING.

LOCKED DRAWER DRAWING

REV. EDS	REV. LWS
REV. 2-1-80	REV. RLC

DRUM HEADS

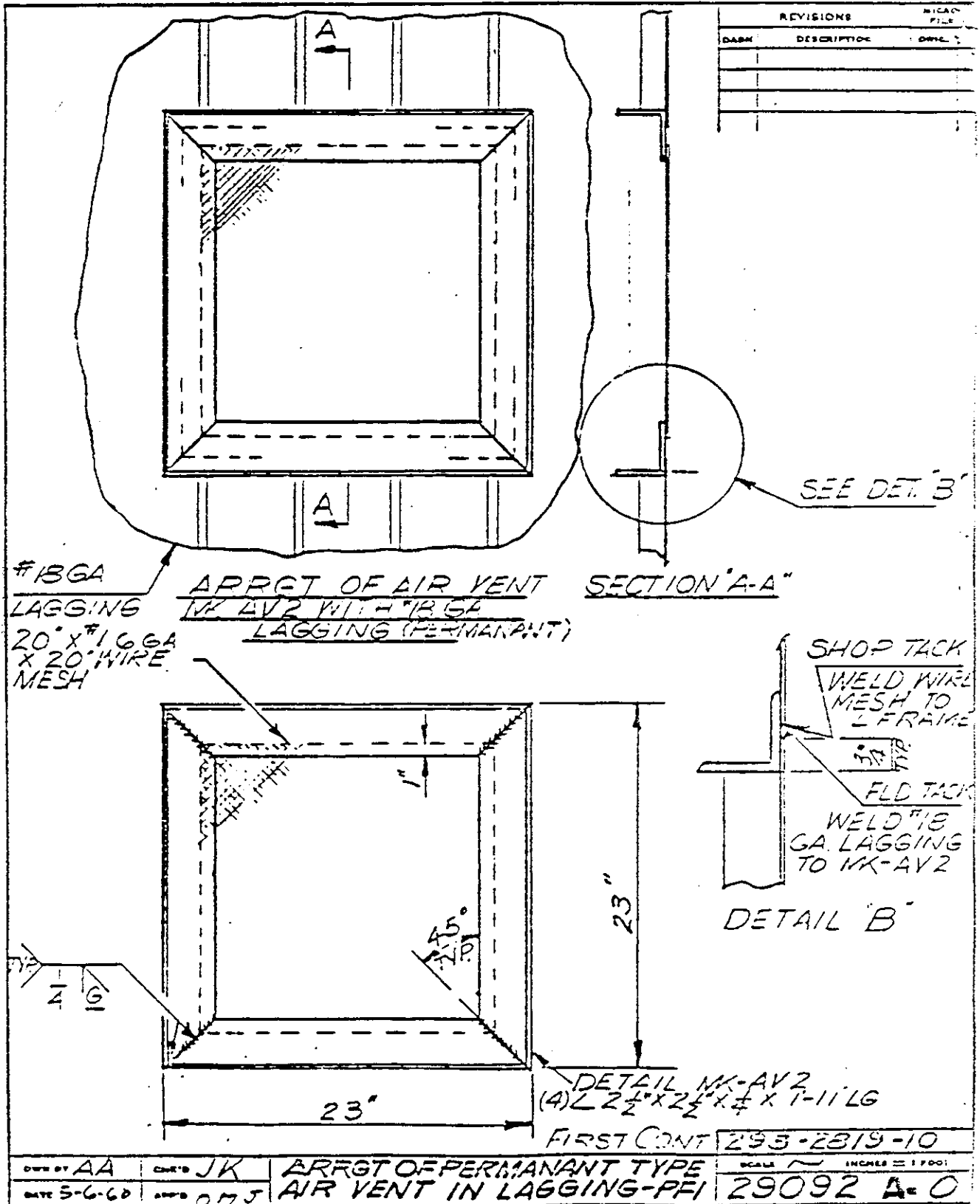
DRUM HTS	DRUM HTS
28445	28445

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THE BARCOCK & WILCOX CO.

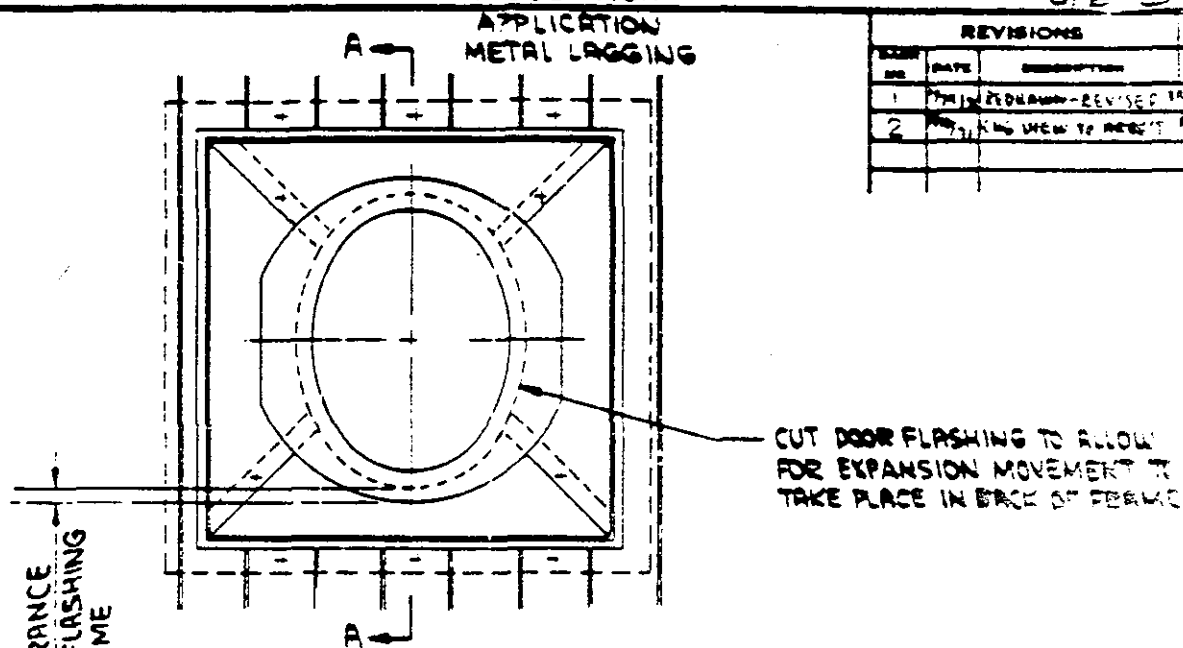
AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHERS, OR FOR ANY OTHER PURPOSE DETRIMENTAL TO THE INTERESTS OF THE BARCOCK & WILCOX COMPANY, AND IS TO BE RETURNED UPON REQUEST. THE EQUIPMENT SHOWN HEREON IS PROTECTED BY PATENTS OWNED OR CONTROLLED BY THE BARCOCK & WILCOX COMPANY AND ANY INFRINGER OF SUCH PATENTS IS LIABLE TO PROSECUTION.



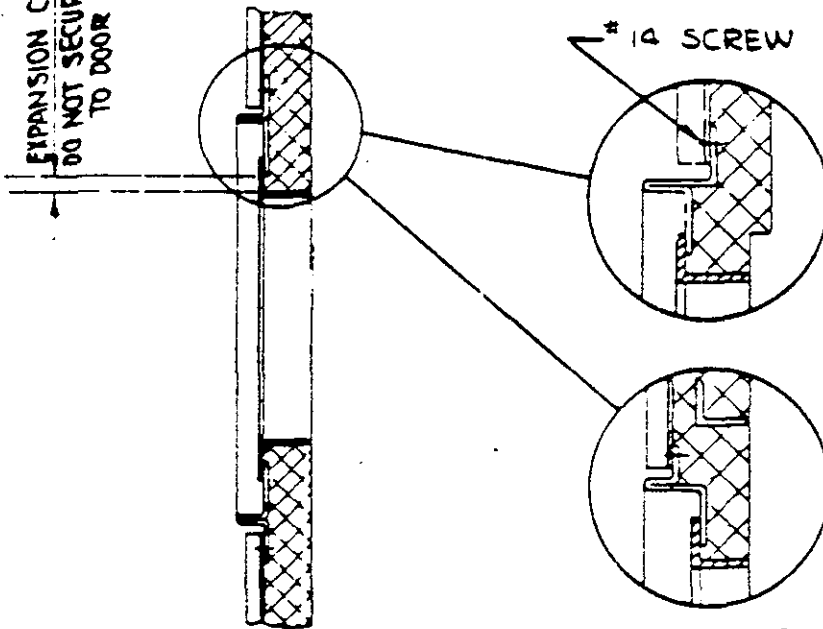
THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
INSULATION

BY
GA
8723
8/2-8-79

REVISIONS			
NO.	DATE	DESCRIPTION	BY
1		THIS DRAWING REVISED TO ALLOW	
2		FOR KING VIEW TO MEET REQ.	



EXPANSION CLEARANCE
DO NOT SECURE FLASHING
TO DOOR FRAME



SECTION A-A

ALTERNATE
ARRANGEMENTS

FLASHING AT ACCESS DOORS

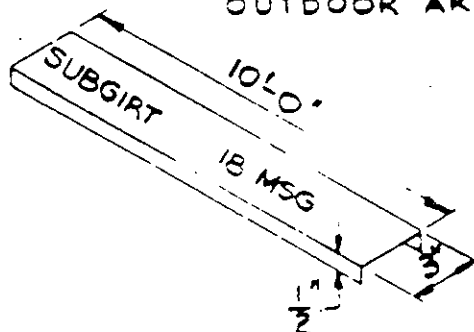
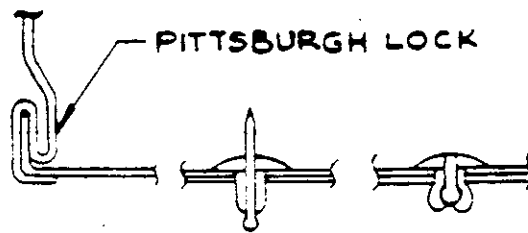
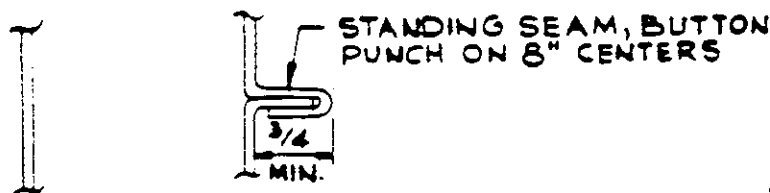
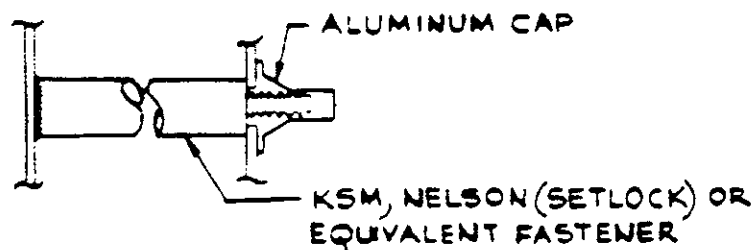
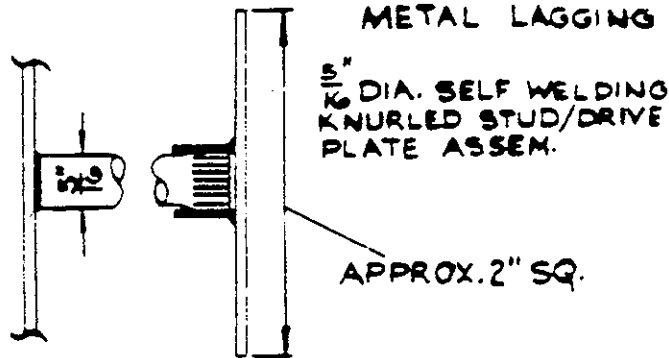
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DESIGNED BY	DATE 8.1.2.	ARRANGEMENT OF METAL LAGGING	SCALE	DATE 8.1.2.
DRAWN BY	DATE 8.8.2.	ROUND ACCESS DOORS	NO.	39732 1-2

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

3V
6A
3Y33
11/6-E-70

INSULATION APPLICATION
METAL LAGGING



REVISIONS				ISSUED
DATE	BY	DESCRIPTION	SCALE	
9/11/77	WJW	REVISION & CHECKS		

NOTES-

1. STUDS FOR LAGGING SHOULD BE APPLIED TO THE CASING BEFORE APPLICATION OF THE INSULATION.
2. ALL SELF WELDING STUD DEVICES SHOULD BE SUCH THAT BURN THROUGH OF CASING PLATE, ETC. IS IMPOSSIBLE. THIS MAY BE ACCOMPLISHED BY CURRENT LIMITING DEVICES OR EQUIVALENT.
3. ON OUTDOOR ALUMINUM LAGGED JOBS ANY PORTION OF THE FASTENER THAT IS EXPOSED TO THE WEATHER SHALL BE MADE OF A MATERIAL THAT WILL NOT STAIN THE LAGGING.
4. WHEN SUBGIRTS ARE USED OVER HARD INSULATION, BEND 1/2" FLANGES FLAT AGAINST SUBGIRT WEB TO ALLOW LAGGING TO BE IN CONTACT WITH THE INSULATION.
5. SUBGIRTS (WHEN USED) SHOULD BE 18 MSG ALUMINIZED STEEL OR PAINTED PER DISSIMILAR METALS SPECIFICATIONS WHERE ALUMINUM LAGGING IS USED AND CS WHERE GALVANIZED STEEL LAGGING IS USED.
6. THE 5/16" DIA. SELF WELDING KNURLED STUD/DRIVE PLATE ASSEM. SHOULD BE AS MFG'D BY H.A. JONES CO. DAYTON OHIO OR EQUIVALENT.
7. #14 SHEET METAL SCREWS SHOULD BE USED WHEN ATTACHING SUBGIRT TO DRIVE PLATE ASSEM. (2) SCREWS ARE REQUIRED FOR OVERHEAD SURFACES.

DESIGN BY W.W. CHECKED J.J.Z.
DATE 8-9-61
E.R.S.

TYPICAL
METHODS OF FASTENING

SCALE DATE 8-9-61
39734 A.9

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3-10-80

REVISIONS		DATE
DATE	DESCRIPTION	BY
1	REMOVED Q41 FROM INSTR. PLUG 2440 REPAIR	
2	Q41 TITLE 11-71 REPAIR	
3	ADDED PLUG 2440 Q41-71 REPAIR	
4	Q41'S W/IN INSTR. TO INSTR. INSTR. SUPP 11-71 REPAIR	
5	REV APPLICATION 9-26-80 K2	

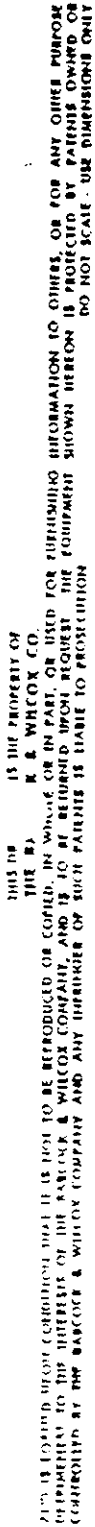


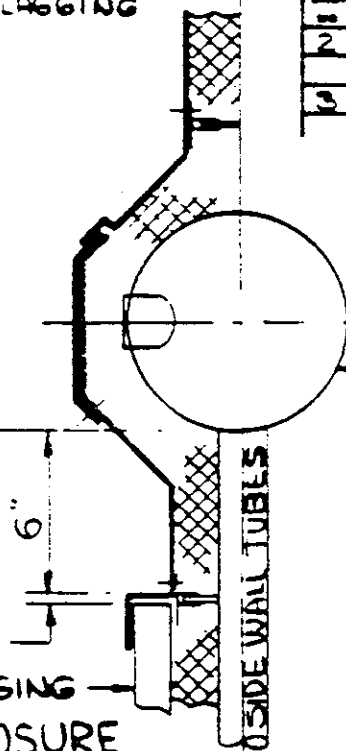
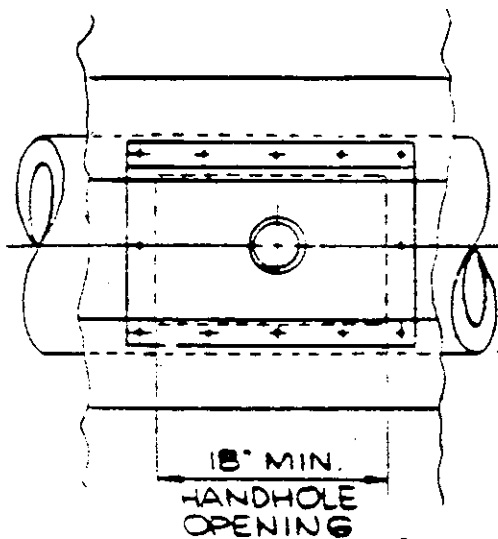
FIGURE 2. *Staphylococcus aureus* VISA.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
INSULATION

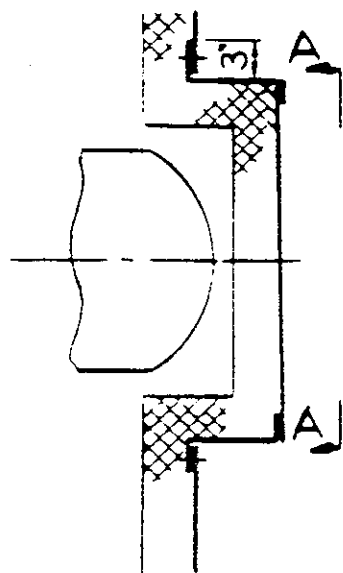
37
GA
3Y38
19/6-8-79

APPLICATION
METAL LAGGING

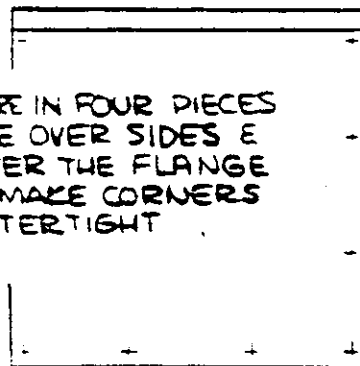
REVISIONS			
NO.	DATE	DESCRIPTION	BY
2	1/2/79	ENCLOSURE - COVER PLATE	BAW
3	1/2/79	ENCLOSURE - COVER PLATE	BAW



SIDE HANDHOLE ENCLOSURE



MAKE ENCLOSURE IN FOUR PIECES
LAP TOP PIECE OVER SIDES &
LAP SIDES OVER THE FLANGE
AT BOTTOM. MAKE CORNERS
& JOINTS WATERTIGHT



FRONT COVER PLATE
MUST SLIDE UNDER
TOP FLANGE & OVER
SIDE & BOTTOM
FLANGES.

VIEW A-A

HEADER END HANDHOLE ENCLOSURE

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RECKED DRAWER DRAWING

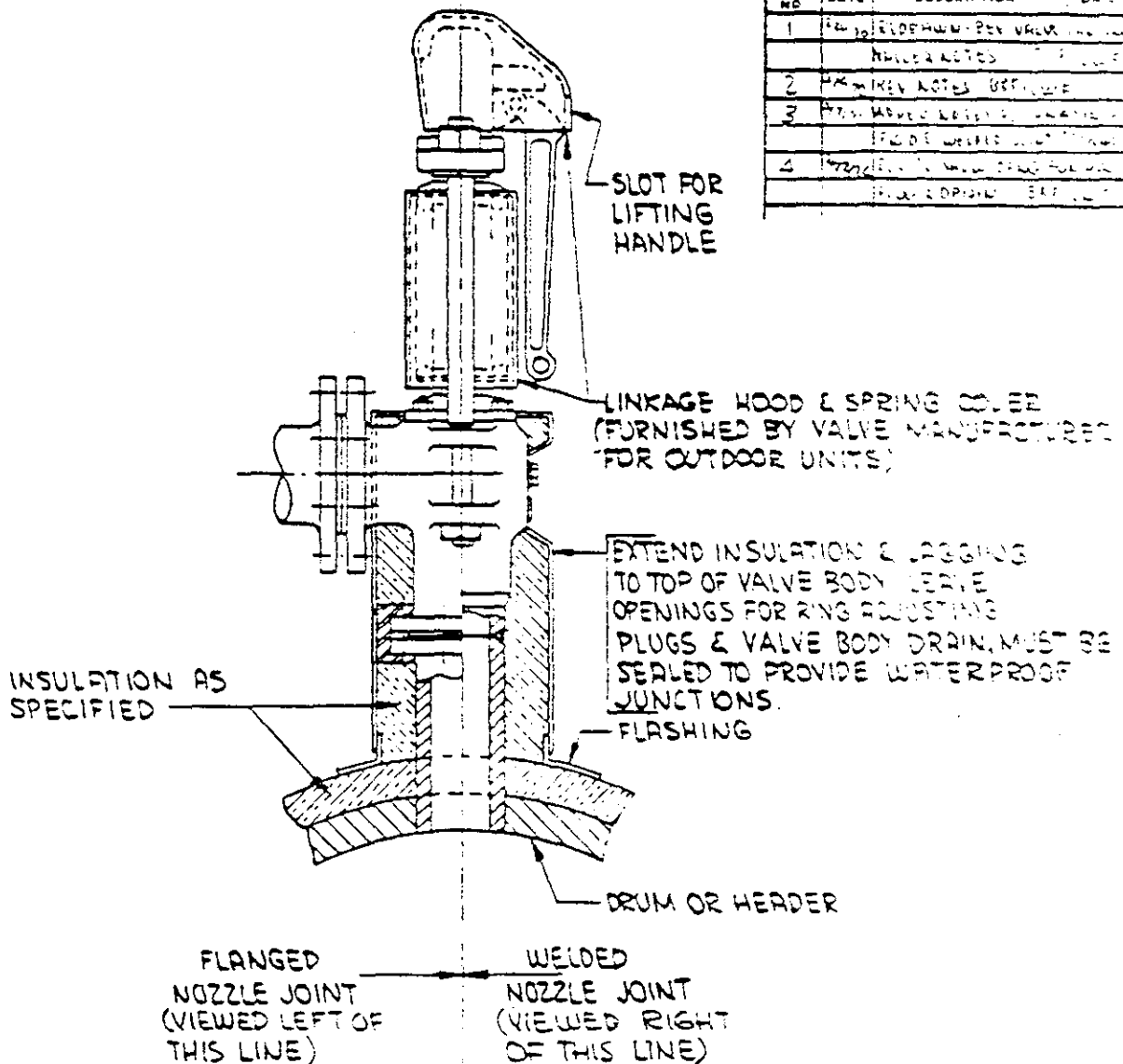
DATE: 11.1.79	BY: J. J. Z	HANDHOLE OPENING COVERS	SCALE:	DATE:
DRAWN BY: L. W. F	APPROVED: E. B. S.		44438	43

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
APPLICATION

SYSTEM
BULL
2/5-25-72

INSULATION & LAGGING FOR SAFETY VALVES

REVISIONS			
DRAWING NO.	DATE	DESCRIPTION	BY
1	12/10/71	REDESIGNED FOR VALVE	
		HAZARD NOTES	
2		HAZARD NOTES	
3		HAZARD NOTES	
4		HAZARD NOTES	



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DRAWN BY B.R.F. CHECKED L.W.F.
PASSED BY A.O.D. APPROVED R.C.M.

ARRANGEMENT OF LAGGING
FOR SAFETY VALVES

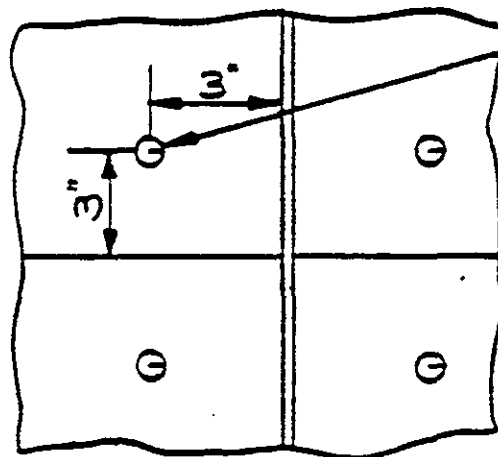
SCALE DATE 12-2-68
DRAWING NO. 64419 A.C.

LOCKED FOR THE COMPANY FORM BSC 100-1-68

INSULATION

INSULATION
APPLICATION OF INTERMEDIATE
TEMPERATURE BLOCK INSULATION

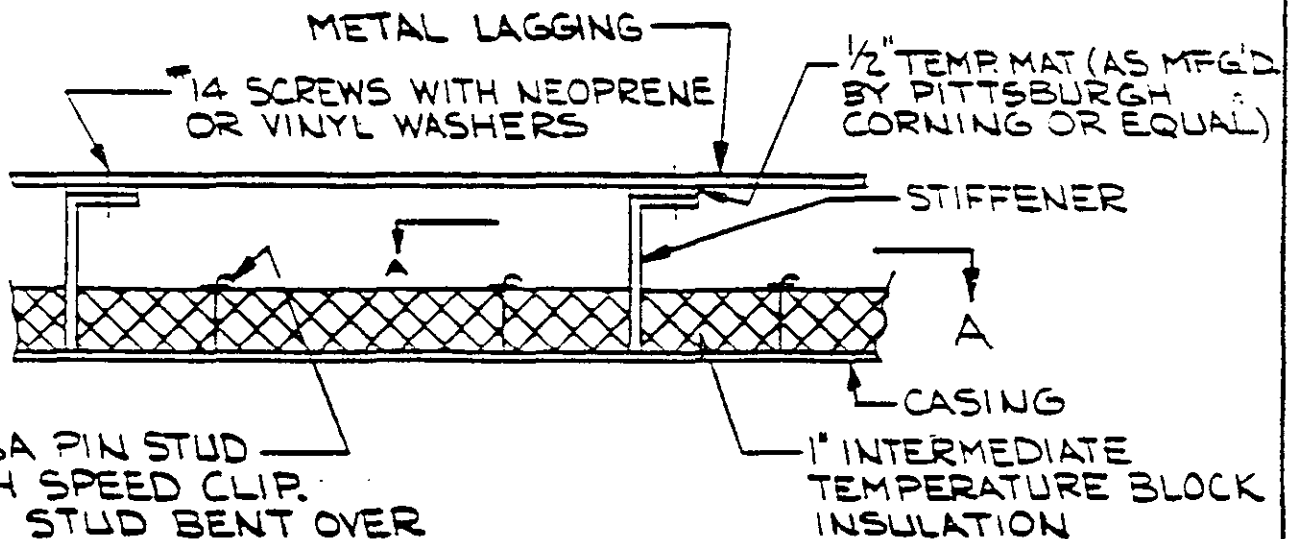
REVISIONS			DATE
8	FILED	REDRAWN	6-7-83
9	FILED	PLASTER LATHING	
10	FILED	REF TO LATH IN NOTE	



SECTION A-A

PIN STUDS TO BE
SPACED ON 12" MAX.
CENTERS OVERHEAD
AND 18" MAX. CENTERS
ON VERTICAL OR
HORIZONTAL SURFACES

BLOCKS BUTTED
TIGHTLY TOGETHER
TO AVOID CRACKS



12 GA PIN STUD
WITH SPEED CLIP.
PIN STUD BENT OVER
AFTER APPLICATION OF
SPEED CLIP

LOCKED DRAWER DRAWING

60

DESIGNED BY B.B.F.	CHECKED BY L.W.F.	TYPICAL APPLIC. WHERE 1"	SCALE 1/4" = 1'-0"	DATE 4-18-67
DRAWN BY A.O.D.	APPROVED BY R.C.M.	I.T. BLOCK IS SPECIFIED	NO. 77804 A-10	

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

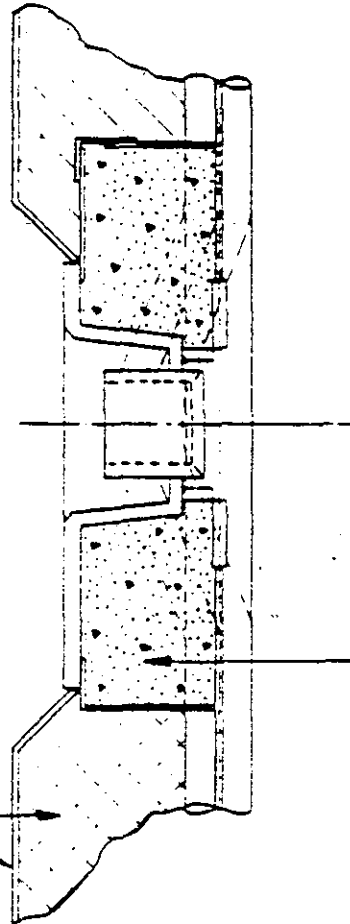
4Y (EDG)

BU
2/12-19-72

INSULATION, BRICKWORK & REFRACTORY

DOORS

REVISIONS				DATE	FILE
NO.	DATE	DESCRIPTION	BY	DATE	FILE
1	2/12/72	REVISIONS TO KAOCAST-30 & ROUNDED			
2	2/12/72	INSULATION KAOCAST-30 & ROUNDED			



INSULATION AND
OUTER COVERING
AS SPECIFIED

FILL AREA BETWEEN TUBES AND
CASING WITH KAOCAST
FLUSH WITH TOP PLATE. APPLIED
IN FIELD BY BRICK WORK
CONTRACTOR.

OWN BY E.B.F.	CHE'D L. W. F.
PASSED BY G.E.S.	APP'D A.B.P.

SMALL ACCESS DOORS

SCALE	DATE 5-23-72
DRAWING NO.	97085 A-2

LOCKED DRAWER DRAWING

FORM 1007-A-1

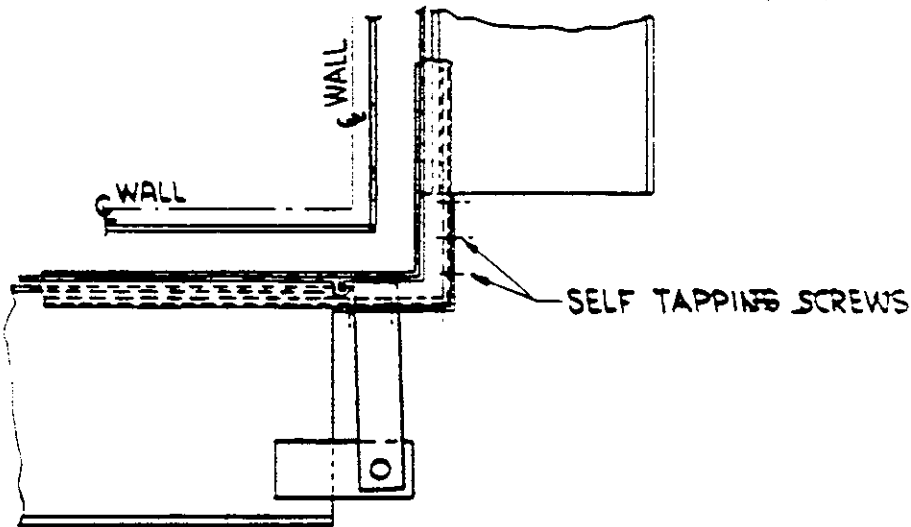
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THE BARCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

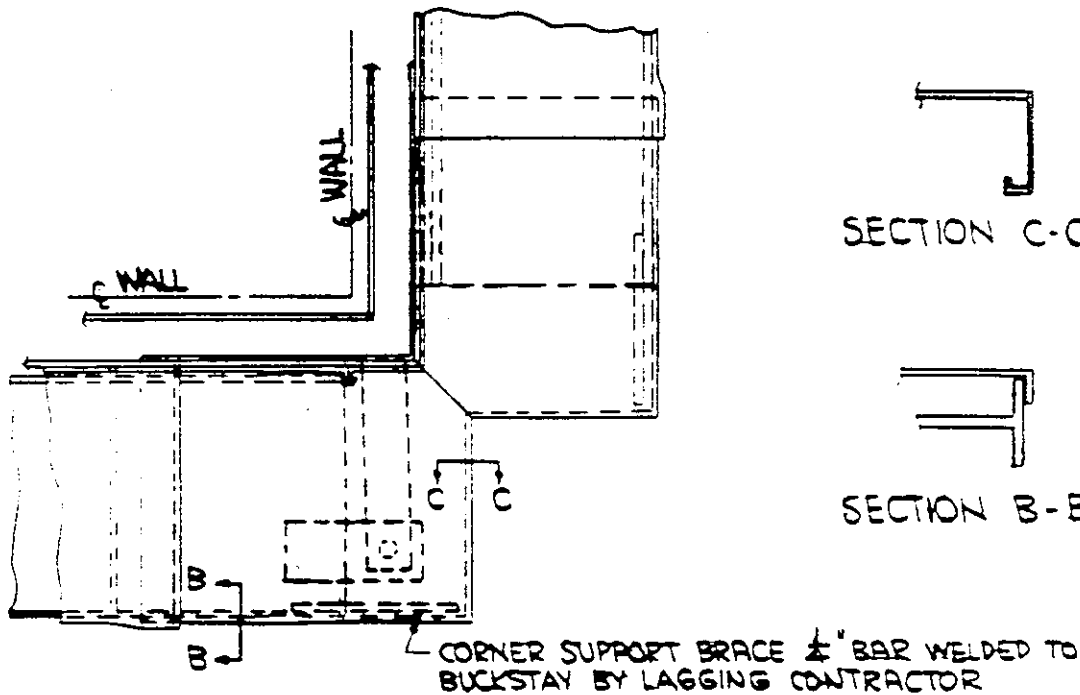
57
6A
3783
3/3-77

INSULATION
APPLICATION
METAL LAGGING

REVISIONS			
DATE	NO.	DESCRIPTION	BY
	1	REVISED TO GENERAL	
		UPDATE /RN/	
	2	REVISED SRT.CC SH	



BUCKSTAY END CONNECTION WITHOUT COVER



BUCKSTAY END CONNECTION WITH COVER

OWN BY B.B.F. CHK'D L.W.F.
PASSED BY GES. APP'D A.B.P.

BUCKSTAY END CONNECTIONS

SCALE DATE 9-23-71
DRWS. NO. 97088 A-2

LOOKED DRAWER DRAWING.

PAGE 000 1007 A-2

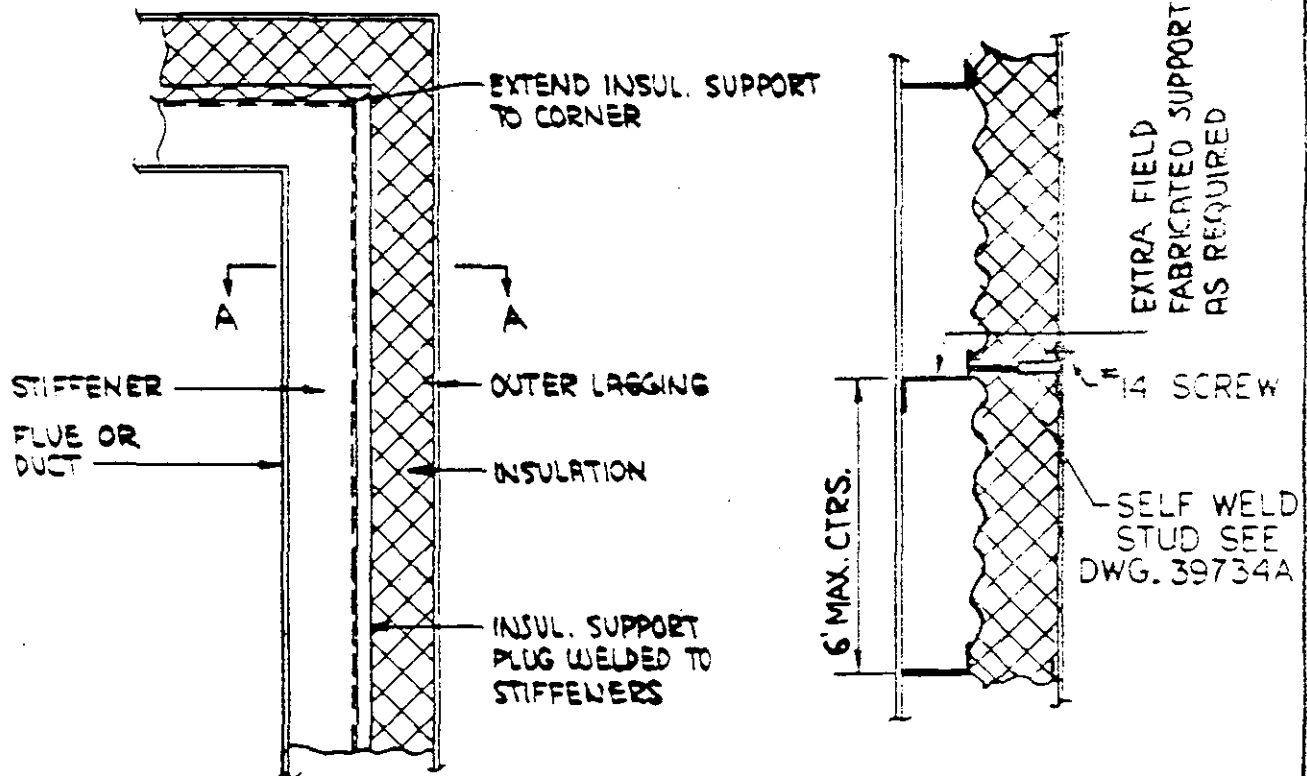
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THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

3Y
6A
3Y33
14/E-8-70

INSULATION
APPLICATION
METAL LAGGING

REVISIONS				REVISION	
NO.	DATE	DESCRIPTION	BY	CHK	APP
1	1/14/71	WELDED TO BARRIER NOTE			
2		ADDED NOTE #			
3		REMOVED INSULATED			
		BARRIER BARRIER			
		SUPPT. (NOTE 2)			
		ADDED WELD STUD			



SECTION A-A

1. FOR THERMAL BARRIERS ON VERTICAL FLUES AND DUCTS WHOSE SIDES ARE 10'-0" OR MORE IN HEIGHT SEE DWG. 3729A.
2. SUPPORTS FOR INNER INSULATION SUPPORT TO BE ON 6'-0" MAX CTRS. PLUG WELD THREE (3) TIMES PER EACH SHEET WIDTH.
3. AN ALTERNATE SYSTEM FOR SECURING THE INNER INSULATION SUPPORT TO EXTERNAL STIFFENERS FOR FLUES, DUCTS AND OTHER AREAS WHERE THE INNER SUPPORT REST AGAINST THE EXTERNAL STIFFENERS SHALL BE "HILTI FASTENER SYSTEM" OR EQUIVALENT. 3-EDN 19P8 PINS PER SHEET WIDTH. PINS SHOULD BE PLACED AGAINST THE LOW SIDE OF CORRUGATION, THAT IS THE CORRUGATION IN DIRECT CONTACT WITH THE SUPPORTING MEMBER.

DWG BY B B F
CHK'D L W F
PASSED BY G E S
APP'D A B P

INNER INSULATION SUPPORT
OVER STIFFENERS

SCALE
DATE 5-23-71
97091 A-2

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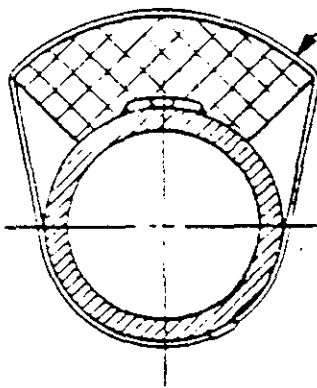
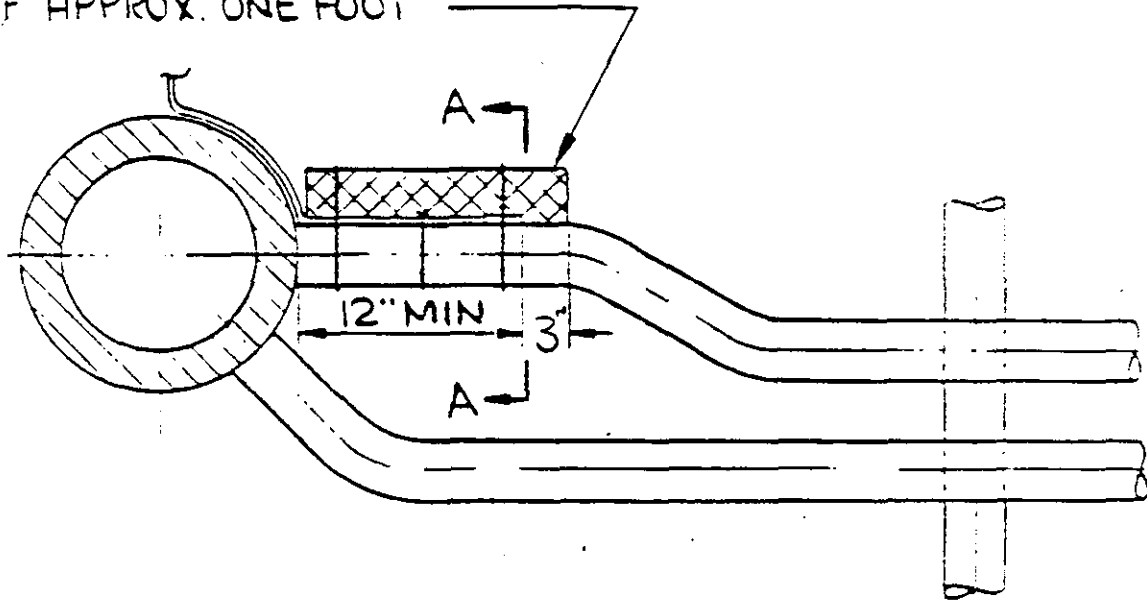
THE BARCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

BY JAW
SA
1-1-72
1-1-28-72

INSULATION
APPLICATION
PERMANENT THERMOCOUPLES

REVISIONS			
DATE	DESCRIPTION	ORIG	

INSULATE THERMOCOUPLE AT
HOT JUNCTION FOR A LENGTH
OF APPROX. ONE FOOT



SECTION A-A

WHEN TUBES, HDR OR DRUM ARE NOT COMPLETELY
INSULATED, ADD 1 1/2" MED TEMP PREFORMED
INSUL. IN THE AREA SHOWN. THE BLOCK IS
TO BE TIED IN TWO PLACES WITH STAINLESS
STEEL BANDS OR WIRE BY INSULATION
CONTRACTOR.

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DWN BY B.B.F.	CHE'D L.W.F.	TYP. THERMOCOUPLE INSULATION	SCALE	DATE 2-1-72
PASSED BY G.E.S.	APP'D A.B.P.		DRAWN	97101 A.C.

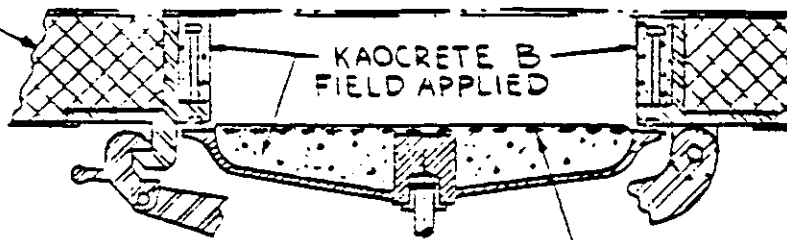
THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

BY C.M.
GA
BUS
1/1-18-72

INSULATION
APPLICATION
DOORS

REVISIONS			
NO	DATE	DESCRIPTION	BY

INSULATION
AS SPECIFIED

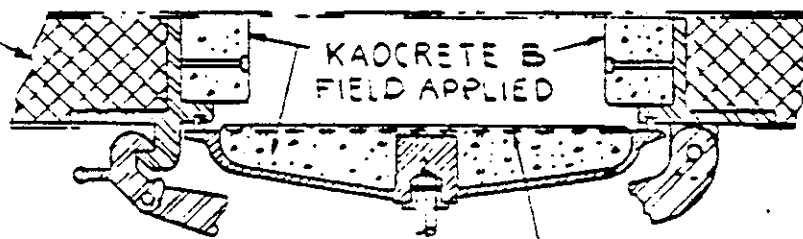


EXPANDED METAL LATH
SHOP APPLIED

ACCESS DOOR IN FLUE, DUCT OR PENTHOUSE
INSIDE OR OUTSIDE INSULATED

NO REFRACTORY, PINS AND EXPANDED METAL LATH
REQUIRED FOR TEMP. 150° AND BELOW
MAX. TEMP. WITH REFRACTORY LINING 899°

INSULATION
AS SPECIFIED



EXPANDED METAL LATH
SHOP APPLIED

ACCESS DOOR
MAX. TEMP. 1500°

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DESIGNED BY	EAS	CHECKED	
DRAWN BY		APPROVED	

ACCESS DOORS

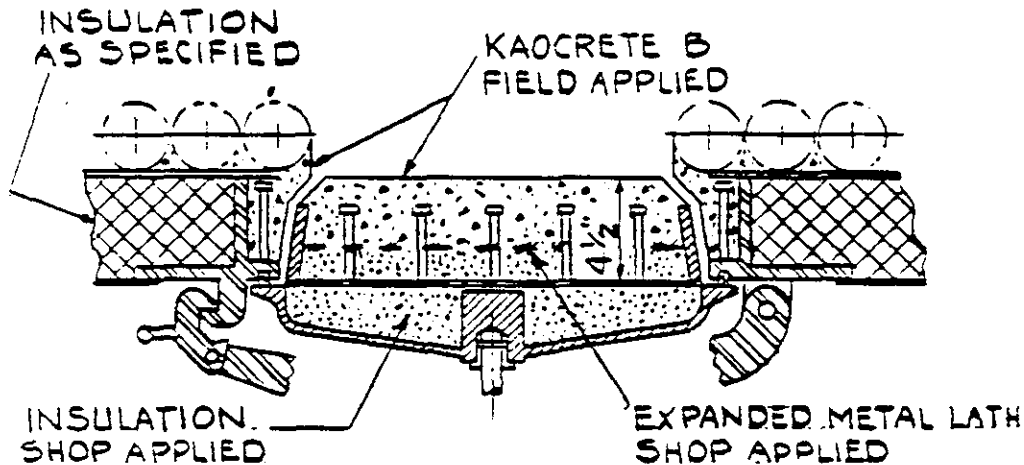
SCALE		DATE	1-12-72
DRAWING NO	101955	A.C.	

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

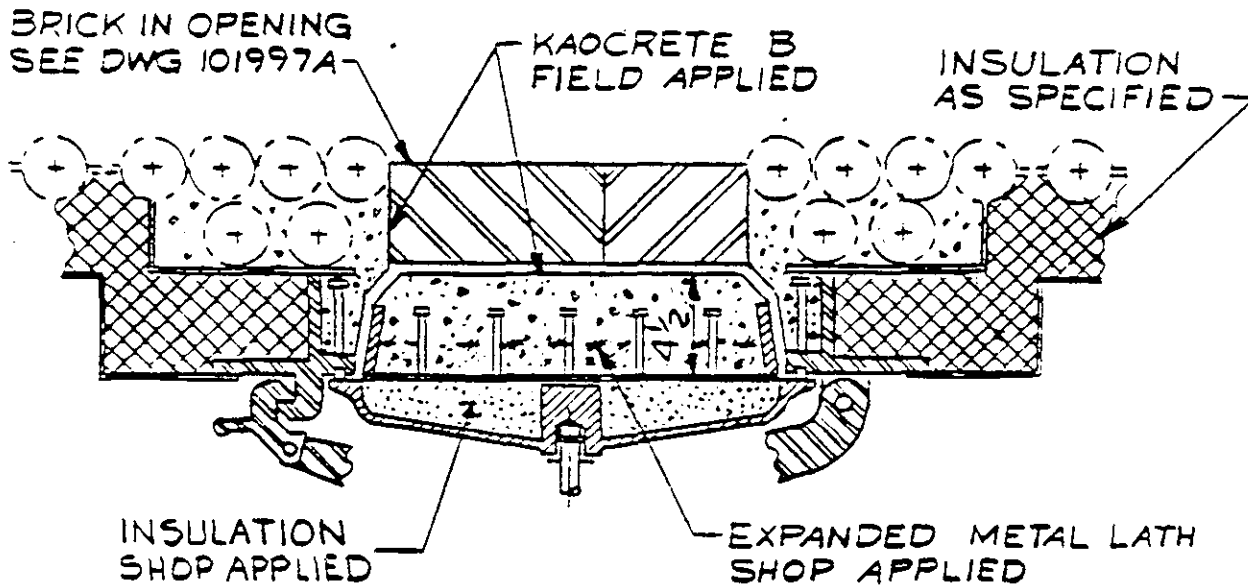
34 (14M)
6A
BU3
12/10-8-82

INSULATION
APPLICATION
DOORS

REVISIONS				MICRO- FILM
DASH NO	DATE	DESCRIPTION	ORIG	
1	12/10/82	3000°F 60% ALUMINA WAS PLASTIC CHROME		
2	12/10/82	CHGD DOOR FOR TEMP OVER 2200°F		



ACCESS DOOR - REFRACTORY LINED
MAX. TEMP. 2200°



ACCESS DOOR - REFRACTORY LINED
FOR TEMP. OVER 2200°

15x21 WATER COOLED ACCESS DOOR DWG 32039E OPTIONAL

DWG BY S.A.S.	CHK'D	ACCESS DOORS	SCALE	DATE 1-12-72
PASSED BY	APP'D		DWG NO 101956A-2	

COPY TRAVEL DRAWING 1-12-72

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THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
INSULATION

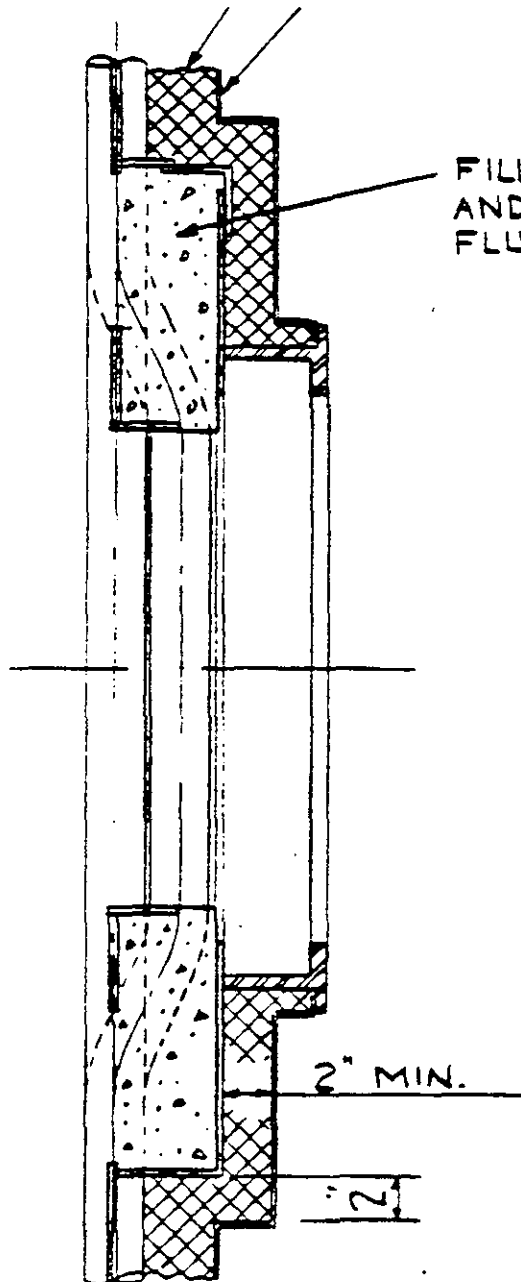
BY (12M),
GA
BU
1/1-18-72

APPLICATION
ACCESS DOOR

REVISIONS			
REVISION NO.	DATE	DESCRIPTION	ORIG

INSULATION AND OUTER
COVERING AS SPECIFIED

FILL AREA BETWEEN WALL BOX
AND TUBES WITH KAOCRETE B.
FLUSH WITH TOP PLATE



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DO NOT SCALE--USE DIMENSIONS ONLY

DRAWN BY S.A.S. CHK'D
PASSED BY APP'D

ACCESS DOOR
MEMBRANE WALL

SCALE DATE 1-18-72
DRWS. NO. 101957 A-C

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
INSULATION

BY C.E.M.
GA
12R1
1/2-13-EC

APPLICATION
SOOT BLOWERS

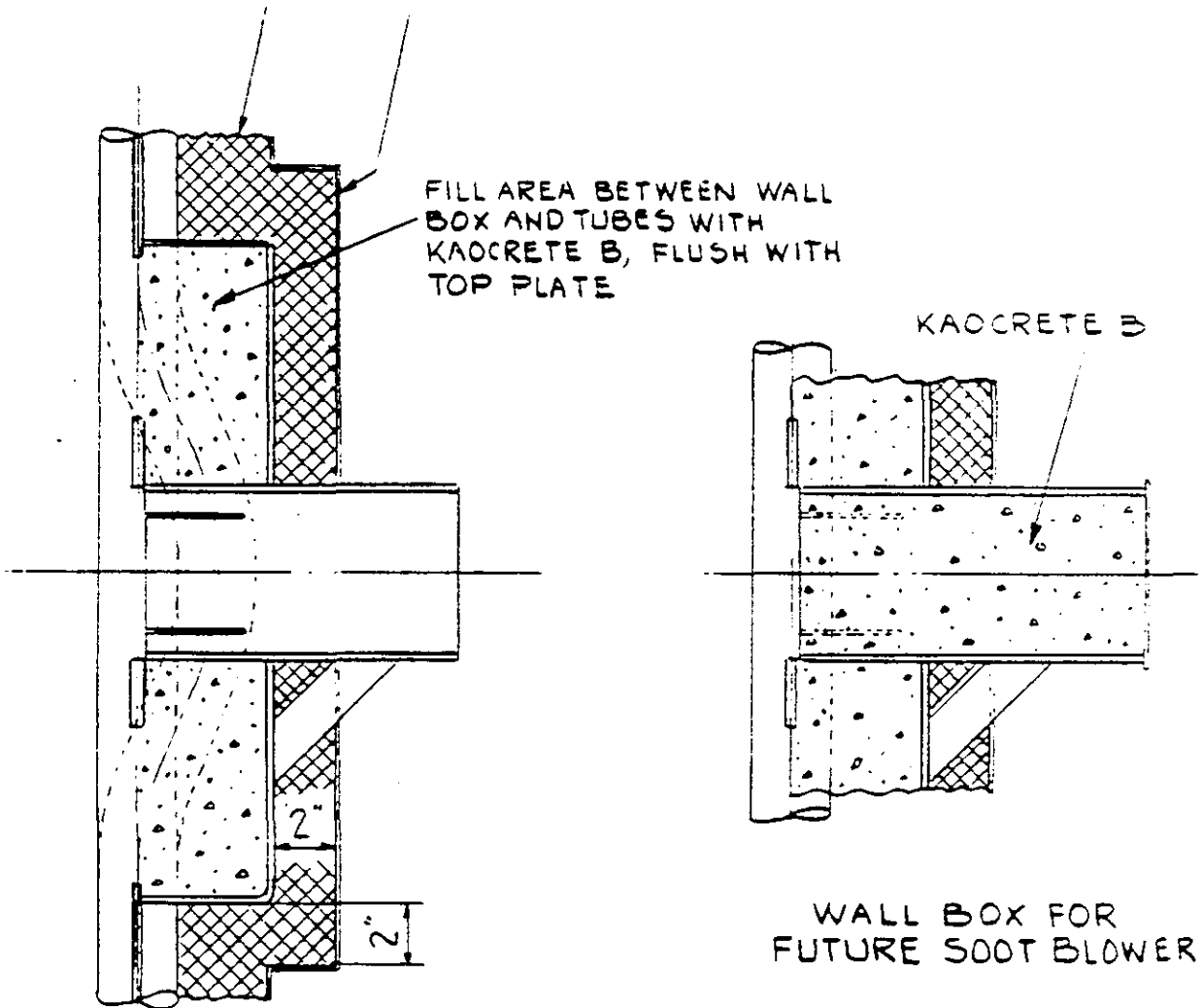
REVISIONS				MISC.
DASH NO	DATE	DESCRIPTION	ORIG	BY

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INSULATION AND OUTER COVERING AS SPECIFIED

FILL AREA BETWEEN WALL BOX AND TUBES WITH KAocreTE B, FLUSH WITH TOP PLATE

KAocreTE B



WALL BOX FOR
FUTURE SOOT BLOWER

FOR PRESSURE OR SUCTION BOILER

DWN BY S.A.S. CHK'D
PASSED BY APP'D

SOOT BLOWERS
MEMBRANE WALL

SCALE ~ DATE 1-17-72
DWG NO 101960 A-0

60

12.M DIV.

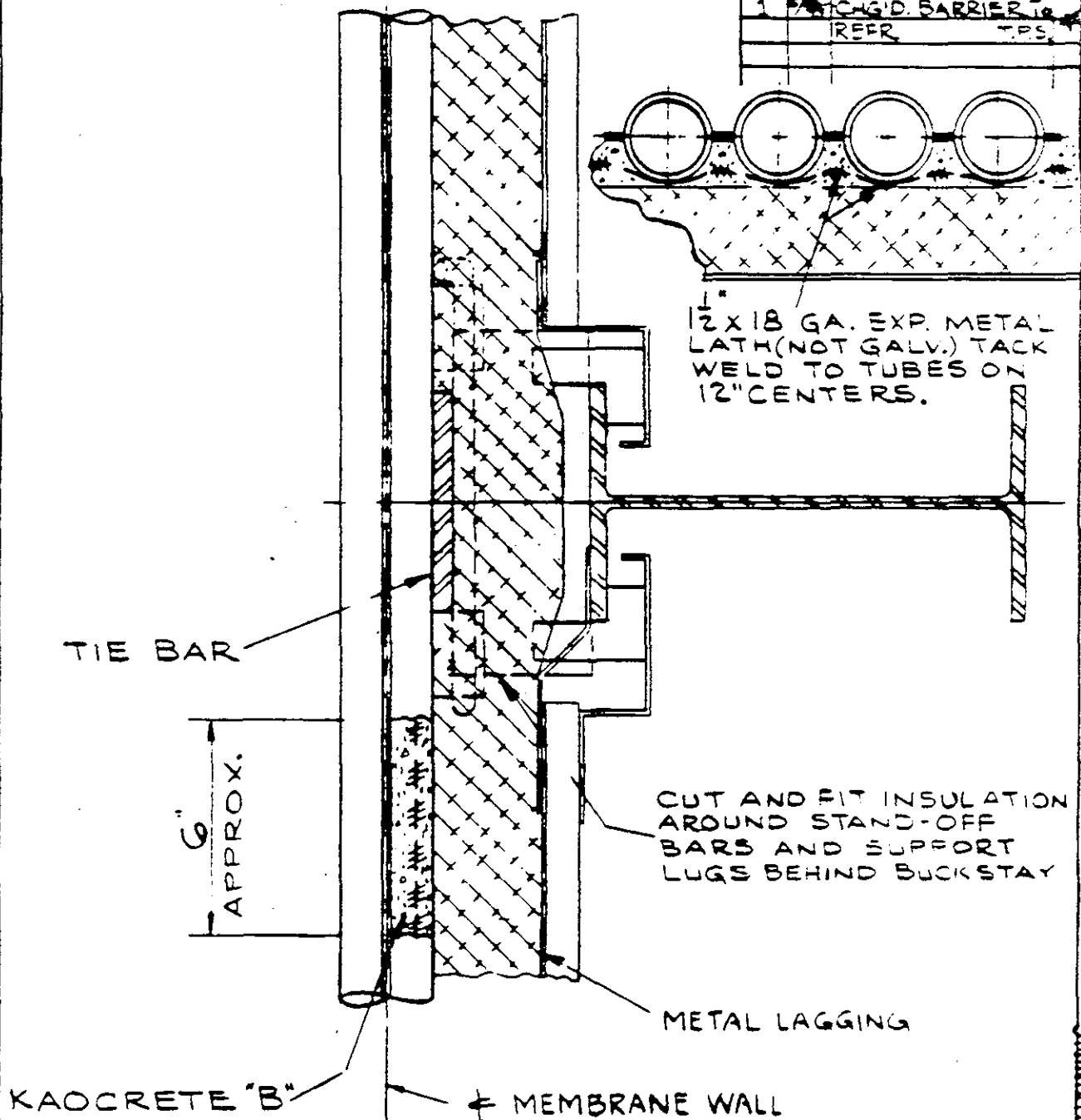
FORM BDM 1087 A-2

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

BY (IEM)
GA
BY
92/6-8-79

INSULATION APPLICATION
AT BUCKSTAY

REVISIONS			
NO.	DATE	DESCRIPTION	BY
1		PATCH'D. BARRIER	
		REFR.	TPS



1/2" X 1/8" GA. EXP. METAL
LATH (NOT GALV.) TACK
WELD TO TUBES ON
12" CENTERS.

CUT AND FIT INSULATION
AROUND STAND-OFF
BARS AND SUPPORT
LUGS BEHIND BUCKSTAY

METAL LAGGING

KAOCRETE "B" ← MEMBRANE WALL

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DO NOT SCALE USE DIMENSIONS ONLY

DESIGNED BY S.A.S.	CHECKED BY	INSULATION AT BUCKSTAY	SCALE ~	DATE 1-26-72
DRAWN BY	APP'D	MEMBRANE WALL	DRAWN NO	101963 A-1

DUPLICATE - ORIGINAL LOST

60

FORM 800 1067 A-2

CKED DRAWER DRAWING 1&M DIV.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

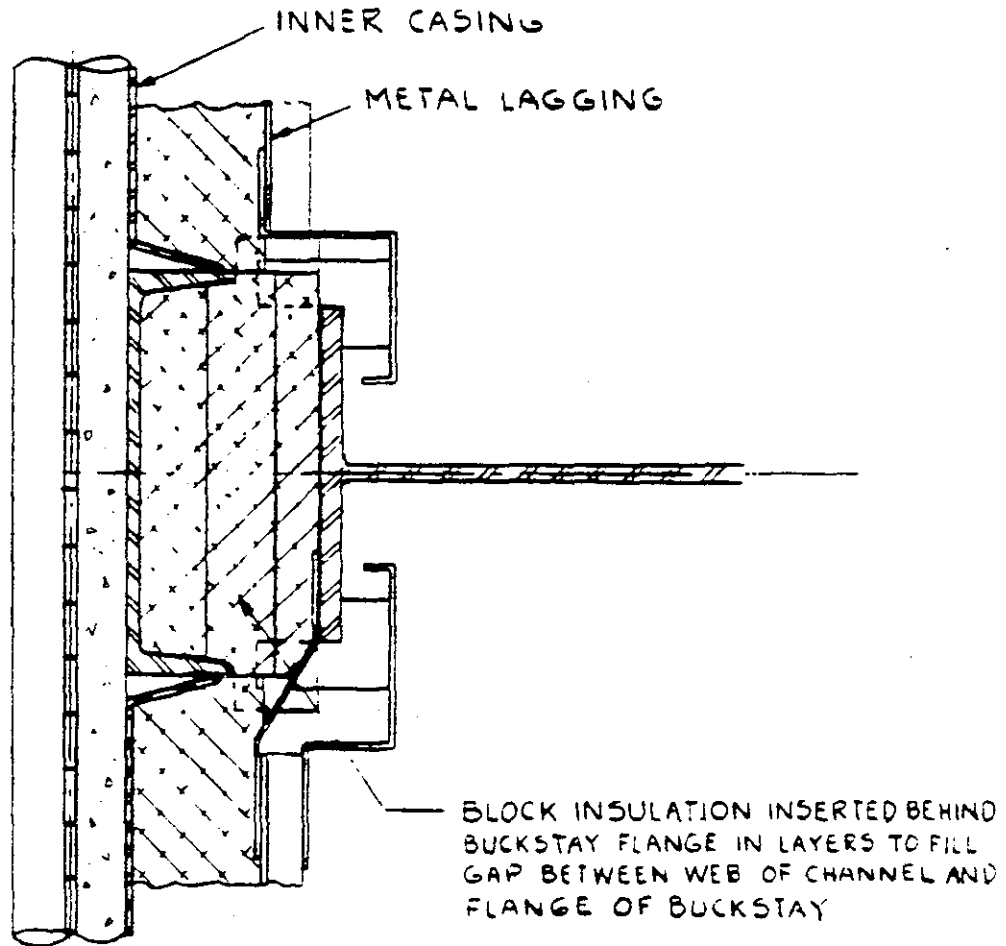
3Y (12M)
6A
-Y1
-12-23-72

INSULATION
APPLICATION
AT BUCKSTAY

REVISIONS			MICRO FILM
DASH NO	DATE	DESCRIPTION	ORIG

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DO NOT SCALE USE DIMENSIONS ONLY



FOR PRESSURE OR SUCTION BLR.

OWN BY S.A.S.	CHK'D	INSULATION AT BUCKSTAY	SCALE ~	DATE 12-26-72
PASSED BY	APP'D	STUDDED WALL	DRW NO 101964 A-0	

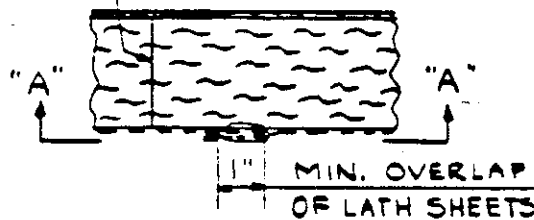
THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

3Y (12M)
6A
3Y1
7/6-8-79

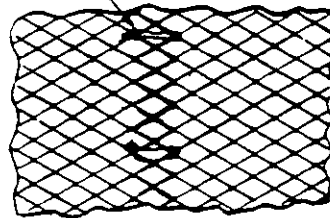
INSULATION
APPLICATION
INTERMEDIATE TEMP. BLOCK

REVISIONS				APPROV.
NO.	DATE	DESCRIPTION	ORIG.	
1	11-22-72	DEL COPPER BRG		
2	2-2-79	FROM LATH JKS CHG'D FROM LATH TO BRG. LATH		

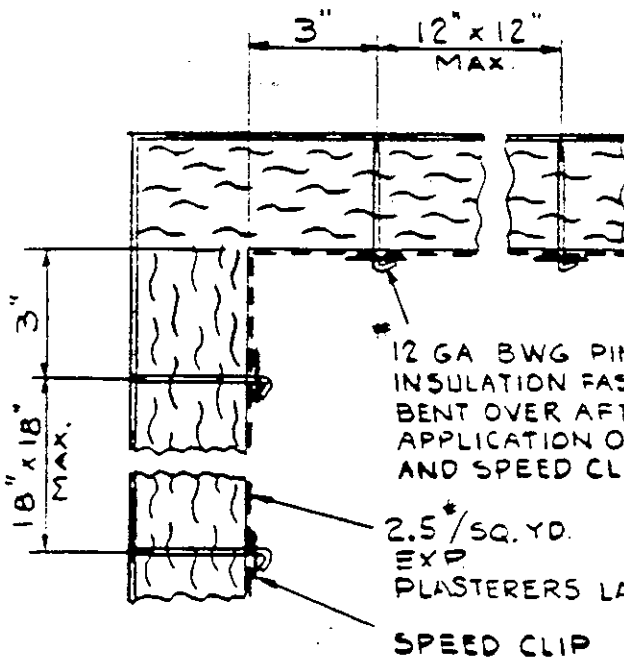
BLOCKS JAMMED TOGETHER
TO AVOID ANY CRACKS



SECURELY TIE EDGES OF
LATH SHEETS TOGETHER
WITH DOUBLE STRANDS OF
TIE WIRE ON 6" MAX.
CENTERS. ADEQUATE
LACING OF LATH SHOULD
BE PROVIDED AT LATH
CORNERS AND EDGES TO
PREVENT CURLING.



VIEW "A-A"



PIN STUDS TO BE 3" FROM
EDGES AND ON 12" x 12" MAX.
CENTERS ON OVERHEAD SUR-
FACES AND ON 18" x 18" MAX.
CENTERS ON ALL OTHER
SURFACES.

12 GA BWG PIN STUD
INSULATION FASTENERS
BENT OVER AFTER
APPLICATION OF LATH
AND SPEED CLIP

2.5⁺/SQ. YD.
EXP.
PLASTERERS LATH

SPEED CLIP

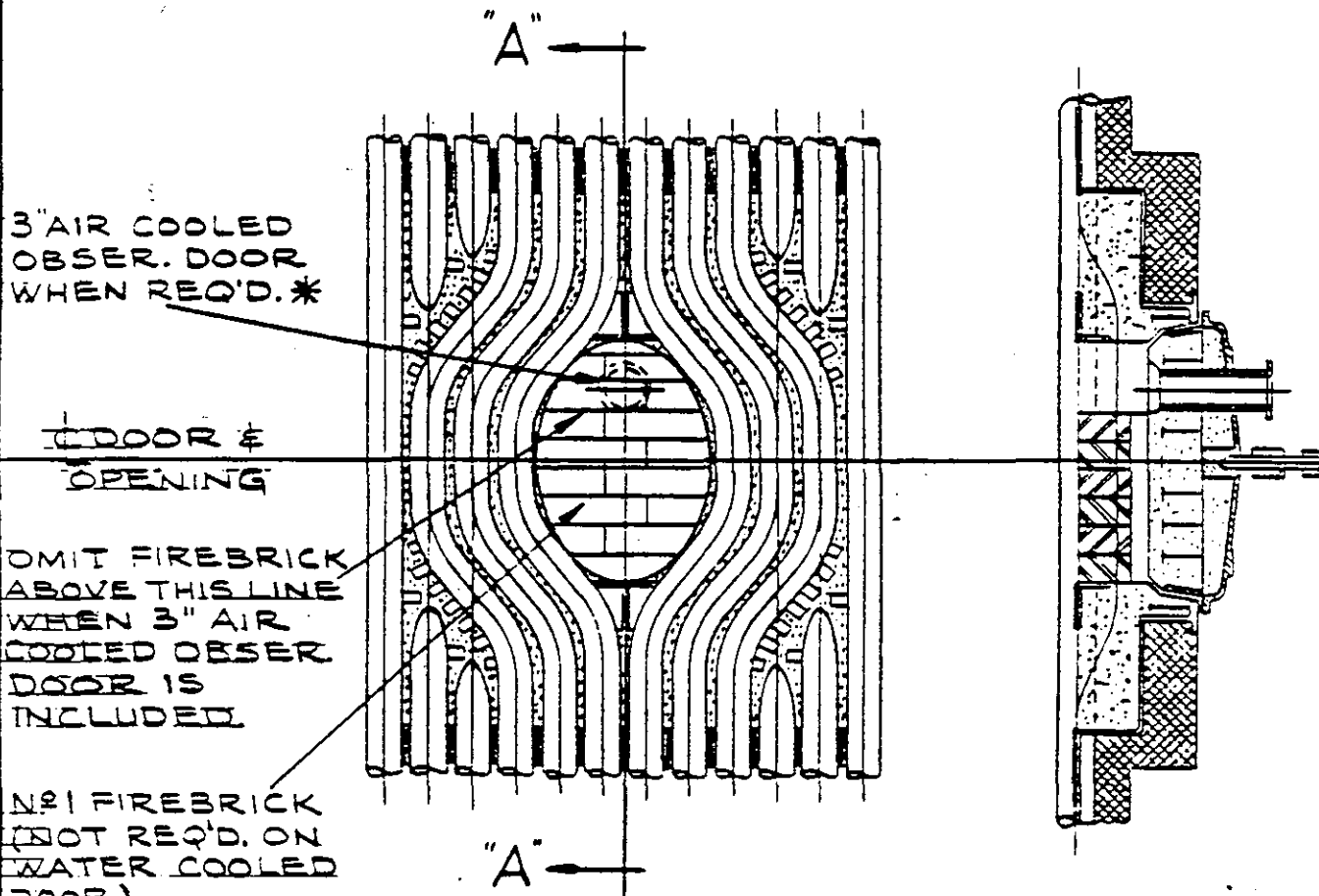
DWR. BY S.A.S.	CHE'D	INSIDE INSULATED VESTIBULE, PENTHOUSE 4	SCALE ~	DATE 2-2-72
PASSED BY	APP'D	AREAS WITHOUT OUTER LAGGING OR FINISH	NO. 101965	A.2

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION

3Y (1EM)
GA
SU3
12/10-8-82

REVISIONS				MICRO- FILM
DASH NO.	DATE	DESCRIPTION	ORIG.	
2	12/10-8-82	DELETED REF TO GSESE		

INSULATION
APPLICATION
DOORS



VIEW FROM
INSIDE FURNACE

SECTION "A-A"
(218546 E SHOWN)

15"X21" ACCESS DOOR WITH REFR. RETAINER DWG. 32047 E

* WHEN 15"X 21" DOOR LOCATION OVERLAPS STD.
LOCATION FOR 3" OBSER. DOOR - USE ARRGT. 218546 E

DRWN BY T.P.S.	CHK'D S.A.S.	ARRGT. OF 15"X21" FURN. ACCESS DOOR WITH BRICK IN OPENING	SCALE	DATE 6-15-73
PASSED BY A.R.K.	APP'D ✓		DRWS: NO.	101997 A-2

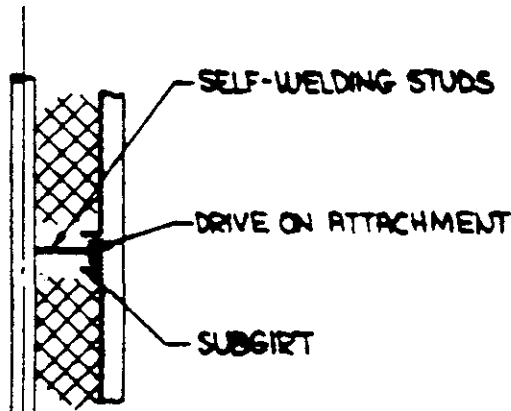
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THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

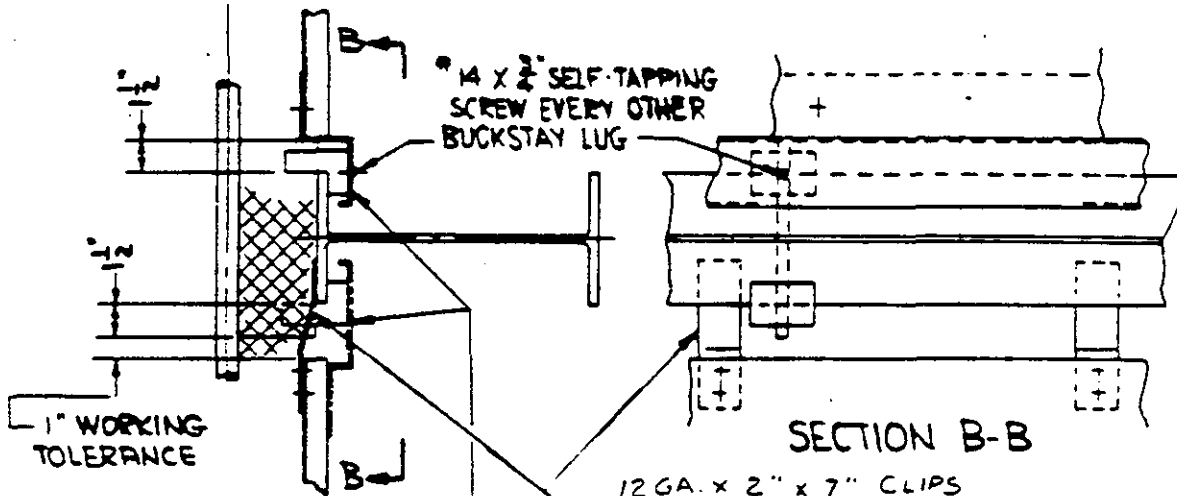
3Y (IAM)
6A
3Y33
1/3-7-77

INSULATION APPLICATION METAL LAGGING

REVISIONS			
DATE	BY	DESCRIPTION	APP'D.



INTERMEDIATE SUPPORTS REQ'D WHEN
RIBBED SHEET EXCEEDS MAXIMUM
SUPPORT SPAN



BUCKSTAY FLASHINGS MUST
BE FABRICATED TO KEEP
THE OUTER FACE EVEN @
THE TOP & BOTTOM OF EACH
BUCKSTAY FLANGE TO
FACILITATE THE CORNER
FLASHING.

12 GA. x 2" x 7" CLIPS
ATTACHED TWO PER R.B.
SHEET SLIPPED BEHIND
BUCKSTAY. DO NOT WELD.
CLIP MUST SLIP BEHIND
BUCKSTAY TO ALLOW FOR
EXPANSION.

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COMPANY. IT IS TO BE RETURNED UPON REQUEST.

DESIGN BY	J.E.D.	CHECKED	✓
APPROVED BY	✓	APP'D.	✓

BUCKSTAY CONNECTION

DATE	3/3/77
NO.	200007 A.O.
CODE	60

ORIGINAL DRAWING

THE BABCOCK & WILCOX COMPANY

POWER GENERATION GROUP INSULATION APPLICATION

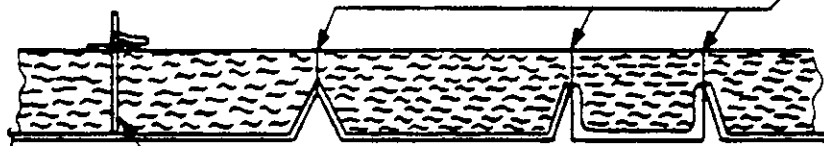
BY (IEM)
GA
3Y/
10/6-8-79

INTER. TEMP. BLOCK APPLICATION

REVISIONS				MAILED
DATE	DATE	DESCRIPTION	BY	FILE

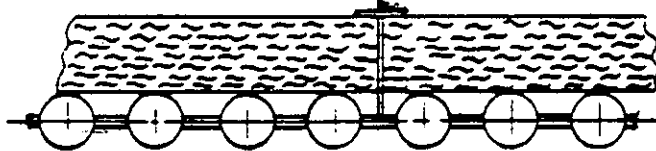
INTER. TEMP. BLOCK MAY BE APPLIED USING #12 GA. BWG PIN STUDS AND SPEED NUTS. STUDS TO BE ON 18"X18" MAX. CENTERS ON VERTICAL AND TOP SURFACES AND 12"X12" MAX. CENTERS ON OVERHEAD SURFACES. ALL BLOCK MUST BE BUTTED TIGHTLY AGAINST ADJACENT BLOCK TO AVOID ANY CRACK.

ON PRESSURE FIRED UNITS, CASING, FLUES, AND DUCTS WILL BE AIR TESTED. SOME OR ALL FIELD WELDS MAY BE LEFT UNCOVERED UNTIL AFTER THIS TEST IS COMPLETE. AFTER TEST, FILL VOIDS WITH INSUL. REQUIRED.

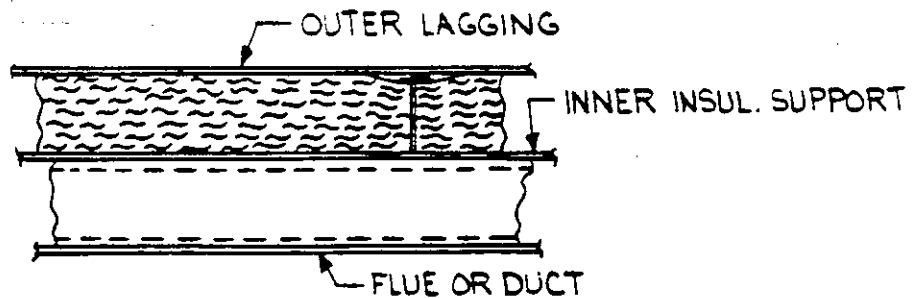


INTER. TEMP. BLOCK ON CASING

STUD TO BE BENT OVER AFTER APPLICATION OF SPEED NUT.



INTER. TEMP. BLOCK ON MEMBRANE WALL



INNER. TEMP. BLOCK ON INNER INSUL. SUPPORT

DRWN BY TRL	CHE'S ✓
PASSED BY TPS	APPROV NJM

CASING AND INNER INSUL SUPPT

SCALE 1/4"	DATE 2-20-79
DRWG. NO. 203022 A-0	

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BUCKLED DRAWER DRAWING; I&M DIV.

THE BABCOCK & WILCOX COMPANY
INDUSTRIAL POWER GENERATION DIVISION

EXISTING PFI-2845
586-0447 (UPGD)
546-0881 (IPGD)

The following are design temperatures to permit determination from 3Y3U2 and 3Y3U3 insulation thickness charts (attached hereto) the minimum thicknesses and layers required for exposed pressure part lines, drains, vents, etc., and connections, when insulation thickness and layers are not already specified on this job's insulation drawings.

Saturated Steam at Boiler Pressure Parts	501°F
Steam at Superheater Inlet	501°F
Steam at Superheater Outlet	750°F

Table 3Y3U2 for "Continuous Service" does not include soot blower lines or drain lines, etc., after first valve nearest supply connection at header, tube, pipe, or drum. Connections included are for exposed valves, fittings, nozzles, piping and tubes.

Table 3Y3U3 for "Intermittent Service" includes soot blower lines, or drain lines, etc., after first valve nearest supply connection at header, tube, pipe, or drum. Connections included are for exposed valves, fittings, nozzles, piping and tubes.

POWER GENERATION DIVISION
INDUSTRIAL & MARINE DEPT.
INSULATION

30
2/1-10-72

TUBES & PIPE
INSULATION THICKNESS

NOMINAL PIPE	0-300. °F	301-400	401-500	501-550	551-700	701-800	801-900	901-1000	1001-1100	1101-1200
SIZE	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT
0-1-1/2"	1	1	1-1/2	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3
2	1	1-1/2	1-1/2	2	2-1/2	2-1/2	2-1/2	2-1/2	3	3
2-1/2	1	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2
3	1	1-1/2	2	2	2-1/2	3	3	3	3-1/2	3-1/2
3-1/2	1-1/2	1-1/2	2	2	2-1/2	3	3	3-1/2	3-1/2	3-1/2
4	1-1/2	1-1/2	2	2-1/2	3	3	3	3-1/2	3-1/2	4
4-1/2	1-1/2	2	2	2-1/2	3	3	3-1/2	3-1/2	3-1/2	4
5	1-1/2	2	2	2-1/2	3	3	3-1/2	3-1/2	4	4
6	1-1/2	2	2-1/2	2-1/2	3	3-1/2	3-1/2	4	4	4
7	1-1/2	2	2-1/2	2-1/2	3-1/2	3-1/2	4	4	4	4-1/2
8	1-1/2	2	2-1/2	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2
9	1-1/2	2	2-1/2	3	3-1/2	3-1/2	4	4-1/2	4-1/2	5
10	2	2-1/2	2-1/2	3	3-1/2	4	4	4-1/2	4-1/2	5
11	2	2-1/2	3	3	3-1/2	4	4	4-1/2	5	5
12	2	2-1/2	3	3	3-1/2	4	4	4-1/2	5	5
14 & OVER	2	2-1/2	3	3-1/2	3-1/2	4	4	4-1/2	5	5-1/2

NOTE: USE DOUBLE LAYER CONSTRUCTION FOR THICKNESS TO RIGHT OF HEAVY LINE.
MT = MEDIUM TEMPERATURE INSULATION

When tubes are insulated in bundles, use the maximum inside dimension of the bundle to determine the required insulation thickness. For instance, if the bundle cross section dimension is 2" x 14", use the insulation thickness specified for 14" pipe.

Where MT Insulation is specified on the job drawings for bundled piping, double layer construction is required.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION
INDUSTRIAL & MARINE DEPT.

3Y(I&I)
3U
3/1-10-72

INSULATION
TUBES & PIPE
INSULATION THICKNESS

On intermittently used lines the insulation may be reduced as shown in the table below. For soot blower systems that are continuously in service indoors, 1/2" must be added to the thicknesses shown in the table below. On all intermittently used lines, full insulation as shown in this section must be used up to the first valve.

PIPE SIZE 0"-4"

TEMP.	THICKNESS OF MED. TEMP. INSULATION (INCHES)
150-500	1
551-800	1-1/2
801-1200	2 (in two layers)

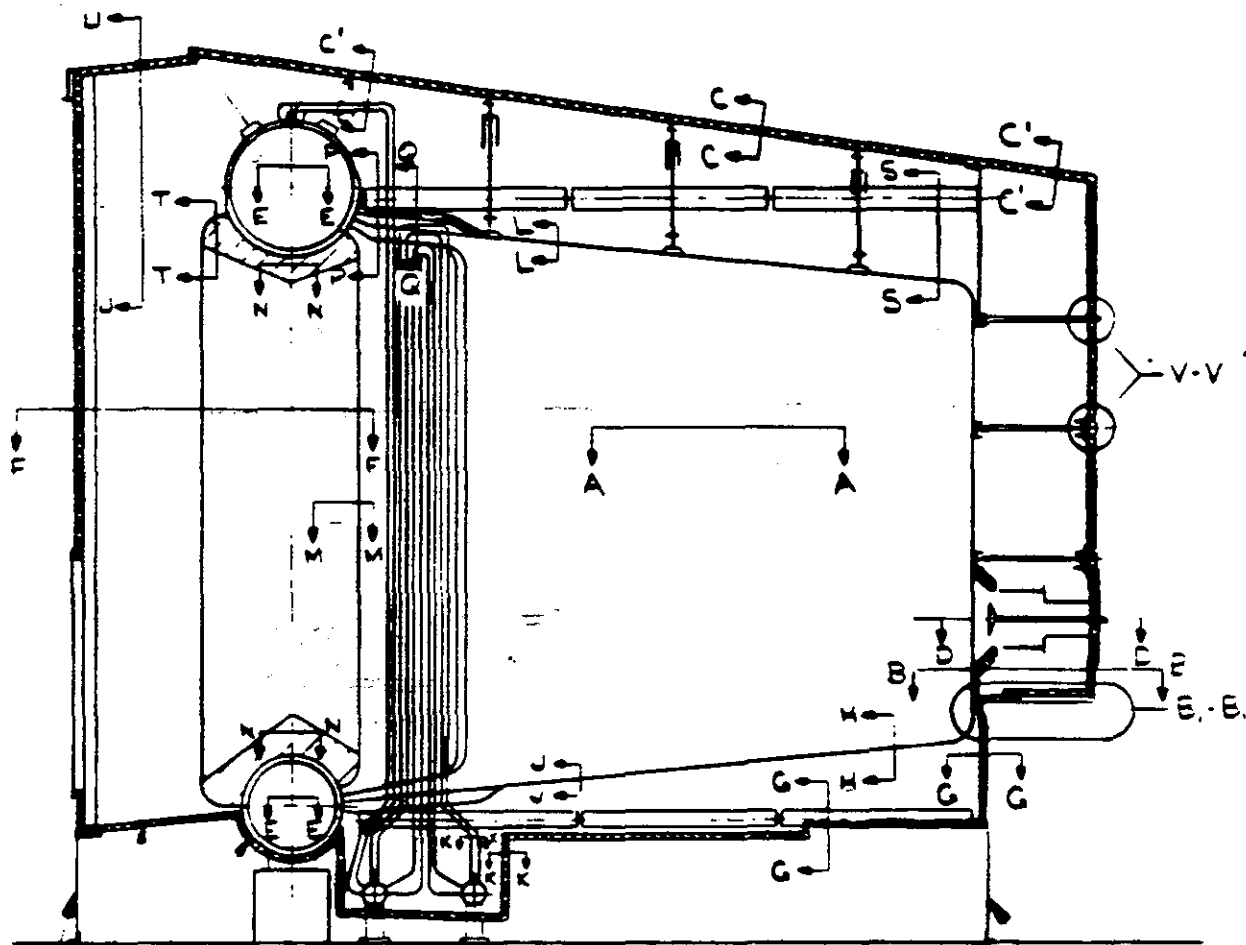
PIPE SIZE OVER 4"

TEMP.	THICKNESS OF MED. TEMP. INSULATION
150-500	1-1/2
501-800	2
801-1200	3 (in two layers)

Babcock & Wilcox
a McDermott company

**INTEGRAL FURNACE BOILER - TYPE FFI
INSULATION
KEY ARRANGEMENT**

REVISIONS			MICRO FILM
DASH NO.	DATE	DESCRIPTION	ORIG



SECTION R-R

LAGGING REQD TO FORM CLOSURE
AROUND BOTTOM OF UNIT

586-0447 (U.P.G.D.)
546-0881 (I.P.G.D.)

DNW BY TWG
CHK'D KMK
PASSED BY DLF
APP'D TCO

INSULATION DETAILS

SCALE DATE 7-17-86
DWG NO 207951 A.0

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CATALOG OF INSULATION INSTRUCTIONS

In order to consolidate instructions regarding the general subject of insulation, refractories and their application, a "Catalog of Insulation Instructions" has been prepared, a copy of which is attached. We would appreciate comments on any phase of these instructions that are not clear to you, and any other questions on insulation about which you may be in doubt.

This catalog does not supersede any job drawings but is designed as a guide to help interpret the meaning of the drawings and to supply information on insulation and its application which may be missing on the drawings.

PART I - APPLICATION

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ATTACHMENT

INTRODUCTION

Insulation on all boilers over 350,000 pounds of steam per hour will be installed in accordance with two sets of drawings. One set will be a series of drawings showing material, thickness, and details of construction which will be made to individual job specifications. Another set of drawings will be issued to cover the procedures to be used in applying the material shown in the first set. The following discussions are designed to help the interpretation of the insulation drawings received for the individual job. These drawings will take the place of the itemized list of material which has been previously included in the insulation contract and the drawings shall be noted to show the extent of the boiler covered by the B&W insulation contract. This procedure became effective on insulation contracts placed after January 1, 1955.

On boilers below 350,000 pounds of steam per hour the same procedure that has been followed for the past few years will remain in effect until further notice.

ERECTOR'S RESPONSIBILITY IN SUPERVISING INSULATION

All insulation work which is done by vendors for the Boiler Division of the Company is under the supervision of the Erector assigned to the job. The various vendors have been notified of this, and in the future all orders for application of insulation will carry a clause stating that the workmanship must be acceptable to Erection.

When an Erector is on a job where insulation work is being done under B&W contract, he will inspect the progress of the insulation work to see that it is according to specifications. When other work on the job has been finished, the Erector will advise the District Erector of his opinion as to whether the insulation work should have additional part-time or full-time supervision. It will be the function of the District Erector to decide what type of supervision will be used for each particular insulation contract.

When an Erector is assigned to a job solely for the inspection of insulation, his time and expense will be charged to the contract number with the subscript I (for example OP-321), and this charge number should be shown on time sheets and expense envelopes. If an Erector is on a job for any other purpose whatsoever, there is no time to be charged to the insulation inspection account. When an Erector is assigned to a job for inspection of insulation, he should be advised by the District Erector how long he is to remain on the job or what phase of the insulation work he is to cover.

When insulation work is sublet by the Purchasing Department, the vendor is given insulation drawings, complete as to detail, which describe how the insulation is to be applied and which types of material are to be used in the various areas. Copies of the drawings are sent to the Erector, along with other job drawings and special instructions where necessary. This insulation catalog should also be considered as part of the insulation instructions for the job.

On certain contracts the Company does not furnish insulation, and it is handled by the Purchaser directly with a sub-contractor. These jobs may be divided into three groups:

1. Contracts on which the Company is obligated to furnish specifications for insulation and supervision for its application.
2. Contracts on which the Company is obligated to furnish specifications for insulation but not obligated to furnish supervision.
3. Contracts on which the Company is obligated to furnish neither supervision nor specifications.

If conditions 1 or 2 above prevail, this will be noted in the C. I. sheets. Under condition 1, the supervision of insulation will be handled very much in accordance with instructions above applying to jobs where the insulation

contractor is the Company's own sub-contractor. Under condition 2, we are not obligated to furnish supervision, but we do have a moral obligation to see that the customer's sub-contractor fully understands our specifications. The Company is obligated to advise the customer if the sub-contractor is not following B&W specifications. In effect this means that as long as the Erector is assigned to the job, he will supervise insulation and advise the customer's local office or representative and the Erection office in Barberton when sub-contractor is not following B&W specifications. Under condition 3, we have no definite obligation to follow insulation in any detail. It must be remembered, however, that Erectors at all times should be definitely interested in seeing that the entire boiler unit is completed in a workmanlike manner that will be a credit to the Company. As long as the Erector is on the job he should be interested in customer's insulation work on the boiler and advise the customer's representative of insulation work that he feels will cause difficulty in the future. He should also advise this office in writing of such circumstances.

INSULATION FASTENERS

There are many ways of attaching insulation to the object which is to be insulated. The type of fastener depends on the location, type of insulation, type of finish, etc. It is common to see several types of fasteners on the same job. The job drawings will designate what type of fastener is to be used at various locations on the individual job.

The main object of the fastener is of course to support the insulation and secure it tightly against the boiler, duct, or supporting framework. It is difficult for every condition to be shown on the drawings so additional fasteners should be added where deemed necessary to obtain a tight construction. This situation will be encountered mainly around doors, soot blower openings, etc.

It should be noted that the insulation fasteners in certain constructions have several functions. The proper support of all phases of the insulation construction and often the final job appearance result from the initial fastener application. Before beginning to install fasteners, the entire insulation construction should be reviewed to make sure the fasteners are applied in a manner that will serve all phases of the job.

It is desirable to make the layout for fasteners as uniform as possible; however, a change in the plane surface, plane interruptions, and openings affect the requirements. Each area should be investigated for special requirements and the best general layout selected. This is of the utmost importance when grooving is required.

On flues, ducts, airheaters and skin casing, the fasteners will be shop applied. Where no skin casing is used, the fasteners shall be field welded to the tubes on spacing shown in Table I. In the case of a brick setting on small boilers, the strip fasteners shall be placed in the horizontal mortar joints between firebrick with bent ends against tubes at approximately 24" horizontal and vertical centers. The bent ends are sufficiently displaced from tube centerline to permit firebrick to bear against the tube.

Standard drawings SSD-267988, attached, tabulates the round studs which are encountered. It should be noted that all even numbered studs are alloy. Drawings SSD-267989 tabulates the strip studs to be used in brick settings. These studs are all of alloy material. Drawing SSD-290883 illustrates tube reinforcement pads which are used on all boilers below 1050 psi. pressure.

TABLE I

TABLE SHOWING SPACING OF FIELD
WELDED STUDS FOR VARIOUS LOCATIONS

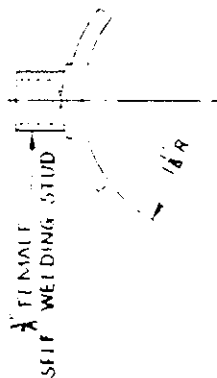
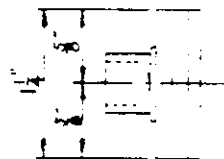
	VERT. WALL & ROOF		HOPPER BOTTOM & FLOOR	
	HORIZ. SPACE	VERT. SPACE	HORIZ. SPACE	VERT. SPACE
BAILEY BLOCK	18" MAX.	24"	12"	18"
PARTIAL & FULL STUD	18" MAX.	$22\frac{1}{2}"$	12"	12"
FLAT STUD	18" MAX.	$22\frac{1}{2}"$	12"	12"
TANGENT TUBE	18" MAX.	$22\frac{1}{2}"$	12"	12"
TUBE & BRICK	18" MAX.	$22\frac{1}{2}"$	-	-
TUBE & BRICK (ROOF)	12" MAX.	12"	-	-

1. CHECK SPECIFICATION OF ALLOY FROM 102, 202, 302, 304, 316, 321, 347, 354, 360, 360L, 405, 430, 434, 439, 455, 455L, 502, 504, 506, 506L, 509, 510, 515, 520, 520L, 530, 530L, 540, 540L, 550, 550L, 560, 560L, 570, 570L, 580, 580L, 590, 590L, 600, 600L, 601, 601L, 602, 602L, 603, 603L, 604, 604L, 605, 605L, 606, 606L, 607, 607L, 608, 608L, 609, 609L, 610, 610L, 611, 611L, 612, 612L, 613, 613L, 614, 614L, 615, 615L, 616, 616L, 617, 617L, 618, 618L, 619, 619L, 620, 620L, 621, 621L, 622, 622L, 623, 623L, 624, 624L, 625, 625L, 626, 626L, 627, 627L, 628, 628L, 629, 629L, 630, 630L, 631, 631L, 632, 632L, 633, 633L, 634, 634L, 635, 635L, 636, 636L, 637, 637L, 638, 638L, 639, 639L, 640, 640L, 641, 641L, 642, 642L, 643, 643L, 644, 644L, 645, 645L, 646, 646L, 647, 647L, 648, 648L, 649, 649L, 650, 650L, 651, 651L, 652, 652L, 653, 653L, 654, 654L, 655, 655L, 656, 656L, 657, 657L, 658, 658L, 659, 659L, 660, 660L, 661, 661L, 662, 662L, 663, 663L, 664, 664L, 665, 665L, 666, 666L, 667, 667L, 668, 668L, 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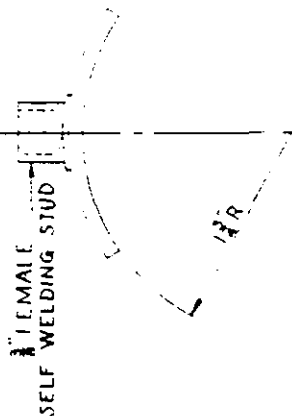
RETRACED & ALTERED IN ACCORDANCE WITH MARKED PRINT RECD WITH JMI MEMO DATED 2/2/51 R 201.86 *Revised*

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THE BABCOCK & WILCOX CO.

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FOR 2 1/2" O.D. TUBES
11 B.W.G. x 1 1/2" HIGH x 2" DEV. LGTH.
MK #1



FOR 3" O.D. TO 4" O.D. INCL.
11 B.W.G. x 1 1/2" HIGH x 2" DEV. LGTH.
MK #2

NOTES:--

THESE ATTACHMENTS ARE FOR ALL CASED AND UNCASD BOILERS UP TO 1050 P.S.I. EXCEPT BLACK LIGATOR BOILERS. FOR APPLICATION PROCEDURE SEE DWGS. SSD-316305

DETAIL OF STUD ATTACHMENTS TO TUBES

DESIGNED BY: J. H. B. DATE: 6-1-50

THE BABCOCK & WILCOX CO.

330-230883-2

REINFORCEMENT FOR REFRACTORIES

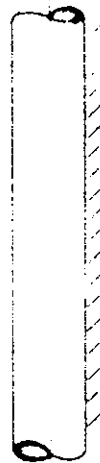
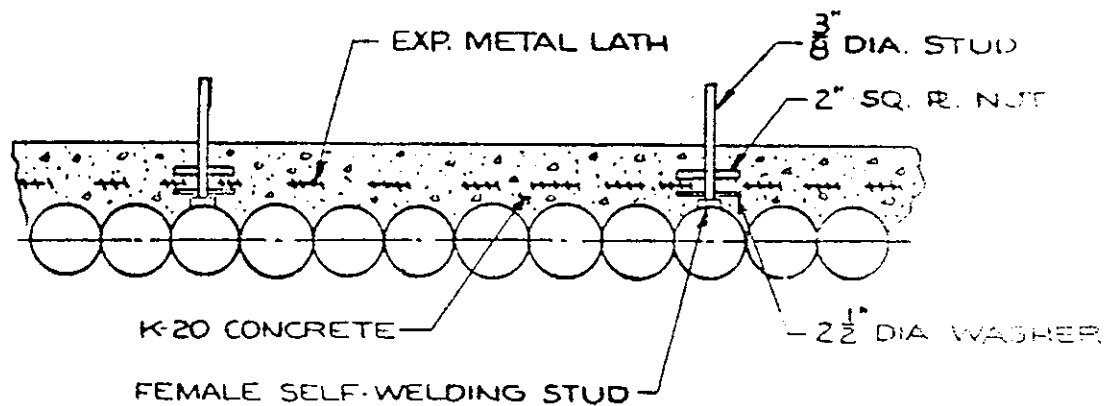
In some types of construction there is a layer of refractory against the tubes which is reinforced with expanded metal lath. (See Fig. 1). This lath is tack welded to the wall tubes on 18" centers, vertical and horizontal. The lath must overlap 3" at its edges to insure that the reinforcement is continuous throughout the refractory. The laps should be held together tightly either by welding or tying with #14 gage wire on 12" maximum centers. This applies to lath imbedded in refractory. Lath in plastic insulation will be discussed later in these instructions.

The lath should be anchored firmly at its edges, where it meets doors, soot blower wall boxes, etc., by tack welding. The aim is to form a firm reinforcement for the refractory which will keep it from breaking loose when minor furnace puffs occur. On vertical surfaces, it is advantageous to install the metal lath so that the slope of the lath was toward the tube surface (see Fig. 2).

Where refractory is used between tubes to form a gas seal, a ladder type reinforcement is used to hold the refractory in place. This is shown on drawing SSD-310309. It should be noted that where inner casing is used, the ladders are used only on wide spaced tubes.

FIG. 1

SKETCH SHOWING K-20 CONCRETE
REINFORCED WITH EXP. METAL LATH



NOTE:

EDGES OF LATH DIAMONDS
SLOPE DOWN AND TOWARD
BOILER WALL

FIG. 2

SKETCH SHOWING PROPER APPLICATION
OF EXPANDED METAL LATH

AND IS LOANED UNLESS OTHERWISE STATED THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURTHER INFORMATION TO OTHERS, OR FOR ANY OTHER PURPOSE DETRIMENTAL TO THE INTERESTS OF THE BABCOCK & WILCOX CO. AND, BE RETURNED UNLESS REQUESTED THE EQUIPMENT SHOWN HEREON IS PROTECTED BY PATENTS OWNED OR CONTROLLED BY THE BABCOCK & WILCOX CO. AND ANY INFRINGEMENT OF SUCH PATENTS IS LIABLE TO PROSECUTION DO NOT SCALE USE DIMENSIONS ONLY.

MATERIAL BY B&W CO.

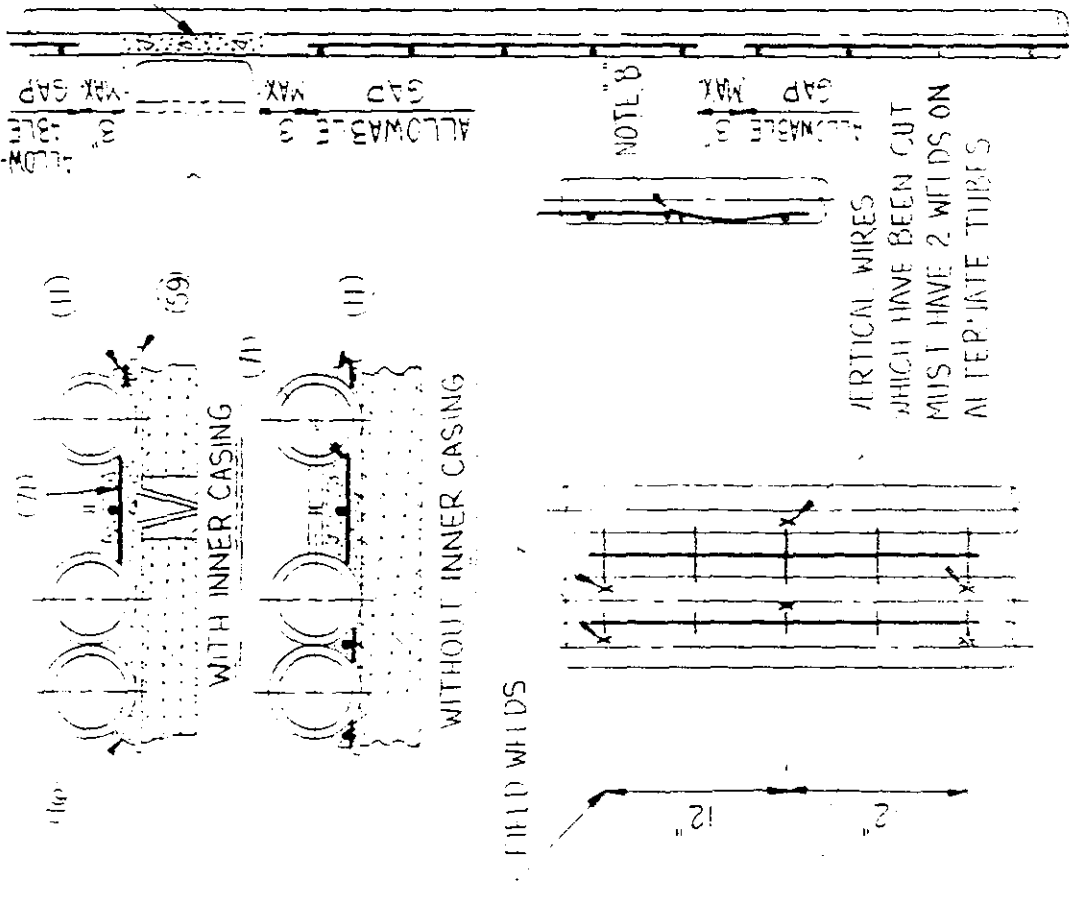
- (10) ANCHOR WIRES PER SSD-310301
- (11) K&L - NOTE "X"
- (59) INNER CASING
- (16) B&W KAOCRETE "B"

NOTE:

- A - PACK KAOLITE BEHIND TIE BARS, CHANNELS, ETC. IN AREA WHERE KAOLITE IS USED & "E" BEHIND TIE BARS, CHANNELS, ETC. IN AREA WHERE KAOLITE IS USED.
- B - ANCHOR WIRES TO BE WELDED TO TUBES ON 12" AT CTRS. (3 WELDS PER 2'-2" SECTION). WHEN WIRES ARE TOO LONG THEY SHOULD BE LAPPED IF POSSIBLE, & CUT TO SIZE ONLY WHEN NECESSARY.
- C - THE "E" BEHIND TIE BARS SHOULD BE HAND APPLIED TROWELLED FLUSH WITH OUTER FACE OF TUBES & ALLOWED TO SET BEFORE CASING OR INSULATION IS APPLIED.
- D - FOR INSULATION SEE APPLICABLE SECTION & JOB CONTRACT.

NOTE "X":

THIS IS A FIELD MIXTURE OF KAOLITE - 20 LBS. WEIGHT AGGREGATE SUPPLIED BY B&W CO. & HIGH EARLY STRENGTH PORTLAND CEMENT SUPPLIED BY BRICKWORK CONTRACTOR.



ARR'GT OF ANCHOR WIRES & REFRACTORY ON WALL TUBES

REVISED 10/28/50
REVISED 10/28/50

THE BABCOCK & WILCOX CO.

NEW YORK, N.Y.

FIG. 3

SKETCH SHOWING EXAMPLE OF DEPTH
GAGE FOR CHECKING K-20 THICKNESS.

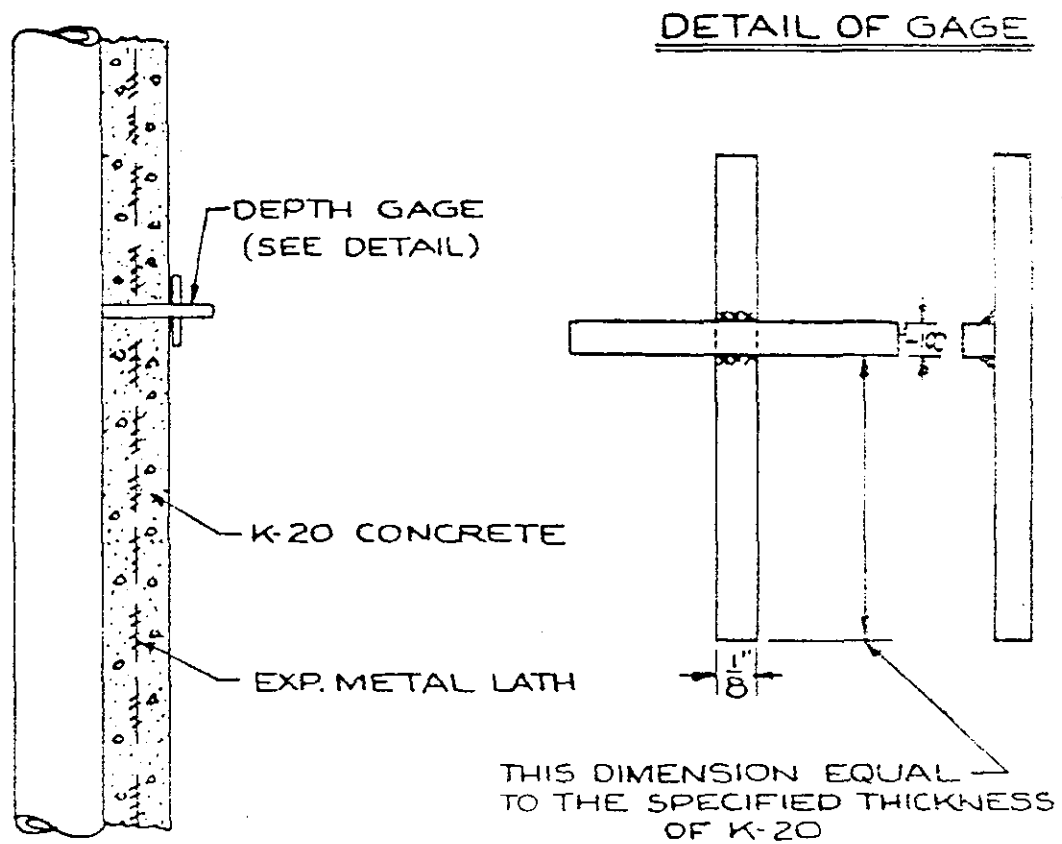
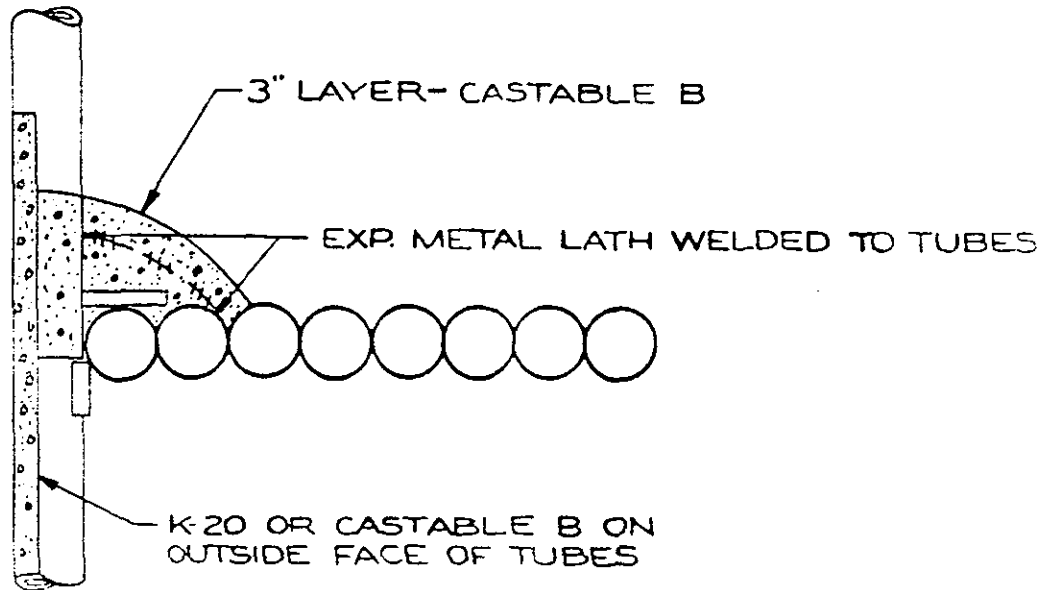
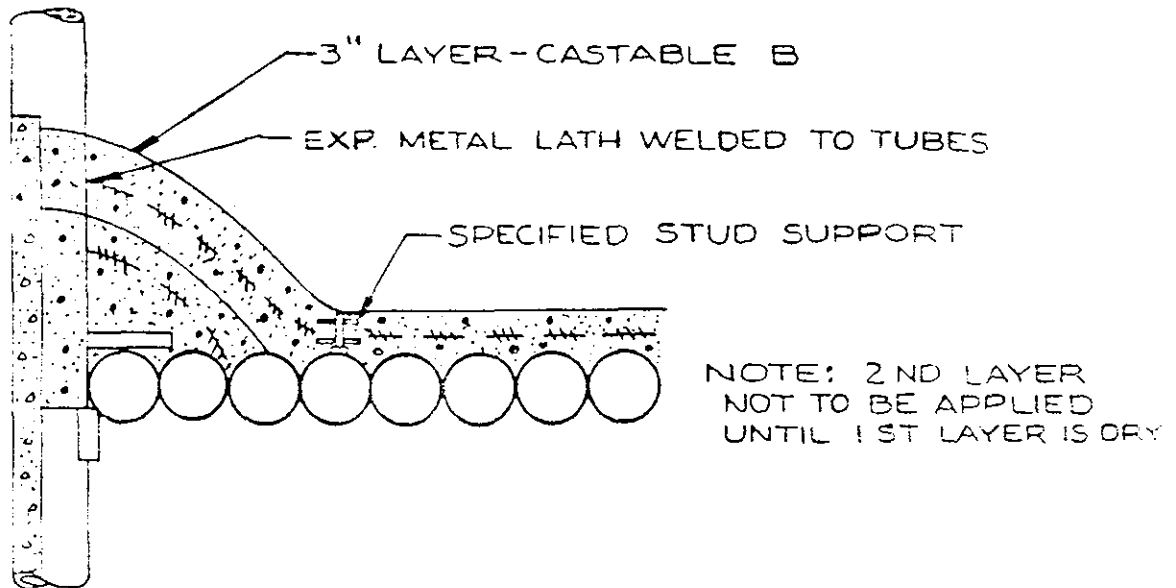


FIG. 4
SKETCH SHOWING STEPS IN APPLICATION
OF REFRACTORY SEALS



STEP 1



NOTE: 2ND LAYER
NOT TO BE APPLIED
UNTIL 1ST LAYER IS DRY

STEP 2

REFRACTORY

The refractories most commonly used in boiler erection work are Kaolite 20, Kaocrete B, Hydrochrome and Plastic Chrome Ore. The Kaolite 20, Kaocrete B and Hydrochrome may be applied by hand or by "Gunning." For either method, the refractory should be packed behind tie bars and similar structural attachments before the major portion of the wall is done. It is advantageous to install refractory behind these attachments before the metal lath is applied.

When gunniting, the material should be built up to sufficient thickness to bury the metal lath and then struck off to a smooth surface. Care should be taken to insure that the specified thickness is not exceeded. A depth gage as shown in Fig. 3 may be used to check thickness.

When hand applied the refractory must be thrown through the lath with enough force to fill all voids behind the lath, the material being built out until the lath is covered and the desired thickness is reached. If block insulation is to be applied to this surface the refractory should be trowelled straight and smooth. If plastic insulation is to be applied, the surface should be made straight but left somewhat roughened.

At the junction of some walls, a mound of refractory is used to seal against gas by-passing. This seal must be applied in two layers, the first being applied before the remainder of the area is covered. See Fig. 4, Step 1. After this first layer is thoroughly dry, the second layer should be installed making it part of the refractory covering the remaining portion of the surface as shown in Fig. 4, Step 2.

All refractory should be stored in a dry place to prevent the various binders in it from setting up.

Proper application of "Plastic Chrome Ore" or P.C.O. is highly important to its successful performance as a furnace lining. The pamphlet "Instructions for Installing and Maintaining B&W Plastic Chrome Ore in Hearths and Furnace Bottoms" points out the peculiar features of this refractory. In applying PCO to studded tubes care should be taken to follow the drawings carefully with respect to thickness, contour, etc. The refractory must be applied in such a way that it will grip the studs and tubes tightly, for only by doing this will the wall be of any value. The studs act not only as a support for the PCO but also to carry heat away from it thereby cooling it and greatly prolonging its life.

PCO is shipped to the job in cans containing 200 pounds of material and has exactly the correct consistency upon leaving the factory so that it is not necessary to add water or any other substance to the material in the field. Under no circumstances should water be added to the material to increase its workability. The plasticizing liquid airsets quickly so the cans should not be opened until the PCO is to be used. If the material has partially airset it is not fit for use and cannot be utilized by adding water to it.

Each can of PCO represents a considerable amount of money and

therefore when shipment is received it should be handled with care. The cans are sealed with a rubber gasket to keep the mixture from air drying and rough treatment will often spring the cans enough to allow the P.C.O. inside to dry out. If any cans are punctured or damaged so that this air seal is not sealing, the number of the damaged cans should be reported to Barberton unless the material is to be used right away. When placing the cans in storage a warm dry place should be selected and the cans stored lid downwards so that any leakage through the lid seal may be detected. The cans should not be subjected to high or freezing temperatures, hot sun, rain or moisture. If in transit or storage any of the material is unavoidably frozen, it must be thawed out slowly, preferably before removing the cover.

There are several special tools available in Barberton that will aid in the application of P.C.O. These include mallets, tampers, vent board and spade as shown on the sketch included with the pamphlet on P.C.O. Before opening the can of P.C.O. it is advantageous to roll the can on the floor so that the material within will pack slightly. This will make it come out of the can easier and will mix it with any liquid which may have separated in storage. The P.C.O. should be dumped on a clean surface, preferably a steel plate or a liquid tight mortar box. If a wooden box is used it should be soaked with water prior to use, then drained. The box is particularly handy if any remixing is required where the liquid has separated from the chrome ore. This liquid must be thoroughly mixed in the material since it is not only a plasticizing agent but is also an air setting binder as well, and is an absolutely necessary ingredient in the material. Mixing a slightly "dry" can with a "wet" one will often be necessary to make a uniform product. The material should be chopped up into 1" particles or smaller, to assure thorough mixing. If the material in the cans is of the correct consistency, the remixing is not necessary and may be shaved off in pieces of correct size and applied.

The pieces used should be of sufficient size so that when pounded into place the required thickness will be achieved in one layer. If P.C.O. is applied in several layers, they do not bond to each other readily - segregation takes place - and the outer layer will probably drop off. In consolidating the material into lumps by hand, it should not be worked to a point where it becomes too plastic as it is then impossible to drive it with mallets into proper position. In general a much better job of application can be obtained if the material is quite stiff and used just as it comes from the can.

In using P.C.O. on a fully studded wall the best procedure is to first apply the material to the outside of the furnace between the tubes to a thickness just covering the first row of studs. This material should then be backed up by a heavy wooden (oak preferred) form cut to the exact shape that the finished surface should assume. The wall should then be finished by driving the material in from the furnace side of the tube to the exact thickness shown on the drawing. To properly bond the material, it must be driven in hard with a mallet. Light taps do not force the P.C.O. into bond and serve only to bring the liquid to the surface where it will air harden preventing proper drying of the material underneath. The above procedure must take place as a continuous process; it is not possible to obtain a good job by putting P.C.O. on one side of the tubes and then later on applying P.C.O. to the other side. Further, it is not feasible to put P.C.O. on both sides simultaneously, since it is impossible to exactly synchronize the mallet blows and the last blow will force the material

away from the studs on the opposite side of the tube. Where material is applied to partially studded tubes the best plan is to make a form that will give the proper contour on one side of the tube, then pound PCO through the studs against the form from the other side. Where material is either too stiff or too plastic to do this, the procedure for fully studded tubes may be followed.

Applying PCO to a floor is somewhat different than to a wall. In this case the material should be applied in small lumps to the desired depth. Before tamping, the PCO should be chopped into a homogeneous mass with a tool similar to a lawn trimmer. This tool is shown in the attached pamphlet. After chopping, the mass of PCO should be tamped solidly into place. To assist in levelling the PCO it is sometimes advantageous to use a heavy plank and drop it, edgewise, on the floor. In order to speed the drying of the PCO the mass should be pricked with closely spaced holes to a depth of 1-1/2" to 2". A useful tool for this job is shown in the attached pamphlet on PCO, entitled "Instructions For Applying and Maintaining B&W Plastic Chrome Ore."

Since new PCO is relatively soft, it must not be walked on until it has been fired. Therefore as soon as work has been completed on the PCO, boards should be provided for the necessary walkways over the area.

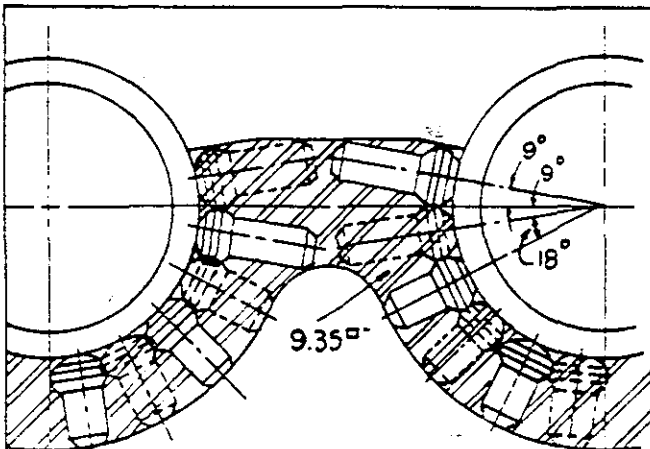
All contours must be as shown on the drawings. Sketches SSK-232299-1 and SSK-232300-1 as shown on pages 17 and 18 show the contours normally used.

When PCO must be applied in freezing weather it is essential to use salamanders or some other type of heater, placed close enough to keep the PCO surface above freezing temperature. Another good method is to fill the wall with warm water after connecting hydrokineters (steam injectors) in the drain nozzles or in one or two handhole openings in the wall headers. These steam injectors which are available in Barberton will keep the wall warm (60°F to 100°F) for any required length of time. If after the PCO installation is completed freezing weather continues, the temperature of the tubes should be increased to 150-200°F and held at this temperature until the PCO is thoroughly dry. If the material is allowed to freeze at the time of application it will crack and disintegrate rapidly when put into normal service.

The photographs on pages 19, 20, 21 and 22 show various stages of application of PCO. It should be noted that the surface is never "slicked" down or trowelled since this brings the liquids to the surface. The surface should be stippled with a coarse flat bristle brush to give the desired finish.

It is sometimes desired to build up a PCO floor that has been in service. In such cases the slag and iron sulfide deposits should be cut out making sure the PCO remaining is not contaminated. The PCO should then be cleaned and roughened. A paste of Krome patch cement is then made by thinning with water until it reaches the consistency of cream. This paste should then be applied to the PCO with a brush or broom. The PCO should not be wet with water prior to the application of the paste. PCO should then be applied in the manner described above.

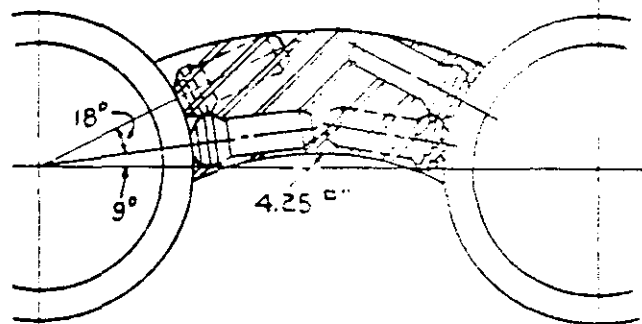
The following photographs show how typical applications should look on various types of wall constructions.



4 ROWS $\frac{5}{16}$ " LG. STUDS 6.46 #/¢
8 ROWS 1" LG. STUDS 10.3 #/¢

P.C.O. REQUIRED
ACTUAL 19.14 # PER SQ. FT. PROJ. AREA
ORDER { 21.25 #/¢ WHEN HAND APPLIED
25 #/¢ " MACH. "

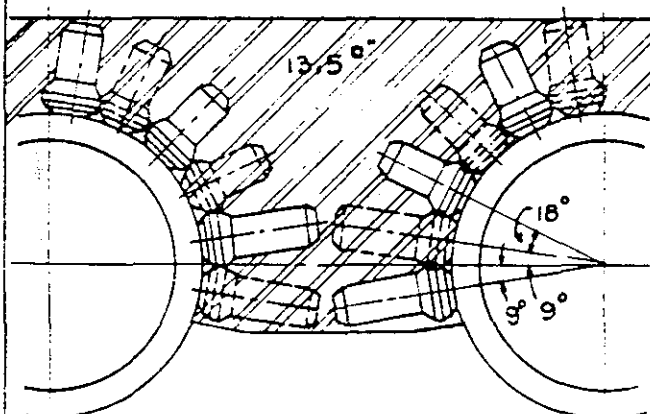
**STANDARD FULLY STUDDED
WALL TUBES**



4 ROWS $\frac{5}{16}$ " LG. STUDS 6.46 #/¢

P.C.O. REQUIRED
ACTUAL 9.16 # PER SQ. FT. PROJ. AREA
ORDER { 10.25 #/¢ WHEN HAND APPLIED
12 #/¢ " MACH. "

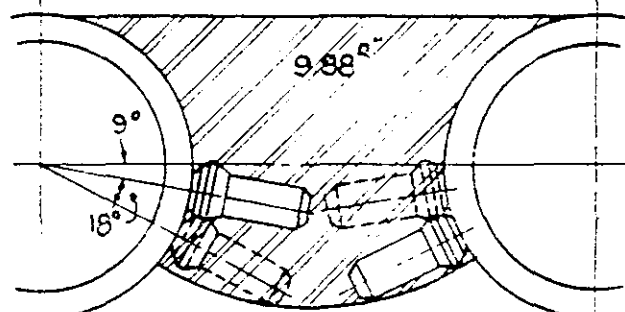
**STANDARD PARTIALLY STUDDED
WALL TUBES**



4 ROWS $\frac{5}{16}$ " LG. STUDS 6.46 #/¢
8 ROWS 1" LG. STUDS 10.3 #/¢

P.C.O. REQUIRED
ACTUAL 30.70 # PER SQ. FT. PROJ. AREA
ORDER { 34 #/¢ WHEN HAND APPLIED
40 #/¢ " MACH. "

**STANDARD FULLY STUDDED
FLOOR TUBES**



4 ROWS $\frac{5}{16}$ " LG. STUDS 6.46 #/¢

P.C.O. REQUIRED
ACTUAL 24.76 # PER SQ. FT. PROJ. AREA
ORDER { 27.25 #/¢ WHEN HAND APPLIED
32.5 #/¢ " MACH. "

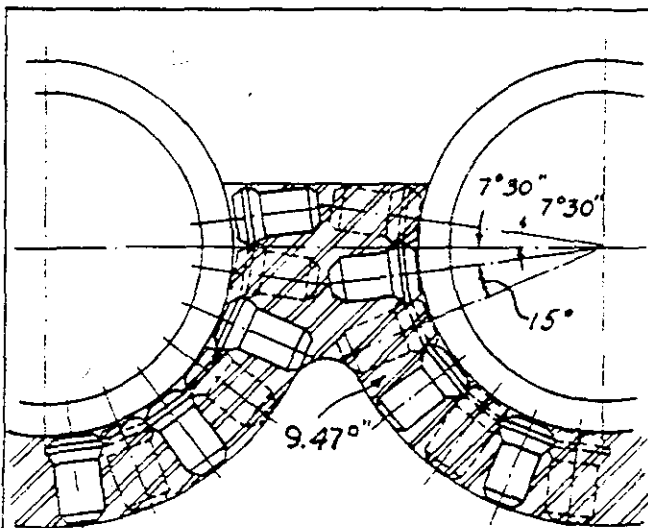
**STANDARD PARTIALLY STUDDED
FLOOR TUBES**

PLASTIC CHROME ORE REQUIREMENTS

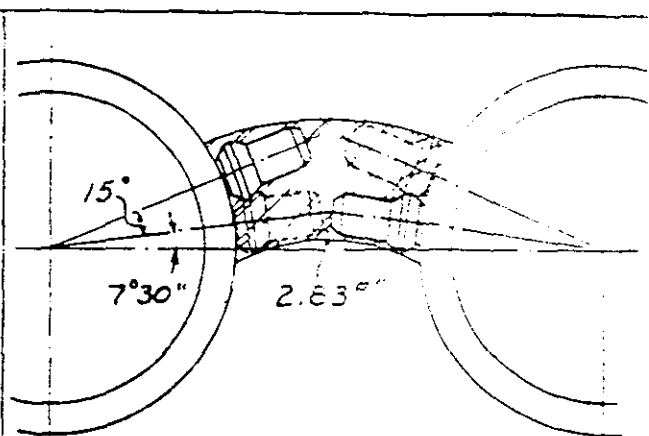
$3\frac{1}{4}$ " O.D. TUBES ON 6" CENTERS
SHOP STUDDED WITH $\frac{1}{2}$ " DIA. STUDS

DWG SSK-232299-1

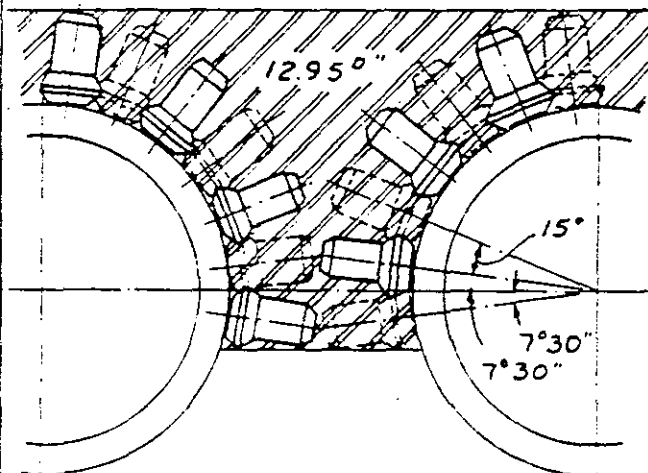
W/ E. & E. #7



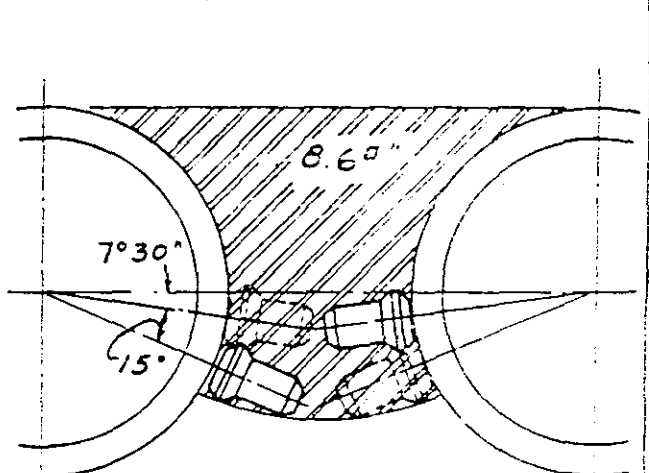
4 ROWS $1\frac{5}{16}$ " LG. STUDS 4.92*/ ϕ
 10 ROWS 1" LG. STUDS 12.86*/ ϕ
 P.C.O. REQUIRED
 ACTUAL 19.04* PER SQ. FT. PROJ. AREA
 ORDER { 21*/ ϕ WHEN HAND APPLIED
 25*/ ϕ " MACH. "
**STANDARD FULLY STUDDED
 WALL TUBES**



4 ROWS $1\frac{5}{16}$ " LG. STUDS 4.92*/ ϕ
 P.C.O. REQUIRED
 ACTUAL 5.88* PER SQ. FT. PROJ. AREA
 ORDER { 6.5*/ ϕ WHEN HAND APPLIED
 8*/ ϕ " MACH. "
**STANDARD PARTIALLY STUDDED
 WALL TUBES**



4 ROWS $1\frac{5}{16}$ " LG. STUDS 4.92*/ ϕ
 10 ROWS 1" LG. STUDS 12.86*/ ϕ
 P.C.O. REQUIRED
 ACTUAL 28.76* PER SQ. FT. PROJ. AREA
 ORDER { 32*/ ϕ WHEN HAND APPLIED
 37.5*/ ϕ " MACH. "
**STANDARD FULLY STUDDED
 FLOOR TUBES**



4 ROWS $1\frac{5}{16}$ " LG. STUDS 4.92*/ ϕ
 P.C.O. REQUIRED
 ACTUAL 21.84* PER SQ. FT. PROJ. AREA
 24*/ ϕ WHEN HAND APPLIED
 28.5*/ ϕ " MACH. "
**STANDARD PARTIALLY STUDDED
 FLOOR TUBES**

PLASTIC CHROME ORE REQUIREMENTS
 4" O.D. TUBES ON 6" CENTERS
 SHOP STUDDED WITH $\frac{1}{2}$ " DIAM. STUDS

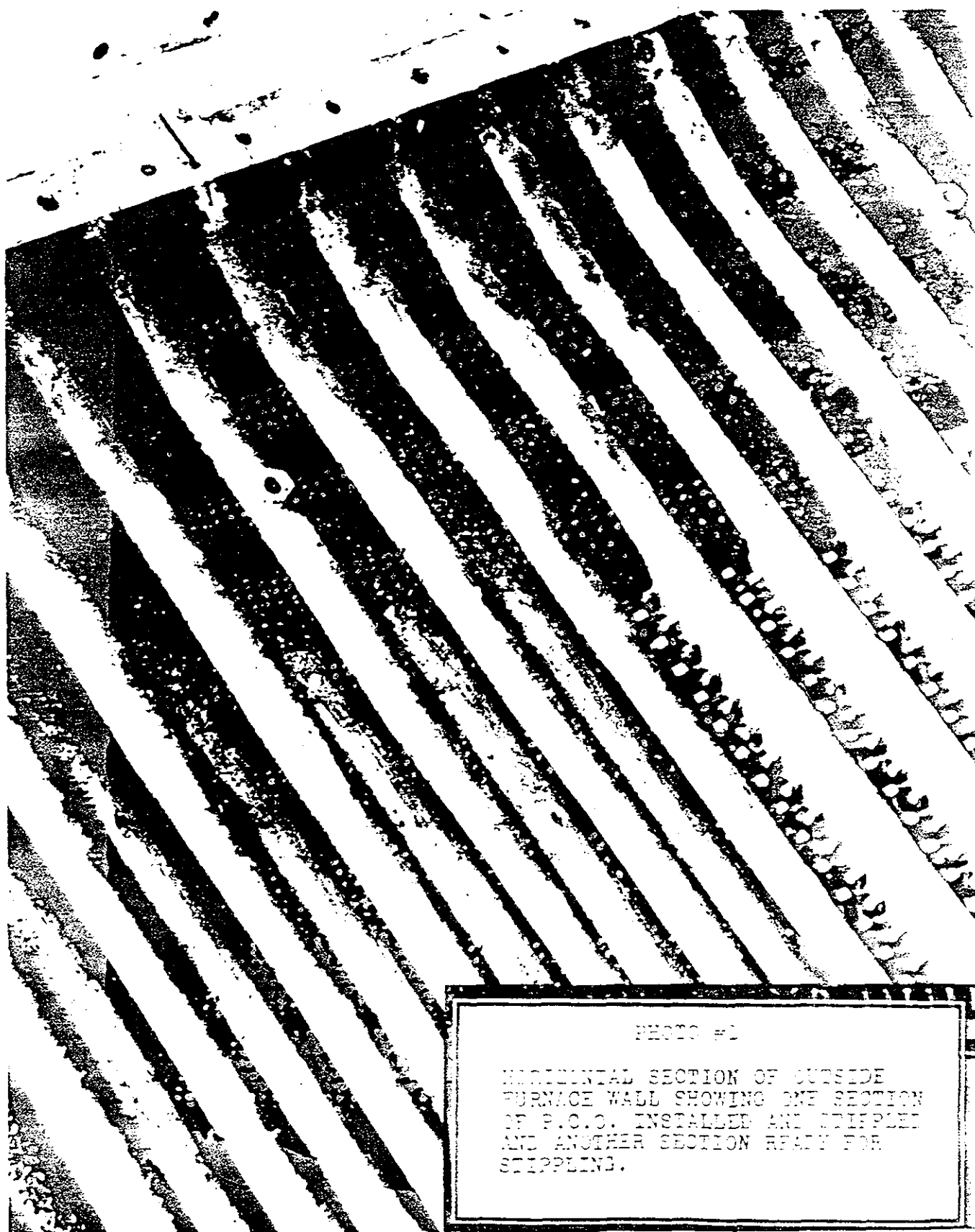


PHOTO #1

HORIZONTAL SECTION OF OUTSIDE
FURNACE WALL SHOWING ONE SECTION
OF P.C.C. INSTALLED AND STIPPLED
AND ANOTHER SECTION READY FOR
STIPPLING.

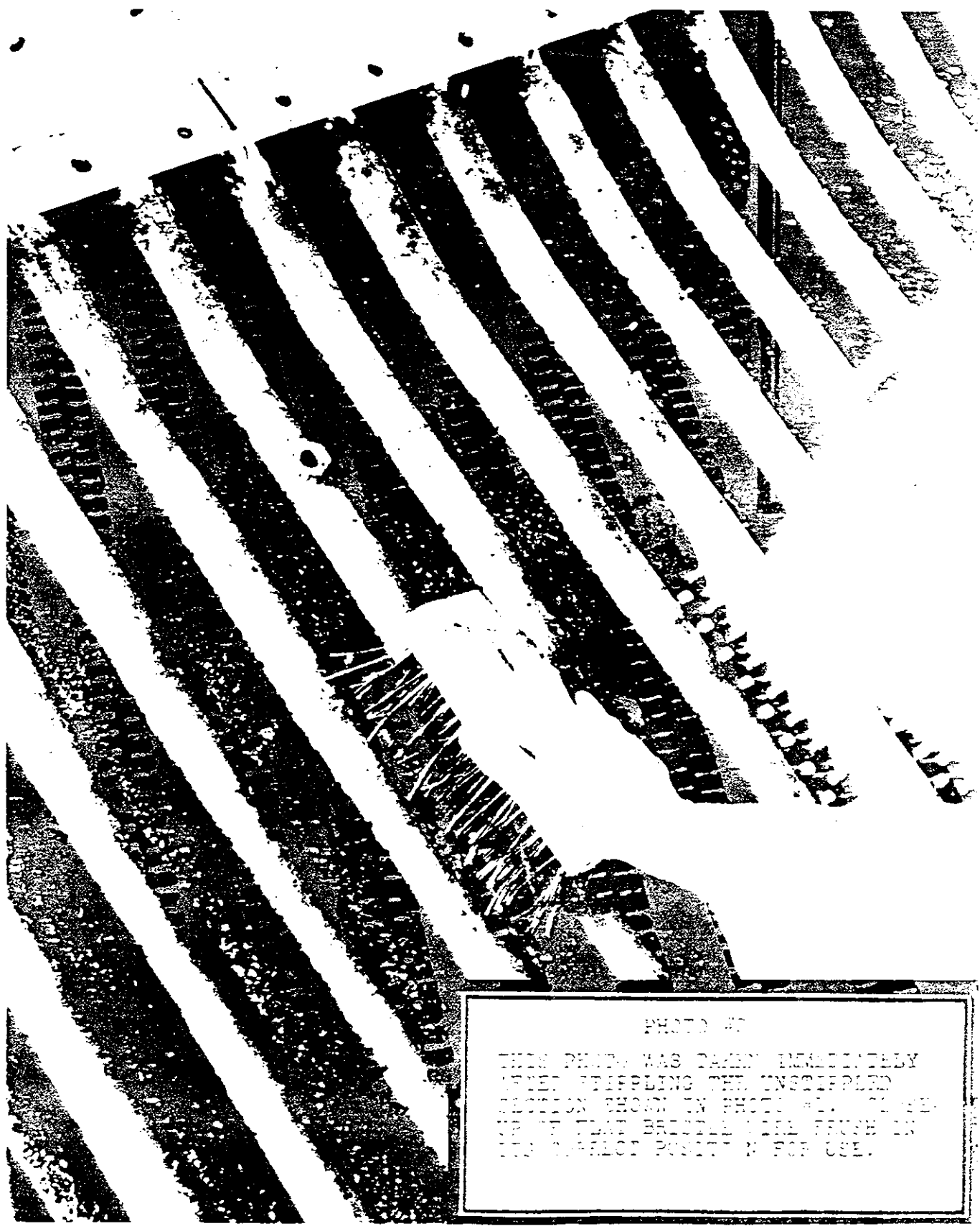
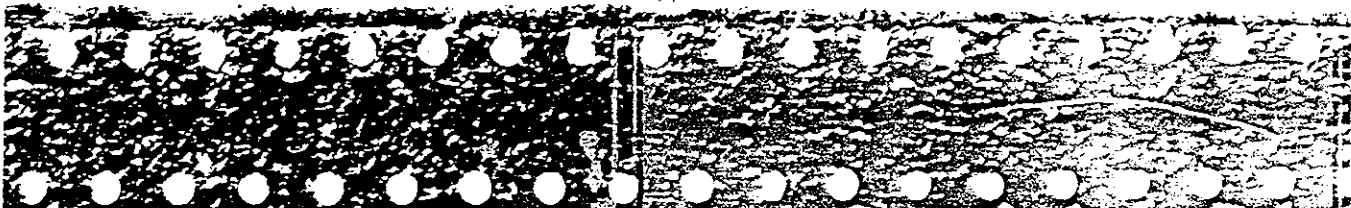
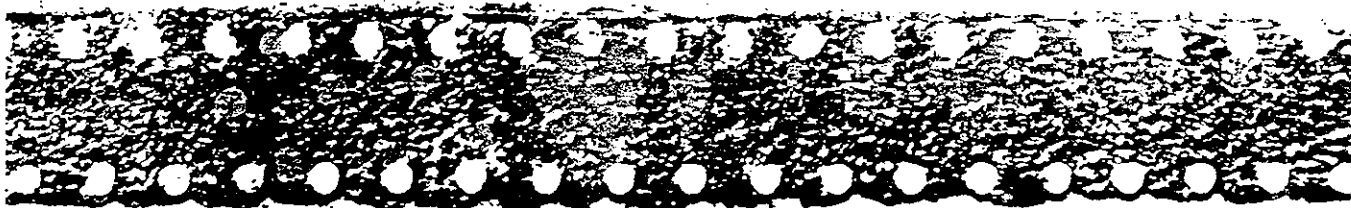
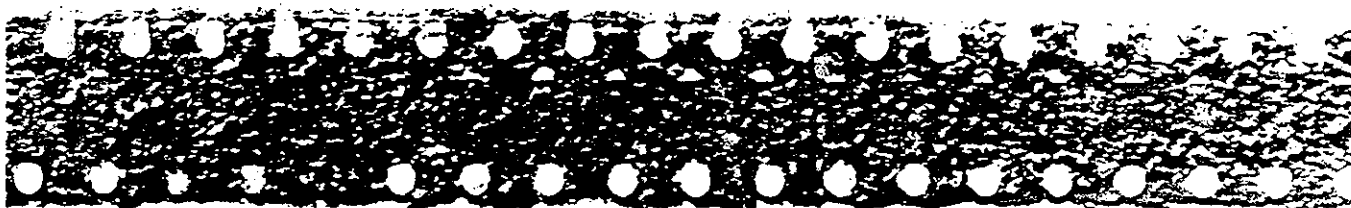
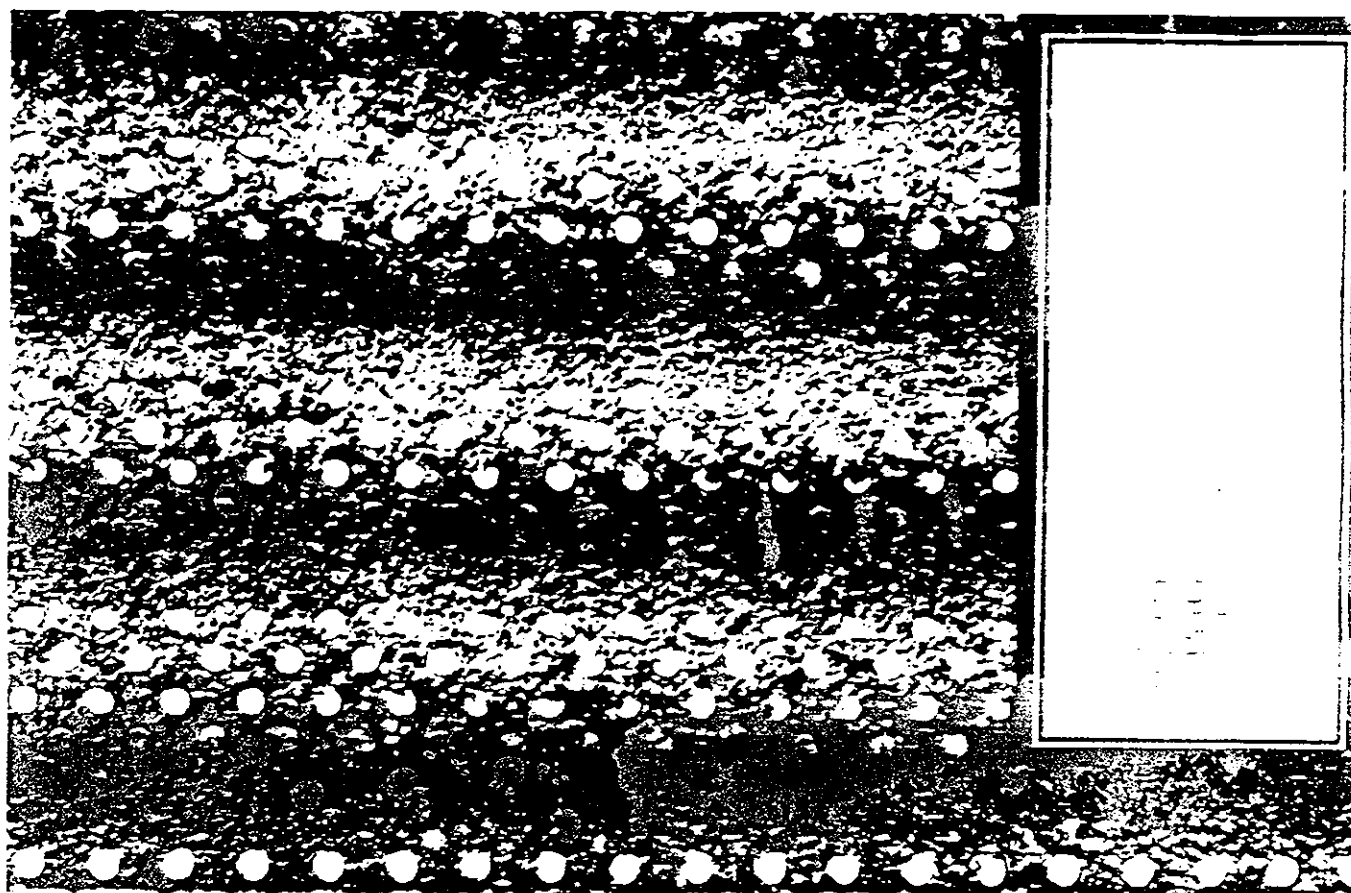
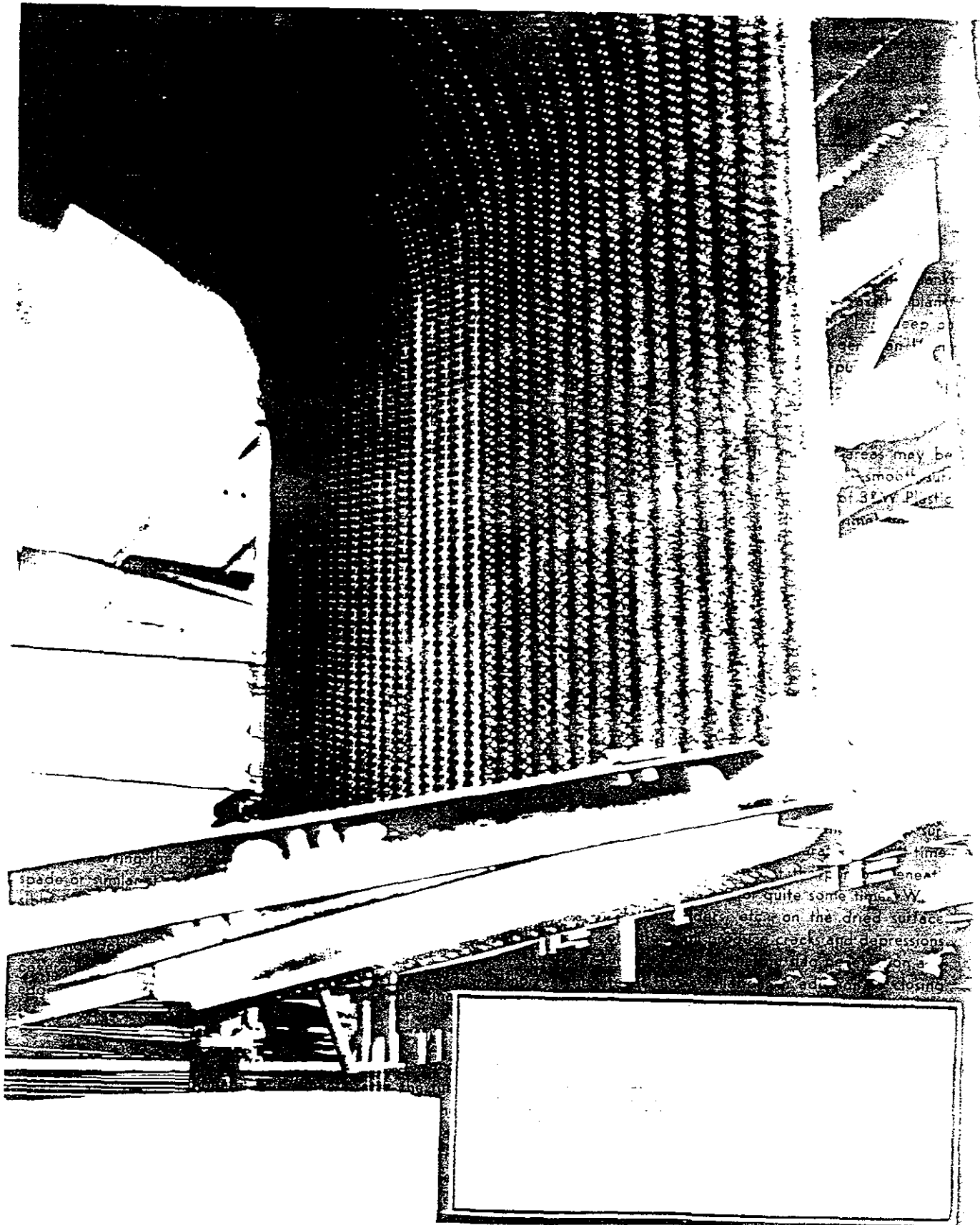


PHOTO #2

THIS PHOTO WAS TAKEN IMMEDIATELY
AFTER STAPLING THE UNSTAPLED
SECTION SHOWN IN PHOTO #1. CLOSE
UP OF THAT BRISTLE WILL SHOW IN
THE CORRECT POSITION FOR USE.





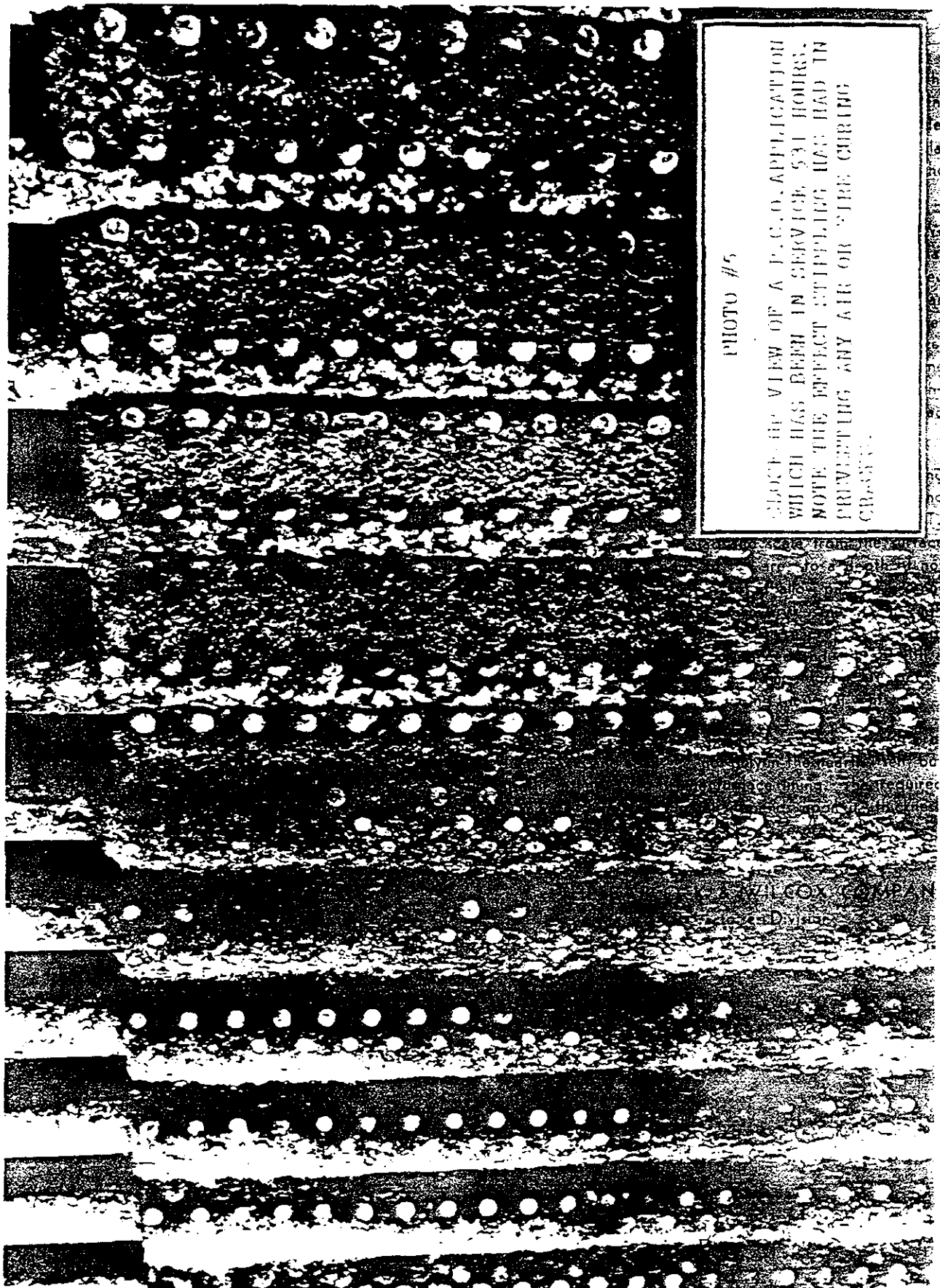


PHOTO #5

CLOSE-UP VIEW OF A P.C.O. APPLICATION
WHICH HAS BEEN IN SERVICE 531 HOURS.
NOTE THE EFFECT SETTLING HAS HAD IN
PREVENTING ANY AIR OR FIRE CURING
CRACKING.



PHOTOGRAPH
OF
THE
TEXTURE
OF
THE
FABRIC

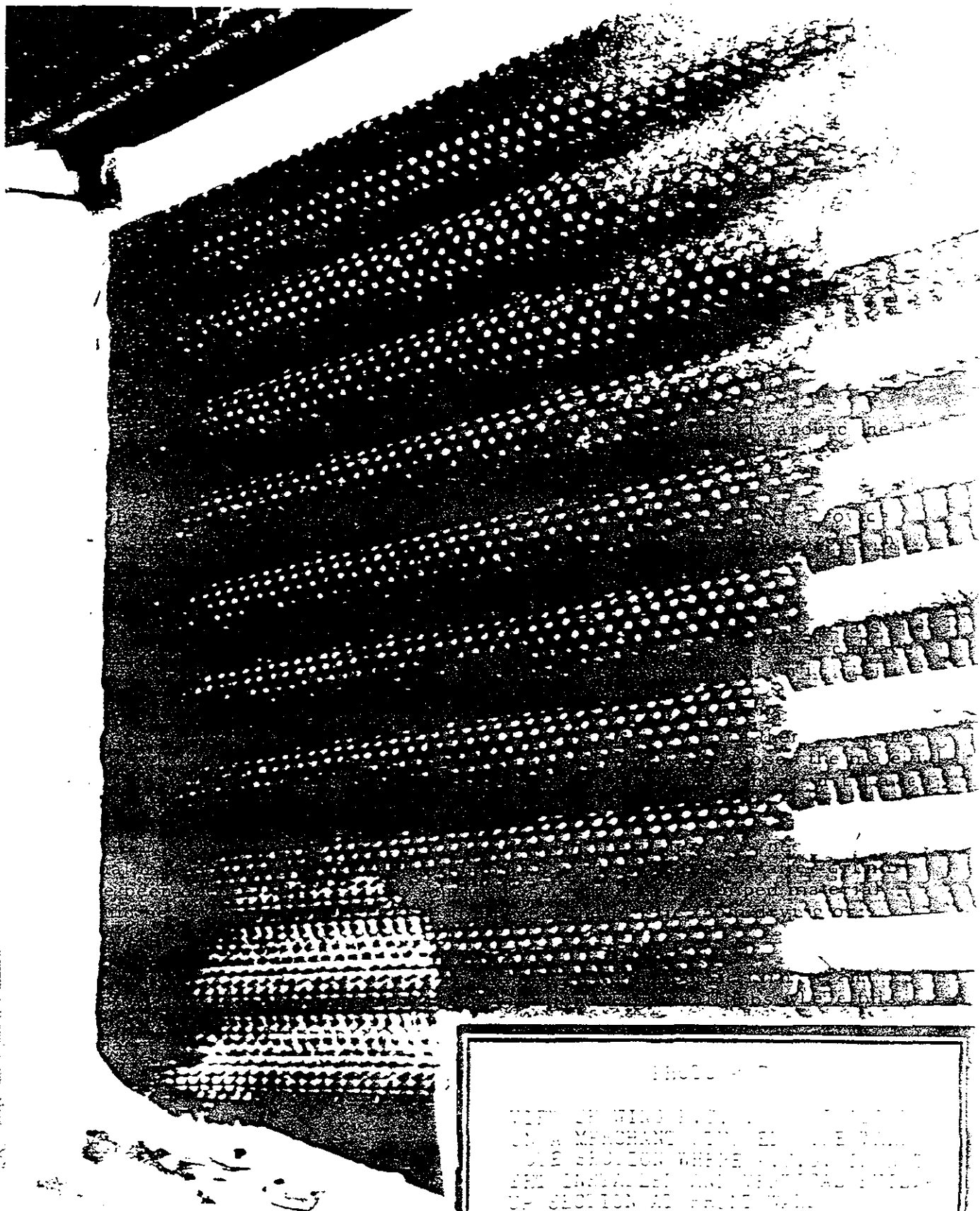


PHOTO 4
 VIEW OF WALL IN THE
 OF A MERCHANT IN THE WALL
 ONE SECTION WHERE THE
 ARE INSTALLED AND THE
 UP SECTION AT FRONT WALL

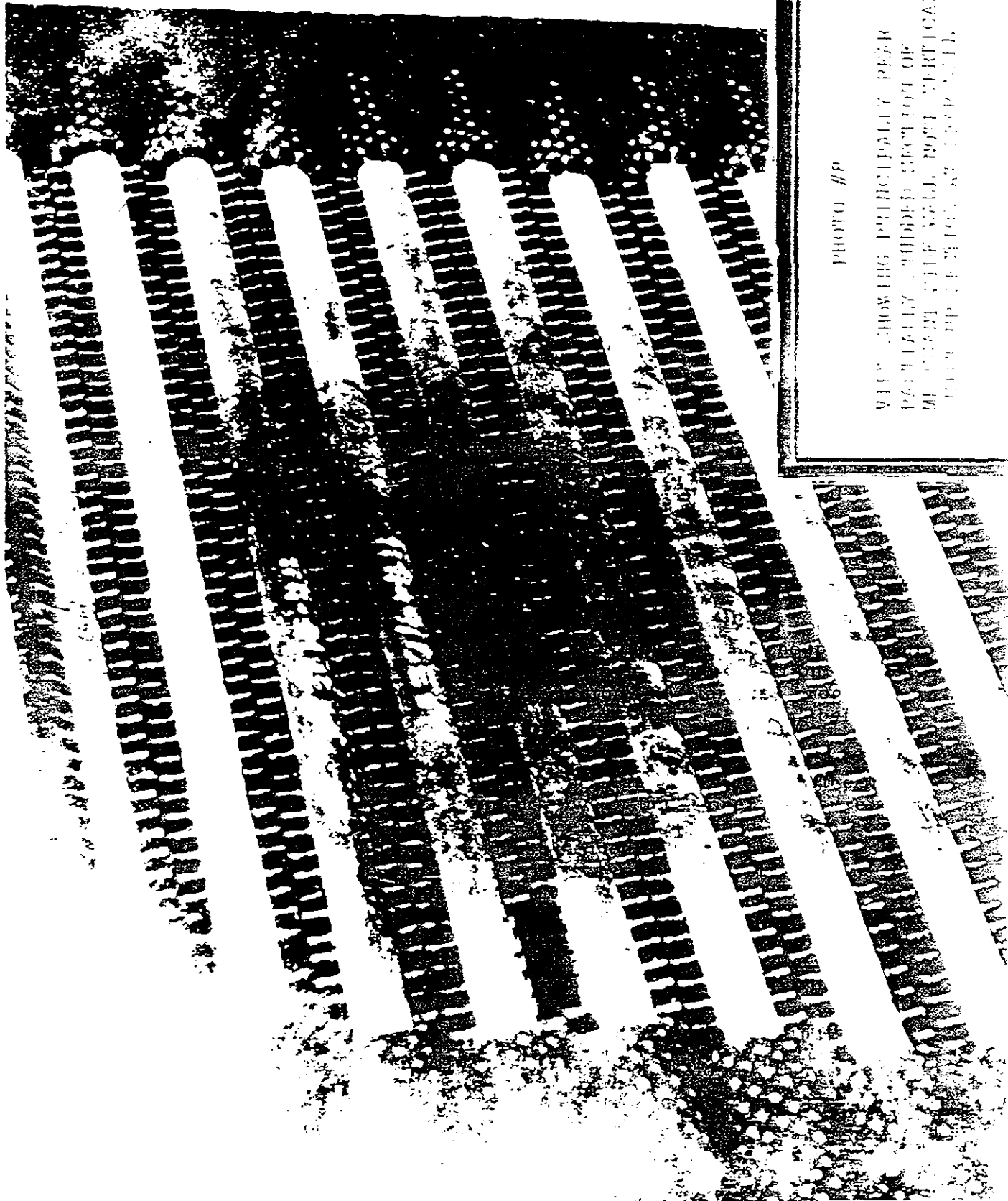


PHOTO #8

VIEWS SHOWING PRINCIPALLY REAR
PARTIALLY THINNED SECTION OF
ME. GREAT VINE WALL, NOT VERTICAL
CUTTING UP AT 2100, AT 2000 VILL.

INSTRUCTIONS FOR APPLYING AND MAINTAINING B&W PLASTIC CHROME ORE

Method of Application B&W Plastic Chrome Ore is shipped in ready-to-use condition . . . never add portland cement, water, or any other materials. Open only sufficient drums to keep installation crews supplied as needed. Remove the lid, turn the drum on its side, roll it back and forth a few times before turning the drum upside down and lifting it off of the contents. B&W P.C.O. should be dumped on a surface free from contaminating materials, and then cut into small pieces.

Chopped material should be covered with wet burlap sacks if there are any delays. It should never be left exposed to the air for a longer period than is required for proper cutting. For hearth work, use a minimum thickness of 4 in. B&W Plastic Chrome Ore. First clean away all loose material and shovel on the small pieces to cover an area 2 or 3 ft. wide along one side or end of the furnace to a thickness $1\frac{1}{2}$ to 2 in. greater than the final thickness desired. Do not attempt to install a layer of B&W P.C.O. on top of a layer that has been previously rammed. In applications where the thickness is too great to pack properly, it is necessary to apply in layers 4 to 5 in. thick, but in all such cases the previously rammed surface must be thoroughly and deeply roughened with shovels or a heavy sharp tool.

After working the plastic into place with the edge of a spade or similar sharp tool, ram it down as evenly as possible to within $\frac{1}{2}$ in. of the final thickness. Apply many sharp blows, rather than light tamping, using a heavy ramming tool having a large face. Do not ram the entire covered area; leave a minimum of 6 in. unrammed at the edge. The rammed area is now ready for the final treatment.

Lay a smooth plank, 2 in. thick, about a foot wide, and from 4 to 8 ft. long (depending upon the size of the furnace), along the furnace wall and sledge it down until the desired hearth thickness has been obtained. Lay a similar plank alongside the first and sledge the plastic down. Then move the first plank forward and proceed as before, but do not ram until the moisture comes to the surface,

and never slick the surface after ramming. If the planks stick, sand them with fine chrome ore, and as the planks are moved forward, make vent holes about 1 in. deep or 3 or 4 in. centers with a stiff tool not larger than $1\frac{1}{2}$ in. in diameter. An ice pick is good for this purpose, or use a board about 12 by 18 in. with eight-penny nails driven through it so nails extend $1\frac{1}{2}$ in. through the board.

After the final ramming, high and low areas may be present. To level off a low area, roughen the smooth surface thoroughly and fill in with small pieces of B&W Plastic Chrome Ore. After tamping (lightly this time) finish by sledging the plank. Remove high spots with a sharp shovel and refinish these areas, too, with the sledge and plank.

After B&W P.C.O. has started to set, it must not be disturbed. If the whole job cannot be done at one time, spread well-dampened burlap sacks over the unfinished edge of the work. When work is resumed, cut several inches of the installed material away from the edge before adding more plastic. Due to the nature of B&W P.C.O., expansion joints are usually not required.

Care Before Firing B&W P.C.O. will air-set and the top surface will dry in a comparatively short time after installation but the portion beneath the surface will remain plastic for quite some time. Walking or resting tools, ladders, etc., on the dried surface while in this condition, will produce cracks and depressions in the upper surface which will permit slag penetration and shorten the life of the installation, in addition to closing vent holes and causing the surface to peel upon heating. Even the placing of boards on the hearth will not protect it if traffic over the hearth is permitted before it has deeply air-set.

It has been found to be of advantage to spread a $\frac{1}{2}$ in. thickness of dry cinders over a B&W P.C.O. hearth to prevent rapid drying before firing. A layer of cinders will also protect the hearth from direct heat during the drying out process.

Firing a B&W P.C.O. Installation Provided that a hearth or bottom has been thoroughly vented, as indicated above, it will not be damaged by the immediate application of heat, provided it is not concentrated and flame impingement is avoided. Fire at low rate or intermittently until all moisture is out of the B&W P.C.O. If air-setting has taken place for a few days or weeks, use greater precautions to dry the bottom very slowly. To obtain maximum slag and wear resistance, a B&W P.C.O. installation should then be fired to as high a temperature as possible before slag flow occurs. Burning in the material at 2,450 F to 2,500 F for 7 or 8 hours will insure good results, but if the furnace cannot be heated to this temperature, hold at the maximum safe temperature for 8 hours or longer.

In drying out the floor of large boilers where B&W P.C.O. has been applied to floor tubes, it has been found to be of advantage to use 5-minute firing periods about every 45 minutes until the steam pressure just begins to rise; then the boiler should be allowed to stand for 8 hours and fired for 5 minutes, and this procedure continued for 24 hours or as long as necessary, making inspections of the floor during this period. This will result in a thoroughly dried out P.C.O. floor, and the application of hard firing after the drying out has been accomplished will not damage the P.C.O.

Small cracks often develop during this burning in process, but these usually close when the furnace is heated to operating temperature. Should any such cracks fail to close after a few heatings, fill them with B&W P.C.O. or a high-bond chrome mortar to prevent slag from working under and floating the hearth.

Method of Maintenance Slag and scale accumulating on hearths or floors should be removed to prevent contamination of the surface. Small deposits are more readily removed than heavy accumulations; in fact, removing heavy slag without injuring the hearth is very difficult.

In removing slag it is best to scrape it off the B&W P.C.O. while the furnace is hot. If a heavy deposit has been allowed to accumulate, it must be carefully chiseled or barred and in the latter case, always hold the tool at an angle with the hearth. Allow some slag to remain rather than gouge the surface of the plastic in an effort to remove the slag completely. If the surface does become chipped during cleaning, patch it immediately (before the furnace is put into production) in order to prevent slag from entering the opening.

Do not allow a hearth to wear too thin before patching it, as there is danger that the thin section may crack and come out, thus necessitating a much larger patch. To patch old work, remove slag and scale from the surface and cut around the edge of the area to a depth of not less than 1 in. This is important; shallow patches are not satisfactory. Be sure that the old work is not hot enough to set the fresh plastic before it can be properly rammed. The surface should also be roughened and coated with a batter of air-setting chrome bonding mortar just before ramming in the patch and providing the usual vents.

Never spray water on a hearth to cool it; this will produce cracks and spalls . . . not only in the hearth itself, but also in other parts of the furnace lining. The required burning-in time for a patch depends upon its thickness, but in any case, raise the temperature gradually.

THE BABCOCK & WILCOX COMPANY
Refractories Division

THE BABCOCK & WILCOX COMPANY
Refractories Division
New York, N. Y.

INSTRUCTIONS FOR INSTALLING & MAINTAINING B&W PLASTIC CHROME
ORE IN HEARTHS AND FURNACE BOTTOMS

These instructions for installing and maintaining furnace structures of B&W Plastic Chrome Ore are the result of years of experience. In the light of this experience, it may be said that the manner in which B&W P.C.O. is applied is probably as important in its effect on the results obtained as the material itself. The homogeneity and compactness of the P.C.O. mass has a direct relationship to its resistance to slag and its ability to stay in place. Due to the nature of the natural material from which the plastic is made it has not been found possible to develop a mix which can be applied with greater ease without sacrificing the ultimate quality of the finished job. Therefore, it may be said that care exercised in installing B&W P.C.O., according to the experience-proven methods set forth below, is at least as essential as the material itself and well repays the effort required.

Due to its nature, there are several fundamental principles which must be followed to obtain best results with B&W P.C.O.

(1) B&W P.C.O. is shipped in the proper consistency for use without the addition of any other ingredients. Water, Portland Cement or other materials will destroy the properties of P.C.O. and must not be added to it.

(2) It is not necessary to allow for expansion joints when installing.

(3) For a successful installation of B&W P.C.O. a jointless, dense, and perfectly uniform mass is desirable. Do not install it in layers.

(4) Thorough ramming and tamping into place is necessary and the mass should not be touched after final tamping and venting. Do not attempt to trowel B&W P.C.O. into place or to slick it smooth.

(5) Do not disturb B&W P.C.O. after air-setting has started.

(6) As B&W P.C.O. is heavy and will sag under its own weight if installed as a vertical or steeply sloped section, do not expect it to remain in place without adequate support and always build sloping sections on a gentle grade.

(7) Do not use or work B&W P.C.O. which shows any sign of having a hardened crust. Throw it away. Any excess P.C.O. which cannot be promptly used should be replaced into drum, covered over with a damp bag and the lid tightly sealed. Should the contents of a drum appear to be less plastic and less moist than usual upon opening, add it in shovel-size lumps to the contents of a "good" drum and chop and work together with a spade on a clean floor or other clean surface.

(8) Avoid freezing B&W P.C.O. in winter both before and after it has been installed and until it has been fired in.

(9) Due to its rapid air-setting properties, B&W P.C.O. cannot be allowed to stand very long after removing from drums without this action taking place. At ordinary room temperatures in still air, one hour is the maximum time unused P.C.O. or unfinished parts of an installation should be allowed to stand without covering with damp bags. In furnaces which are warm or in which there is a strong draft, air-setting may begin in a very few minutes. Under these circumstances, unworked P.C.O., unfinished sections, etc., should be kept constantly covered with damp bags.

STORING: Do not store B&W Plastic Chrome Ore in a hot place as heat will cause steaming which may build up pressure enough to cause air leakage with consequent drying and air-setting. Drums should be kept under cover in a cool place but not allowed to freeze.

HANDLING: B&W P.C.O. drums are rugged and every effort has been made to make them air-tight by gasketing the lids and attaching the lids by a number of crimped-on lugs.

Air leakage or loss of liquid will cause drying and setting.

On receipt of shipment, inspect for damage, particularly around the lid joint. If leakage is suspected, store the drum upside down and if seepage of the liquid occurs, tighten the lugs with a dull cold chisel and hammer.

TOOLS REQUIRED FOR BOTTOM OR HEARTH INSTALLATION: Provide tools shown on drawing RS-208 in sufficient quantities to suit the size of the installation. They should be strong and well made.

Also provide hardwood planks 2" thick and 12" wide in suitable lengths for finish-tamping. Several other boards not less than 1" thick should also be provided to cover the P.C.O. after installation for protection against damage to the surface from walking on it or resting tools or equipment on it.

OPENING DRUMS: To open a drum, pry up the "ears" with a sharp instrument or screwdriver inserted in the holes in the lugs on the lid and then knock the lid off. Roll the opened drum back and forth a few times to loosen the material which may then be dumped upon a clean space close to the point of installation by turning the drum upside down and lifting it from its contents.

Do not open drums of B&W P.C.O. until the material is needed for actual use. If a delay or interruption of the work should occur after drums have been opened, or the P.C.O. dumped, such drums or dumped material should be covered with damp bags to prevent the plastic from drying or setting before it can be installed.

For large installations, drums can be handled into the furnace and emptied close to the point of actual installation. For small jobs where this cannot be done, the drums should be dumped onto a clean space near the furnace and the P.C.O. cut into lumps to facilitate handling through an excess door.

BOTTOM OR HEARTH INSTALLATION

INSTALLATION: For hearth or furnace bottom work, use a minimum thickness of 4" of B&W Plastic Chrome Ore.

Clean the surface on which the P.C.O. bottom is to be installed of all dirt and dust and install the material in sections about 30" wide.

Cut the P.C.O. into convenient shovel-size lumps and place evenly over an area about 30" wide to a depth somewhat greater than the finished application desired (5" to 5-1/2" for a 4" floor) beginning along the wall farthest from the access door.

Ram or cut-in the lumps with the tool shown in drawing using a chopping action. Thoroughness and the use of force in chopping with the spade provides for a complete mixing of the lumps and produces a uniform and well-bedded mass. Do not smooth or walk upon the resulting rough, chopped surface. If the foregoing instructions have been followed a final thickness of 4" of P.C.O. will be provided.

If a greater thickness is desired, additional lumps should be added on top and chopped into the material already in place, using deep strokes with the spade to tie it into the material beneath. Continue this procedure until a thickness from 1" to 2" greater than the desired thickness is obtained. Try heavy blows with the tamper on a small area and check for depth to see if the correct level is obtained.

After the proper thickness is obtained, tamp down the chopped P.C.O. with heavy blows using the tamper shown in drawing RS-208. Sharp blows, rather than light tamping, are necessary.

Tamp the entire area covered but leave at least 6" of chopped but untamped material as an unfinished edge into which the next section of plastic may be chopped, thus insuring a jointless bottom. As tamping progresses, cover this unfinished edge with damp bags to prevent air-setting before the next section is chopped into it.

For final treatment, lay a 2" hardwood plank 12" wide upon the installed P.C.O. section and tamp it with hard blows of the tamper to insure a smooth, even surface. When the entire area has been evenly tamped, lay a second plank similar to the first against the plank just tamped and tamp it firmly as before. This will finish off a 2" section and leave the remaining 6" strip of the 30" section un-tamped for ramming in the next section to it.

Care should be taken to smooth out ridges which may be raised between plank positions. Lay the plank over such ridges and tamp lightly or, if the ridges be slight, light tamping without the plank will remove them.

As each area of several square feet has been tamped and rammed, check for depth, using a small diameter rod; for level, using a level board; or for slope, using a string. Always check level and slope with reference to previously-checked areas so that the entire floor will be uniform.

After the final ramming, high or low spots may be present. Slag pools

will form if they are not leveled. To level off low spots, the tamped P.C.O. should be thoroughly chopped and more material added in small lumps which are chopped into the underlying bed and tamped as before. Areas which are too thick may be shaved off with a sharp shovel and lightly tamped.

If additional thickness is desired after final tamping, do not add more P.C.O. until the existing material has been chopped up. Additional material should be chopped deeply into the installed mass to obtain a thorough tie-in and to prevent layers. Be sure that the stroke of the tool carries it well into the underlying material.

When an area has been satisfactorily completed, vent it by pricking it with small holes on approximately 3" centers, using the ventboard shown on drawing RS-208.

Additional sections of hearth or furnace bottom are laid in similar manner next to the tamped and vented sections by shoveling material alongside the untamped edge of the previously laid section and chopping it into place, tamping and venting as described above.

Keep off of hearths or furnace bottoms of unfired P.C.O. If it should be necessary to walk upon them, lay tools upon or stand ladders on such surfaces, even when air-set, cover the necessary area with 1" boards to protect it from damage.

Do not delay packing and tamping after the P.C.O. has been shoveled into place and do not leave an unfinished surface or edge without covering with damp bags to prevent air-setting.

Do not attempt to rework B&W P.C.O. after installation when air-setting has begun to take place. If the face of an installed section should become air-set before the next section can be laid, remove the air-set portion or surface and discard it before thoroughly chopping in newly applied material.

LABOR: It has been our observation that in hearths or furnace bottoms it requires from one to two man hours per cubic foot of material for a first-class job (i.e., one to two man hours per drum of material). This includes labor in connection with handling, opening drums, application, etc.

Care Before Firing:

B&W P.C.O. will air-set and the top surface will dry in a comparatively short time after installation but the portion beneath the surface will remain plastic for quite some time. Walking or resting tools, ladders, etc. on the dried surface while in this condition will produce cracks and depressions in the upper surface which will permit slag penetration and shorten the life of the installation, in addition to closing vent holes and causing the surface to peel upon heating. Even the placing of boards on the hearth will not protect it if traffic over the hearth is permitted before it has deeply air-set.

Firing a B&W P.C.O. Installation:

Provided that a hearth or bottom has been thoroughly vented as indicated above, the best installation will result if heat is applied immediately upon completion.

If it is impossible to apply heat immediately after installation and the

hearth or bottom is allowed to stand for a considerable length of time, shrinkage cracks will develop. If these cracks are large (over 1/8"), it is necessary to fill them before applying heat with a chrome bonding mortar having good air-setting qualities. Smaller cracks (under 1/8") can be neglected because they will close up when heat is applied to the hearth.

The furnace temperature should not be increased too rapidly. If the moisture in the B&W P.C.O. changes into steam too rapidly, it will not be able to escape through the vent holes quickly enough, resulting in a blistered or bloated surface of the hearth or bottom. Generally, B&W P.C.O. will be dried out satisfactorily if the same time-temperature cycle is followed that is used for drying out other refractories in the furnace setting. For the average furnace job, if the temperature is brought up to about 500°F and held for 6 to 8 hours and then raised to about 1200°F and held for 3 to 4 hours, the material should be thoroughly dried out.

After the drying out period, the B&W P.C.O. must be burned in at the final operating temperature of the furnace. The length of time which a hearth should be held at the maximum temperature varies with its size and thickness. A minimum for small or medium size hearths (4" thick) would be five hours. The time required for larger and thicker hearths should be increased accordingly so that the heat will penetrate to a greater depth.

You cannot injure B&W P.C.O. by increasing the burning-in temperature, in fact it improves the structure. Therefore, where other refractories and equipment in the furnace permit, it is advisable to raise the burning-in temperature somewhat above the maximum operating temperature of the furnace.

MAINTENANCE: Except in slag tap furnaces, slag and scale accumulating on hearths or furnace bottoms should be removed to prevent contamination of the surface. Small deposits are more readily removed than heavy accumulations; in fact, removing heavy slag without injuring the P.C.O. is very difficult. In slag tap furnaces, the slag surface is best left alone except in cases where a heavy accumulation of iron or iron sulfide finally dictates removal in which case considerable replacement or repair will be found necessary.

The best way of removing slag is to scrape it off of the B&W P.C.O. at frequent intervals while the furnace is hot. If a heavy deposit has been allowed to accumulate, the furnace will have to be cooled down and the slag carefully chiseled or barred.

In barring the slagged surface, always hold the tool at an angle to the hearth and allow some slag to remain rather than gouge the surface of the plastic in an effort to remove it completely.

Do not allow a hearth or bottom to wear too thin before patching, as there is danger that the thin section may crack and come out and therefore require a much larger patch.

To patch old hearths or furnace bottoms, remove the slag and scale from the surface and cut around the edge of the area to a depth of not less than 1" below the existing surface. This is important: Patches less than 1" thick are not satisfactory. Lens-shaped or tapered patches are worthless. All patches should be of uniform thickness laid in the existing hearth and joined to it at vertical or slightly undercut edges. Be sure that the old work

is not hot enough to set the fresh plastic before it can be chopped in and tamped.

Apply a wash coating of a chrome bonding mortar having good air-setting qualities to the roughened surface of the old P.C.O. to provide a good bond between it and the new P.C.O. applied as a patch. Apply this mortar over a small area at a time, immediately before putting the new P.C.O. into place, so as to prevent its having time to air-set before the P.C.O. is applied. The P.C.O. placed in the patch should be rammed and vented in the same manner as new P.C.O. hearths described above.

Never spray water on a hearth or furnace bottom to cool it. This will produce cracks and spalls not only in the hearth but also in other parts of the furnace lining.

The required burning-in time for a patch depends upon its thickness. When patches are relatively thick they should be burned in as rapidly as possible after installation.

REBUILDING BOTTOMS: It is better to patch or completely re-install hearths or furnace bottoms of B&W P.C.O. rather than attempt extensive rebuilding. Hearths and bottoms should preferably be allowed to wear thin and be replaced with new hearths altogether. However, should a hearth of sufficient original depth wear thin, it may be rebuilt when it is possible to add 3" to 4" of material to the entire surface. All slag and spalled or cracked portions of the bottom should be cut away and removed to a level where the bottom is in a sound condition.

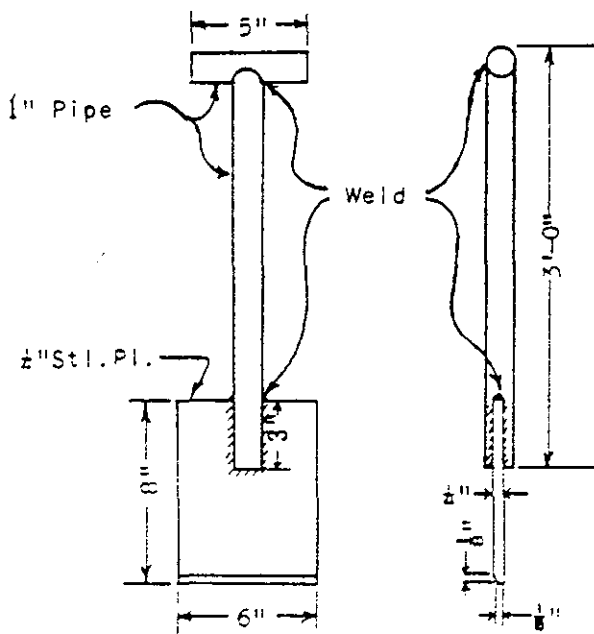
Provide the tools which are required for laying a bottom as described above and as shown on drawing RS-208.

Apply a coating of a chrome bonding mortar having good air-setting qualities to the surface of the old P.C.O. to provide a bond between it and the new plastic. Apply this wash coat over a small area at a time, just before installing the new P.C.O., so that it will not have time to air dry and air-set before the new P.C.O. is put in place.

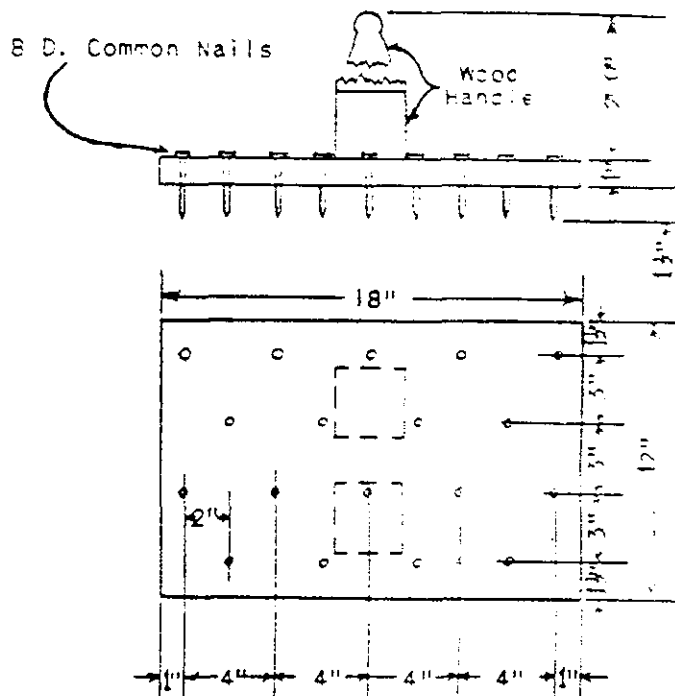
Proceed with the installation of the new P.C.O. in the manner prescribed for installing a new bottom.

THIS DRAWING IS THE PROPERTY OF
THE BABCOCK & WILCOX CO.

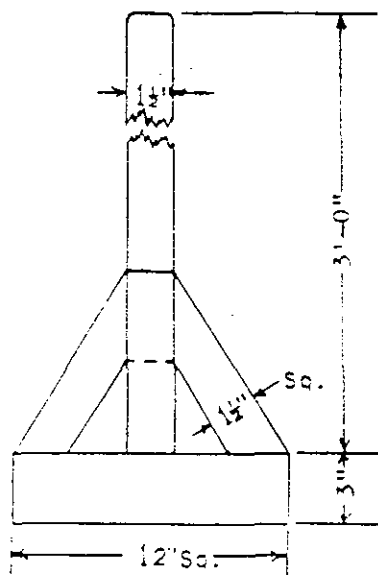
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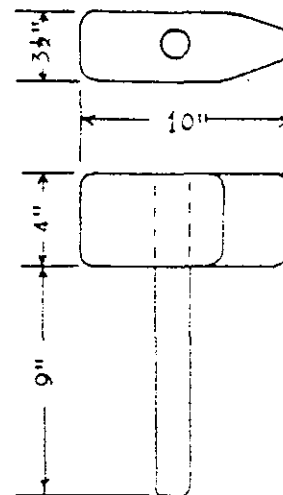
(A) SPADE FOR PACKING
B&W PLASTIC CHROME ORE



(B) VENT BOARD



(C) HARDWOOD TAMPER



(D) HARDWOOD MALLET
(Dogwood or Hickory)

TOOLS FOR INSTALLING B&W PLASTIC CHROME ORE
IN BOTTOMS OF BOILERS AND FURNACES

DRAWN BY S.C. CME'D
S. L. 20 - C APP'D

THE BABCOCK & WILCOX CO.
REFRATORIES DIVISION

SCALE 1/4" = 1"

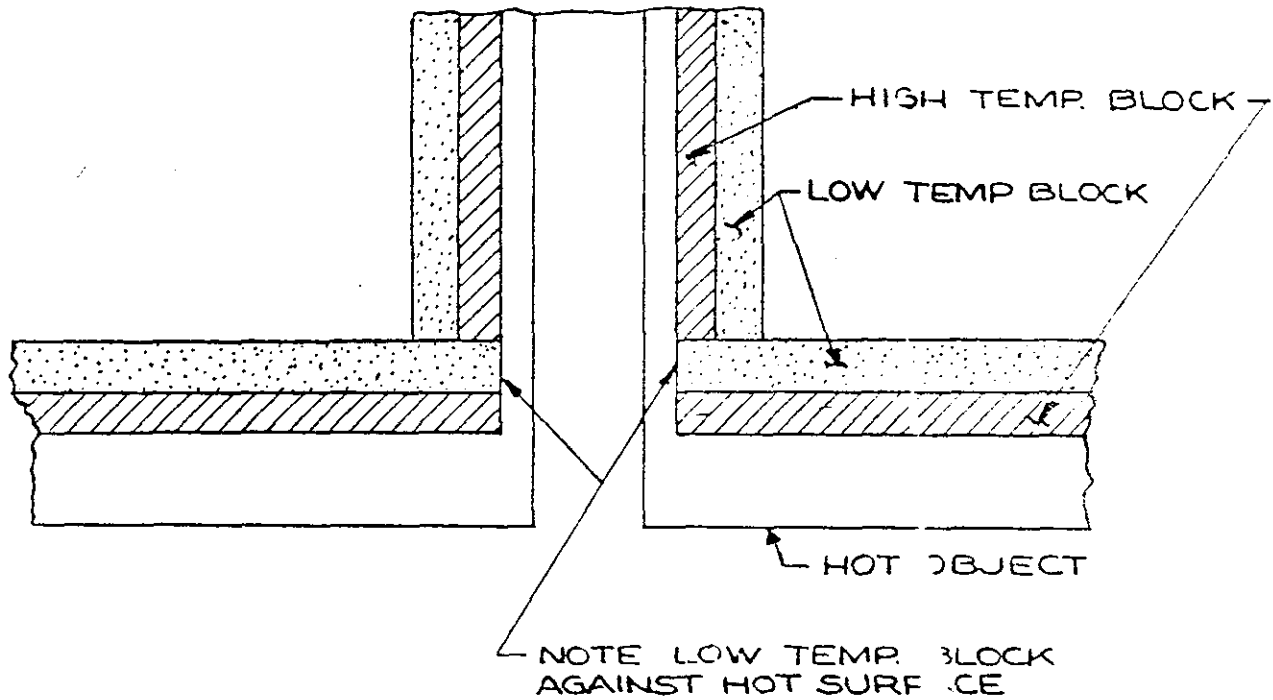
RS - 208

BLOCK INSULATION

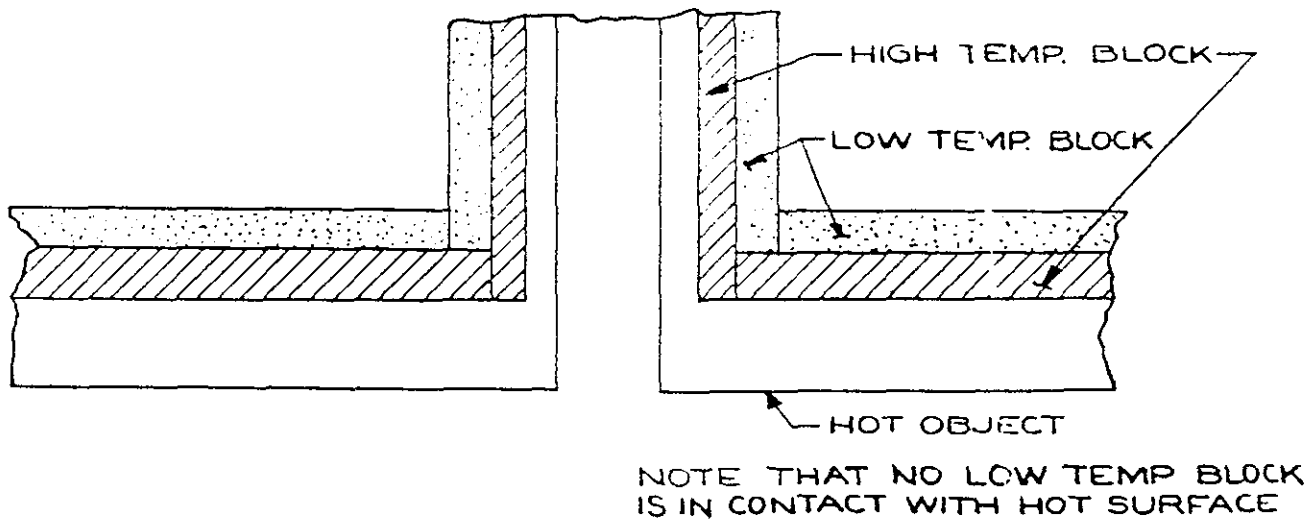
After fasteners have been applied to the wall, block is applied. The main object is to have the block fit tightly against the object being insulated and against the neighboring block. There are several operations in the application of block which will give trouble if not done properly. When using layers of block having different temperature limits, the block having the higher limit should naturally be placed against the hot surface. Fig. 5 shows a typical example where this might be encountered.

To reduce leakage through the insulation to a minimum, the blocks should be closely butted together with the joints staggered. Where two layers of block are used, the joints of the inner and outer layer should be staggered. All joints and holes in the blocks must be filled with an insulating cement of the same temperature limit as the block.

FIG. 5
SKETCH SHOWING METHOD OF APPLYING
BLOCK OF DIFFERENT TEMP LIMITS



INCORRECT METHOD



CORRECT METHOD

LACING WIRES

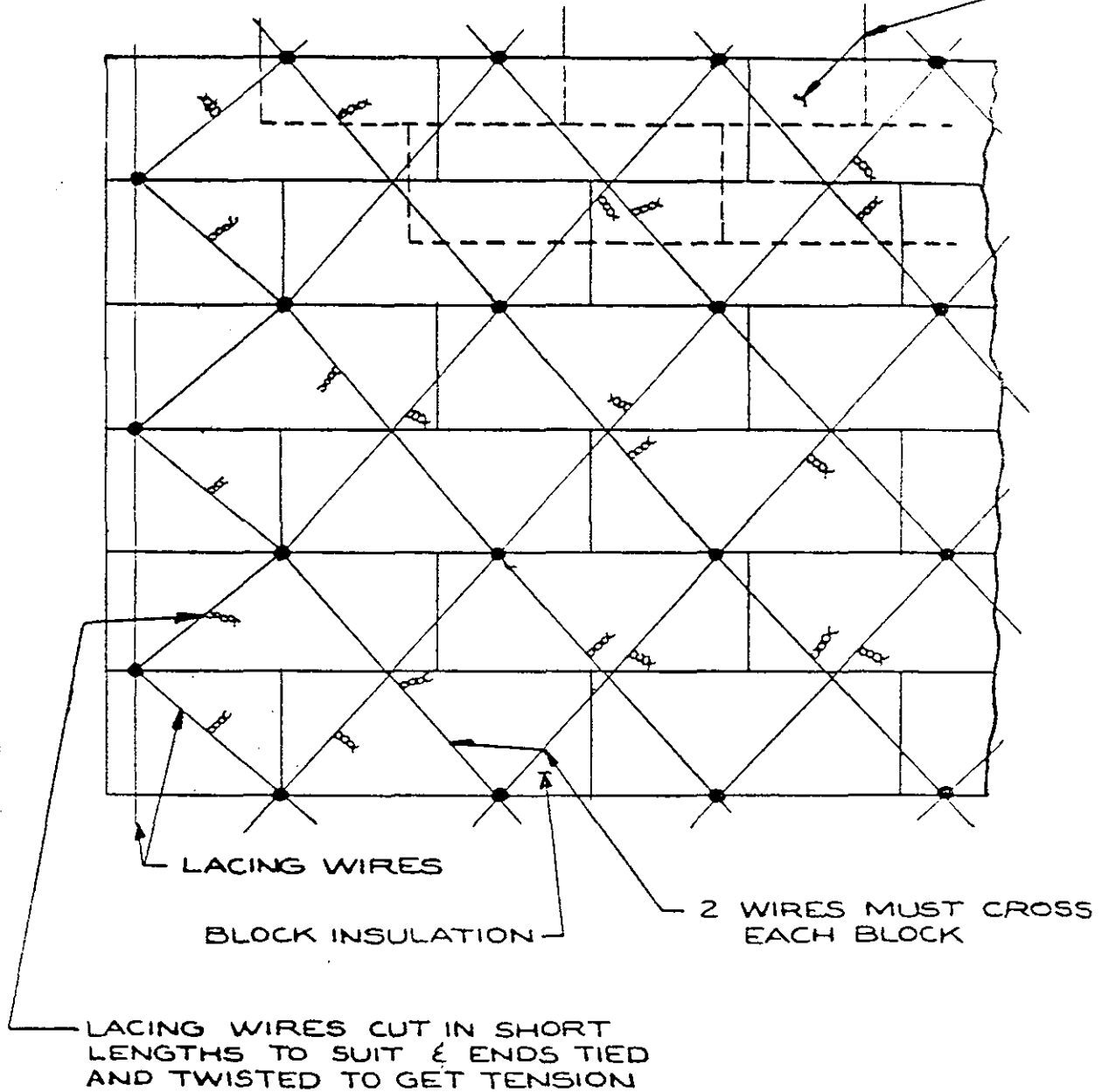
As block is applied it is necessary to secure it to the fasteners. The most common method used is a network of 14 gage lacing wires which attach to the fasteners and cross over the block holding it firmly against the object being insulated. On all flat surfaces and flues and ducts over 33" in diameter, a diamond shaped pattern is required. When two layers of block are used, it is not necessary to use lacing wires on the inner layer. Fig. 6 (a), (b), & (c) illustrate typical lacing wire constructions. As in the case of insulation fasteners, there will be places where additional wires must be used to properly secure the blocks, such as around doors, soot blowers, etc.

In some instances a soft block is used which must be protected from the cutting action of the wires. In such cases, metal washers and corner beads will be supplied to fit under the lacing wires as protection for the block. (See Fig. 7).

The lacing wires on tubes, pipe, or ducts of less than 33" O.D. shall be in bands around the block. Figure 8 shows a typical example of this type of construction.

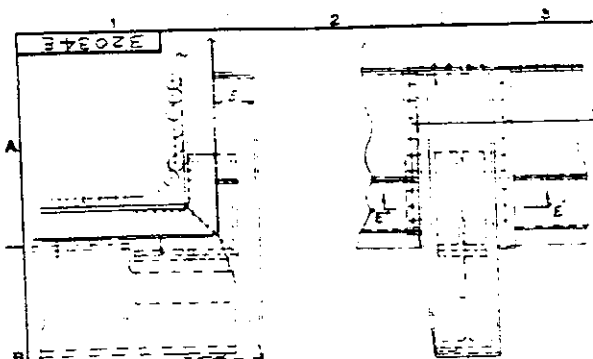
FIG. 6

NOTE INNER LAYER STAGGERED



(a)

SKETCH SHOWING LACING WIRE APPLICATION



DESIGN OF CORNER WHEN
STAY BEAMS IN ADJACENT
WALLS ARE ON DIFFERENT
ELEVATION

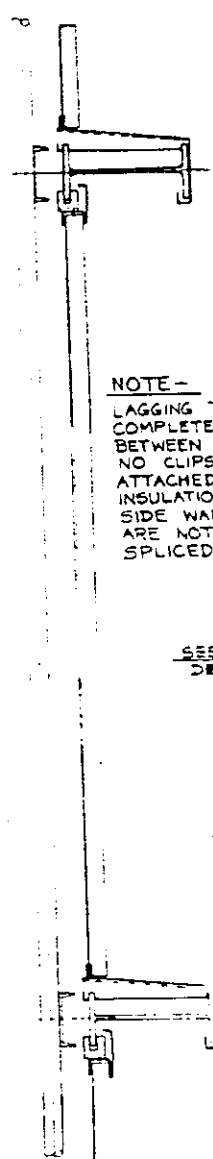


1/2" BAR
ENDS
STAYS
1/2" LG WELDS
ON SIDE

SECTION C-C

NO.	DESCRIPTION	DATE	BY	CHKD.
1	DESIGN			
2	DETAILS			
3	SECTION			
4	DETAILS			
5	SECTION			

A
B
C
D
E
F
G
H
I



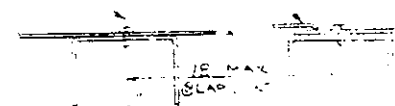
NOTE -
LAGGING TO BE
COMPLETELY SELF-SUPPO
BETWEEN BUCKSTAYS AND
NO CLIPS ARE TO BE
ATTACHED THROUGH THANEL
INSULATION TO BOILER
SIDE WALL. PANELS
ARE NOT TO BE
SPLICED

SEE ENLGD
DETAIL-N

SEE ENLGD
DETAIL-P

AGGINS

10 (190 DA)
SELF TAPPING
SCREWS



SECTION A-A

SIZE	A
3/4"	2
1"	3
1 1/4"	4
1 3/4"	5
2"	6
2 1/4"	7
2 3/4"	8
3"	9
3 1/4"	10
3 3/4"	11
4"	12

SECTION S-S



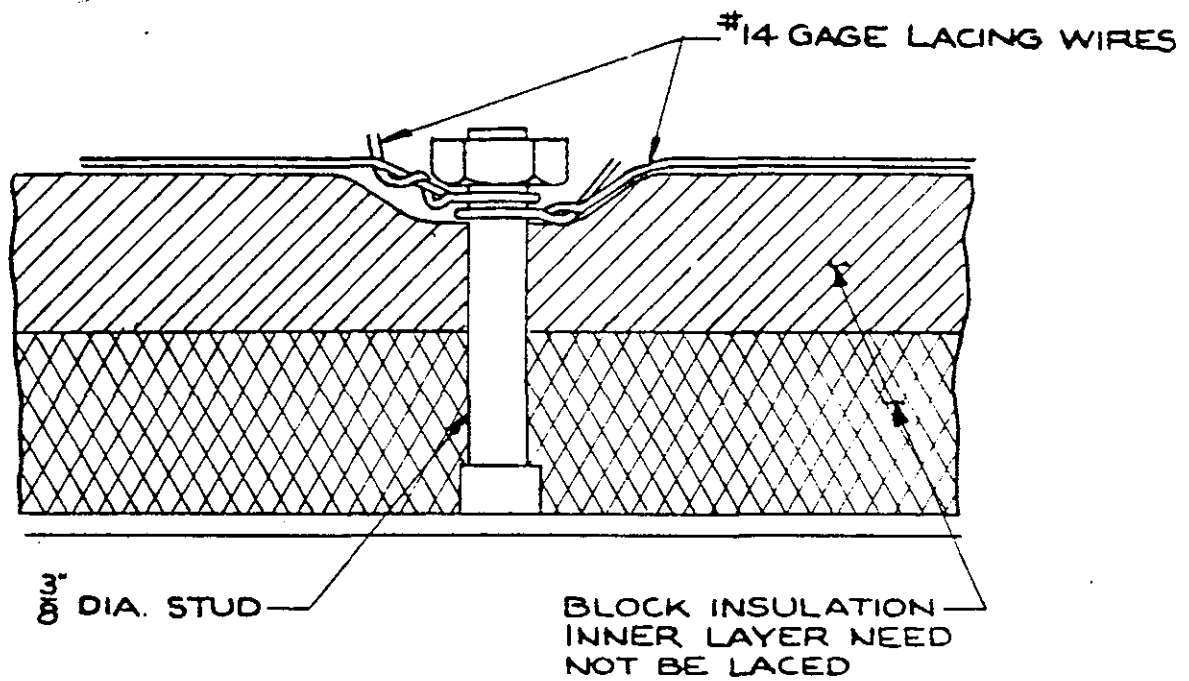
DETAIL-R

ALL CONNECTIONS MUST BE
WEATHER TIGHT

(OUTDOOR INSTALLATION)

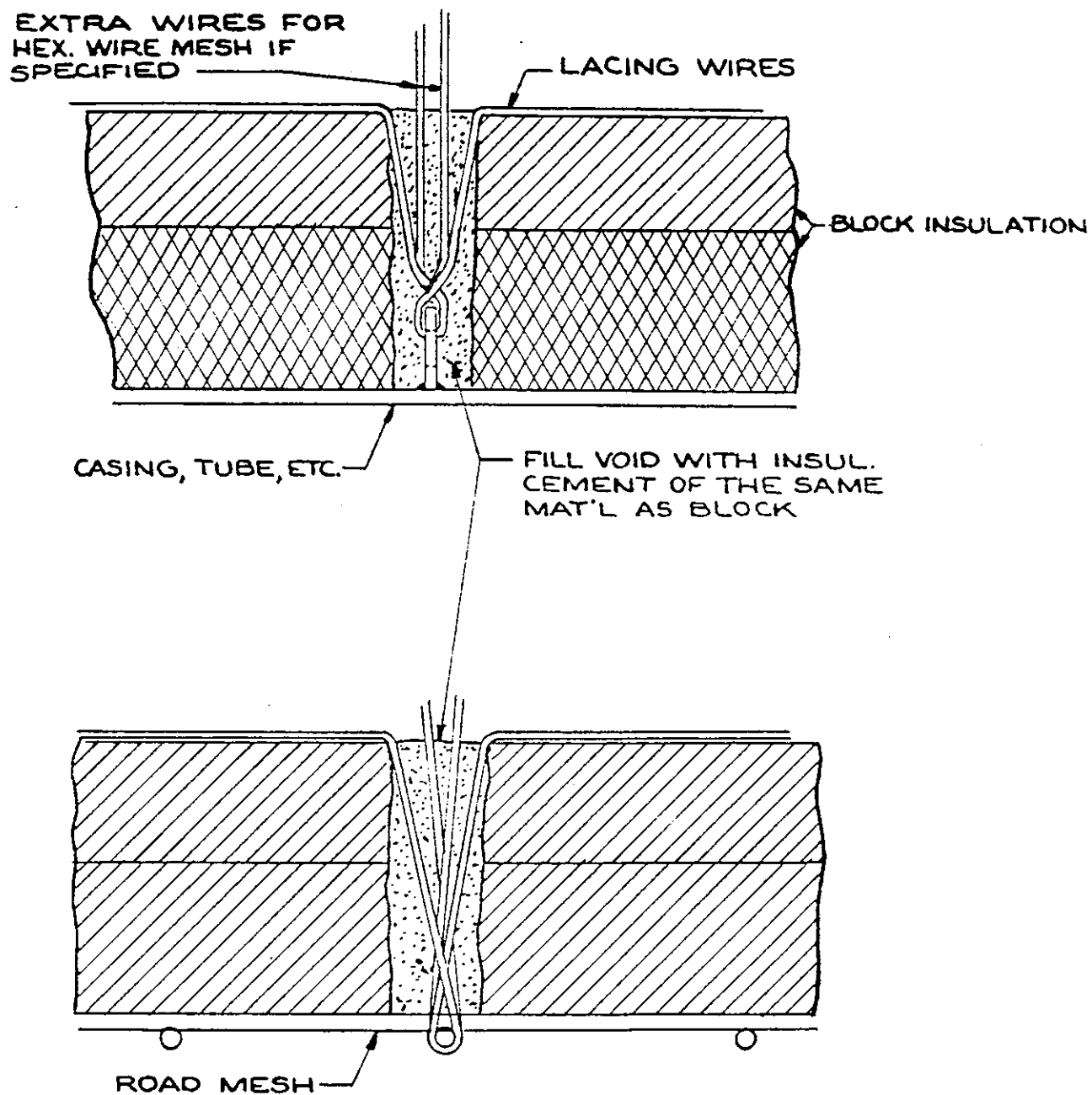
THE BASKOCK & WILCOX CO.
ARRGT. OF LIGHT GA
METAL LAGGING OVER
BOILER WALLS
STANDARD 32034E-4

LOOKED DRAWER DRAWING



NOTE TO GAIN ADDITIONAL TENSION IN WIRES AND FORCE BLOCK AGAINST SURFACE OF CASING, NUTS SHOULD BE SCREWED DOWN FLUSH WITH BLOCK AFTER LACING WIRES ARE TIED.

(b)



(C)

FIG. 7

SKETCH SHOWING PROTECTIVE PADS
FOR LOW STRENGTH BLOCK

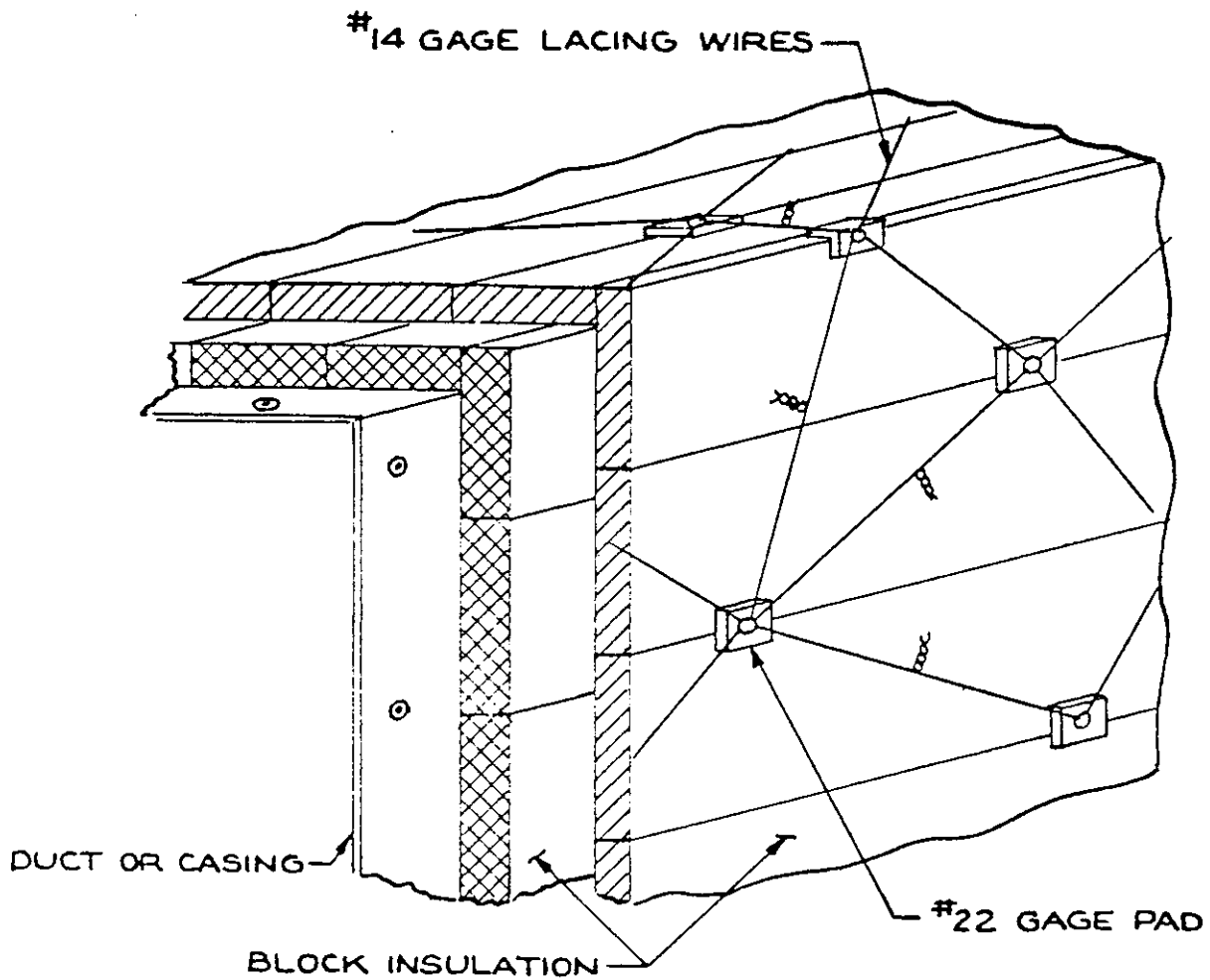


FIG. 8
SKETCH SHOWING LACING WIRE APPLICATION
FOR PIPE, FLUE, ETC. UNDER 33" O.D.

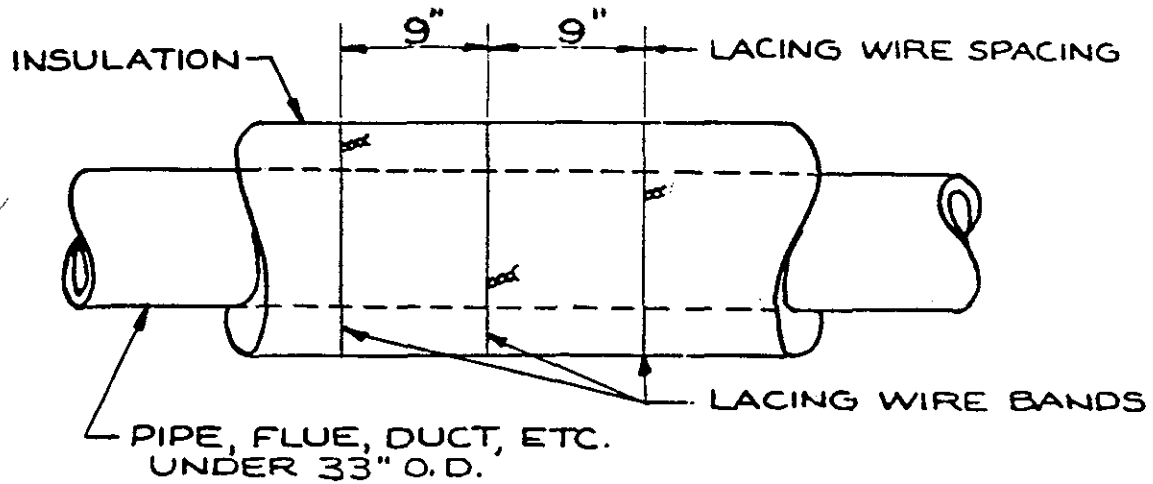
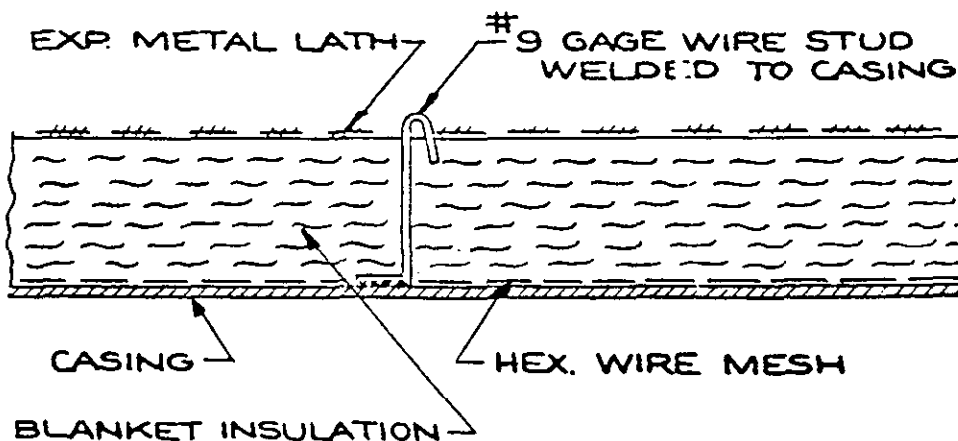


FIG. 9
SKETCH SHOWING METHOD OF SECURING
BLANKET INSULATION WITH WIRE STUDS



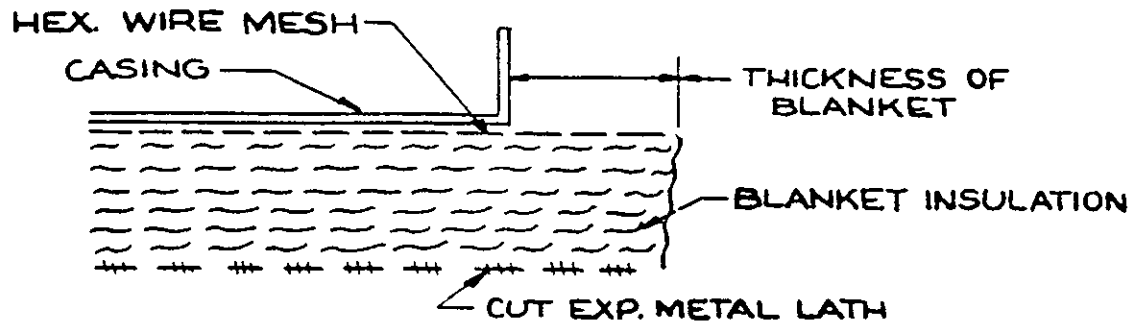
BLANKET TYPE INSULATION

Although block type insulation is most widely used on boilers, there are occasions where blanket type is used. The installation of the blanket is relatively simple since it carries its own reinforcement in the form of expanded metal lath and chicken wire. The blanket is impaled over #9 gage wire studs and secured by bending the stud over the lath. (See Fig. 9).

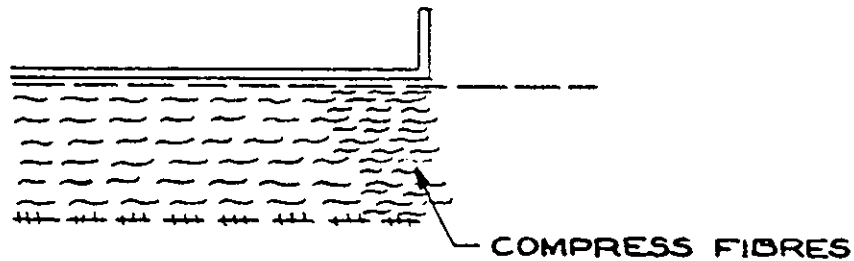
To prevent gas leakage and casing hot spots, special care must be taken where blankets join. Adjacent edges of blankets must be forced together and the metal lath laced to achieve maximum sealing. At casing flanges, the blanket ends should be wrapped with its mesh and lath. Both of these conditions are shown in Fig. 10. The studs holding the blanket may be shop or field applied. When field applied, the studs should be spaced on approximately 12" centers vertically and horizontally with outer rows of studs 3" from the edge of each panel. (See Fig. 11). The blanket should always be installed with the metal lath on the outside face of the blanket.

The material making up the blanket may be mineral wool, glass wool, Kaowool, etc. All these may be installed as described above.

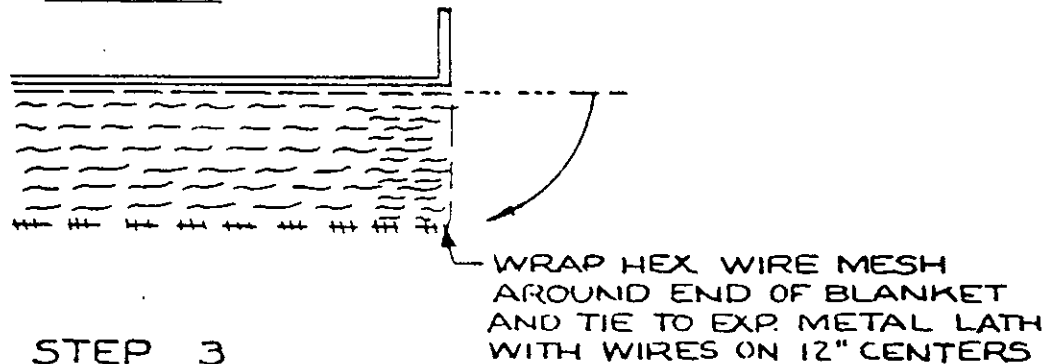
FIG. 10
SKETCH SHOWING METHOD OF JOINING
AND ENDING BLANKET INSULATION



STEP 1



STEP 2



STEP 3

METHOD OF MAKING BUTT JOINT

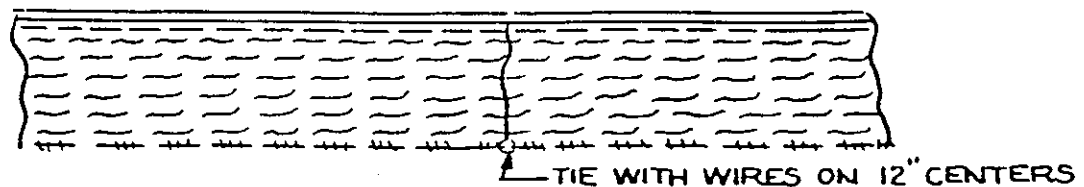
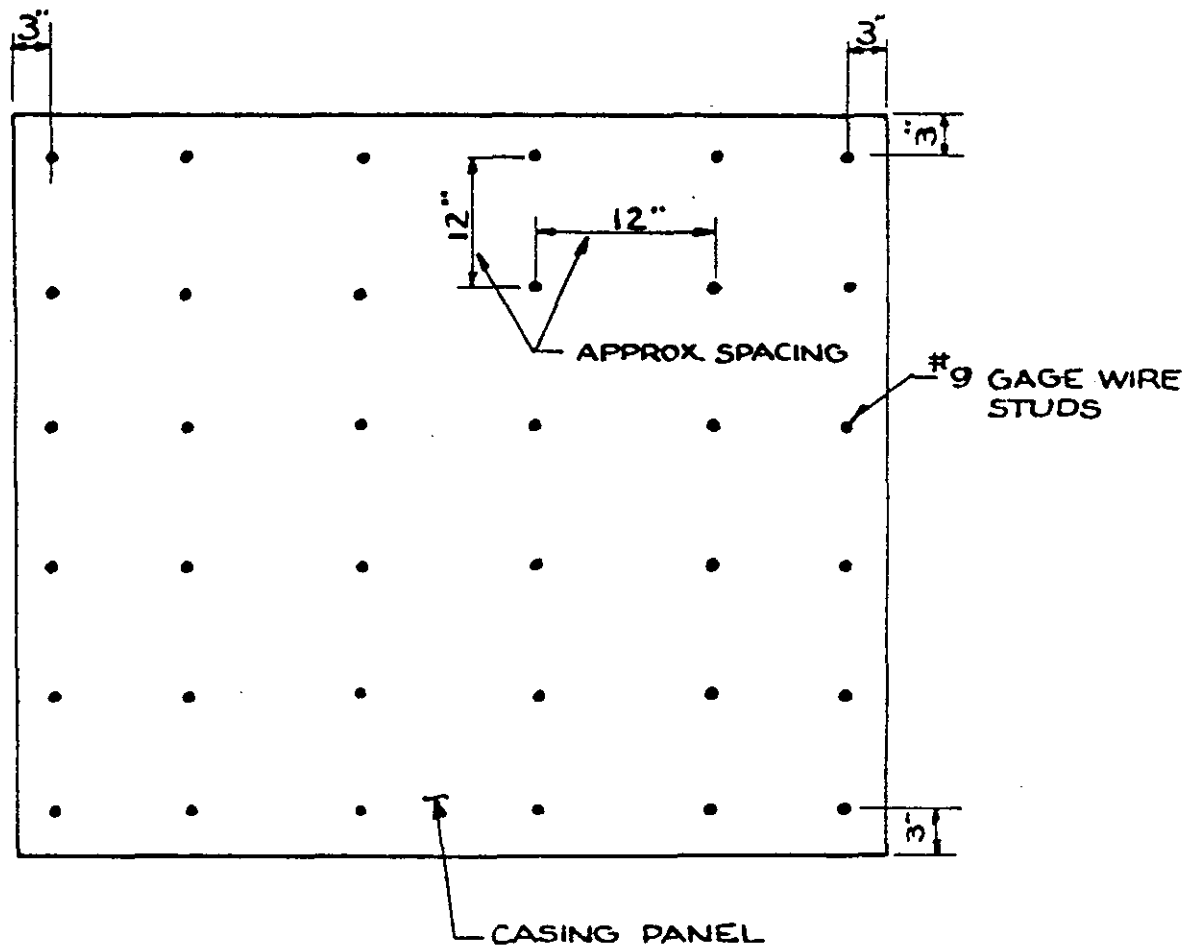


FIG. 11

SKETCH SHOWING SPACING OF FIELD WELDED
STUDS FOR BLANKET INSULATION



LAGGING

Lagging is a sheet metal covering placed over block insulation to protect it from the elements and physical abuse, and to give the boiler a neat, finished appearance. The lagging takes the place of the high temperature plastic insulation finish coat and sealing compounds.

Lagging will be sublet by the B&W Co. Purchasing Dept. to a sheet-metal contractor who will supply the material and erect it. The lagging will not be designed or engineered except as shown on drawings 32034E, 32049E, 32038E, 23114E, and 32046E, copies of which are attached herewith. The details will be left up to the contractors who usually fabricate the panels on the job to fit the individual boiler being covered. It must be neat in appearance and arranged so that it will prevent water from getting into the insulation.

The contractor will be required to furnish all necessary fasteners, covers supports, clamps, clips and any other such items required to make a finished job. The lagging ribs should line up vertically from top to bottom wherever possible to give a neat appearance. It is particularly important that the ribs line up between buckstays. The lagging must be completely drainable and must not contain places where water can collect, either on panels, flashing, or stiffeners. It must be installed in direct contact with the insulation so that "oil canning" will be held to a minimum.

DESIGN OF CORNER WHEN
DATA ARE IN ADJACENT
ELEVATIONS

LAPS APPROX. 10'-0" CTRS
TO SUIT LENGTH OF RUN THAN CAN
BE SHOWN

5 MIN. 18 MAX.
18 FOR PANELS WITH
CORNER JOINTS

SECT. E-E

4. SUPPORTING AT
4. CTR. HUMAN
2.5' MAX. TO CLEAR
B'YWAY CLAMPS

NOTE -
CLIPPING TO BE
CONNECTED TO SELF SUPPORTING
BETWEEN DUCTS AND
NO CLIPS ARE TO BE
ATTACHED THROUGH THE
HUMAN TO DUCTS
ARE NOT TO BE SPICED

SEE ENL. G.D.
DETAIL - N

SEE ENL. G.D.
DETAIL - P

SPACING CLIPPING
NOT TO BE LARGER THAN
SPAN EXCEEDS 10'-0"

SLOT WIDTH -
= BEAM FLD. = 1/2"

LACING TO BE IN
CONTACT
WITH INSULATION

SECT. G-G
WITH 1/8 GA LACING

SECT. H-H
WITH 1/8 GA. ROOF DECKING

SECT. A-A

ENLARGED SECT. B-B
AT 1/2 STORY

DETAIL - N

SECTION S-S

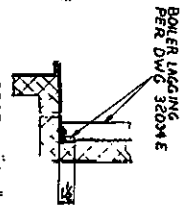
ALTERNATE TYPICAL SECTIONS
AT CHANGING OFFSETS

DETAIL - P

DETAIL - R

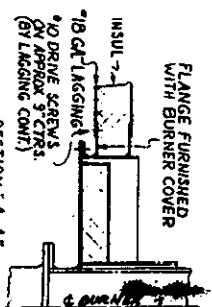
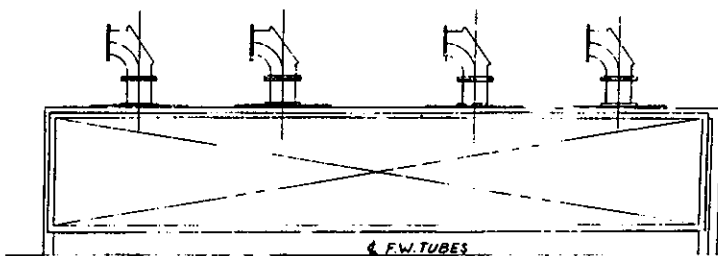
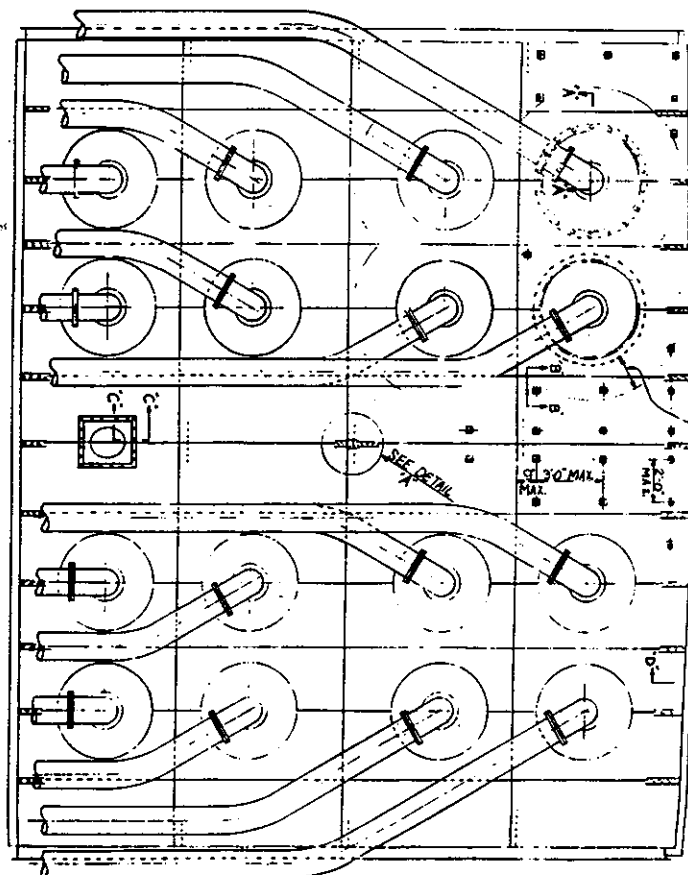
INDOOR INSTALLATION

1. ALL MATERIALS SHALL BE NEW UNLESS OTHERWISE SPECIFIED.
2. ALL MATERIALS SHALL BE OF THE BEST QUALITY AVAILABLE.
3. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
4. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
5. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
6. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
7. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
8. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
9. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:
10. ALL MATERIALS SHALL BE OF THE FOLLOWING GRADES:

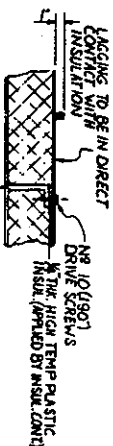


FLANGES TO RUN PARALLEL TO SLOPE SO-
AS TO AVOID POCKETS

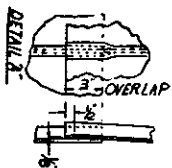
CLIPS NOT REQUIRED WITH
18 OF BURNER FLANGES
EXCEPTS SHOWN AT JUNCTION
OF FLANGES BETWEEN DOWNER.



SECTION "A-A"
TYPICAL SECTION THRU BURNER COVER



SECTION B.B.

[illegible]

THE QUALITY OF THE SERVICE

MIL BARRACKS & MILITARY

ARMY OF LIGHT

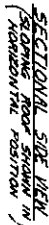
METAL LACING

BUMMER BOXES

STANDARD 5-3203



SLOPE APPROX 1' PER FT.
..SINKING TO BE MADE WITH
..STANDING "SUBVERSE"
..RESTRICTION TO LATERAL



ENLARGED SECT. B-B'

EASTERN CLAP
(FURNISHED BY
LABARGE CONTRACTOR)

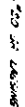


ENDS OF WINGS TO
BE SEALED BY SOLDERING
ON WELDING (ON OUTDOOR
- OBS GVR)

FASTENER CLIP

ERIN SHILD COLEMAN

JOINTS TO BE SEALED
BY SOLDERING OR
WELDING (AN OUTDOOR
CLOSURE ONLY)



REVIEWED BY STM.

118 Col Larkin

5215 T.H. 97446

Prakas,

52445-51
52446-51

AN OUTBACK
ADVENTURE

11/11/2019

2-11-75 A-N

ON 11/11/19

WEAVER
L. Wainwright

3

TYPICAL SECTIONS A-A THROUGH HANGER ROD SEALS

CHANGES TO NON
METALLIC TO SCALE

3

1

—

1

ENGAGED

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MANUFACTURERS OF
METAL LININGS OVER
PENTHOUSE

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DATE _____ TIME _____

BY **93046B.2**

FINISH COATS AND REINFORCEMENT

"Finish coats" are coverings over block and certain blanket insulations to provide a continuous outer coating which covers all the joints, cracks, reinforcing material, lacing wires, and uneven spaces remaining when the block or blanket is applied. The coat also minimizes air infiltration to the setting.

The material most commonly used for the finish coat is High Temperature Plastic Cement, although flues and ducts sometimes have a hard smooth coat of asbestos cement or canvas finish. The constructions using these materials are listed below:

(a) 1/2" High Temperature Plastic on Expanded Metal Lath.

In this type of finish 18 gage expanded metal lath is used as the reinforcement for the plastic. Full sheets of lath are applied against the block and tied back firmly by lacing wires which are attached to the insulation fasteners. (See Drawing SSD-310334). The sheets should be placed so that a space of 1/4" to 1/2" will exist between adjoining sheets of lath. They must not be tied together but should be allowed to move individually when the boiler expands. The edges of the lath should be securely tied to the lacing wires to prevent curling. The spaces between the lath should line up vertically and horizontally.

After the lath is securely tied down the plastic should be applied in one 1/2" coat making sure that it keys well around the lath. The plastic should be soaked in water at least eight hours to insure that the water has completely saturated the plastic. When properly soaked the plastic is easier to apply and will trowel smooth.

Grooves, as shown later in these instructions, should be made in the space between the sheets of lath. The spaces should be marked with a wooden peg or welding rod to aid in finding them after the plastic is applied. It is important to see that a full 1/2" is applied to the lath since, in drying, the plastic will shrink and if a thin coat has been applied, the lath will show through. The plastic should be applied while the boiler is cold. After at least one heating and cooling cycle, all cracks except those at the grooves should be cut out and refilled with plastic.

(b) 1-1/2" High Temperature Plastic on Expanded Metal Lath.

The correct installation of the lath is particularly important to prevent cracking, bulging, and peeling. The lath, as shown in Fig. 12 (a), page 58, is supported on studs which are welded to the tubes or casing. It is applied in full sheets with boiler cold and is held away from the blocks with plate nuts. These plate nuts should be only hand tight, to allow the mesh to slide when the boiler gets hot. The application of the metal lath should start with the application of the filler sheets behind the buckstays. These filler sheets should be applied between the buckstay spacers and lap the adjacent rows of studs above and below the buckstay. See Fig. 12 (b), page 58. After the filler sheets are installed, full size

sheets of lath, which are 4 x 8, should be started at the row of studs above a buckstay, lapping over the outside of the filler pieces. The lath should be lapped at least three inches as shown on Fig. 12 (c), page 58. The horizontal and vertical laps between buckstays should be in a continuous line as shown on Fig. 13, page 59. Each lap must be secured with studs welded to the casing. Where a lap does not fall on a line of studs located studs, additional studs must be added to hold the laps together and prevent bulging. At the junction of four thicknesses of lath, the inner plate must be eliminated and the lath pushed tight against the block to keep it from showing through the finish coat.

The finish coat is applied in two layers, the first layer being thicker. If possible, this first coat should be applied with the boiler cold. High temperature plastic should be soaked in water at least eight hours before applying. This allows the water to completely saturate the plastic making it easier to apply and trowel smooth. The plastic should be thrown through the lath with enough force to completely fill the space behind the lath and built out to cover the lath to the specified thickness. The first layer of plastic should be grooved at the laps and in between as necessary to form 4' x 4' panels. The details of the grooving are under the section titled "Grooving." After the first layer of plastic is thoroughly dried, all shrinkage cracks except those in the grooves are to be cut out, peened with a hammer, and filled in with plastic insulation.

The second layer should be approximately 1/2" thick and should be applied with the boiler cold. If job scheduling requires the unit to be in service before application of the second layer, it may be applied with the boiler hot. In no case should the studs show through this second coat. If the studs show, they should be clipped off so that they are buried under the plastic. The grooving of the second coat must coincide with the grooves in the first coat. Small pegs, short pieces of wire, or the line studs into the grooves of the first layer aid in the location of the grooves in the second layer. After the second coat has thoroughly dried and the boiler has gone through at least one heating and cooling cycle, all shrinkage cracks other than those in the grooves should be cut out, peened with a hammer, and filled with plastic insulation.

(c) 1/2" High Temperature Plastic on Hexwire Mesh.

Another type of finish coat utilizes 1/2" of High Temperature plastic with hex wire mesh, chicken wire, or poultry netting as the reinforcement. The application of the wire mesh is the most particular part of this type of finish. The mesh must be tied securely to the lacing wire over the block and also directly to the insulation fastener. This mesh must be installed with the boiler cold. Since the mesh must act as a reinforcement for the plastic, it is important that the mesh be held away from the block occasionally so that the plastic may bond itself into the mesh. To accomplish this, small daubs of plastic 3" in diameter and 1/4" thick should be applied to the block before the mesh is installed. The daubs should be placed between the spots where the mesh is to be tied down. When applying the mesh, the adjacent sheets should lap by at least 3" and be tied together with wire on 12" maximum centers. The mesh must be wired down at each insulation fastener and at each cross point of the lacing wires. At each opening or stopping point of the mesh, additional wires must be installed to tie the mesh down to prevent it from pulling away from the block. (See drawing 23043D, page 60. In no case should the use of staples be allowed for holding down the mesh.

The 1/2" of plastic should be applied in one coat with the boiler cold, taking care to trowel the plastic in through the mesh to bond the plastic and the reinforcing mesh.

The plastic should be grooved into panels approximately 3' horizontal by 5' vertical. Additional grooves around doors, etc. are to be made as shown in section on grooving. After the plastic has dried, and preferably after the boiler has gone through a heating and cooling cycle, all shrinkage cracks in the plastic should be filled in.

(d) 1/2" Asbestos Cement on Hex Wire Mesh.

The type of finish commonly used on flues and ducts is 1/2" Asbestos Cement on Hex Wire Mesh. The wire mesh application is the same as that for the "plastic finish" only using the cement for the cauls to hold the mesh away from the block.

The cement is applied in two layers. The first layer is 1/8" thick and should be troweled through the mesh to bond the cement and mesh. After this first layer is thoroughly dry, the shrinkage cracks must be filled in. The second layer should be 1/8" thick troweled smooth. The finish coat should be grooved into approximately 3' horizontal by 5' vertical panels, with additional grooves around doors, etc. as shown in section on grooving.

(e) Canvas.

A canvas covering is used in some cases as a finish covering over block. Although it is used sometimes on flues and ducts the more common application is piping such as downcomers, steam piping, etc. The canvas covering is applied over block, resin-sized paper, or asbestos cement, depending on location and job specifications. It may be applied by gluing or by sewing. The glued method is more in common practice than the sewn type of application. The job drawings will specify which method is to be used.

In applying the glued canvas, it should be thoroughly saturated in the glue, wrung out, and securely shrunk over the insulation. It is highly desirable to apply this canvas when the boiler and piping are cold. If applied while the boiler is hot, the canvas will wrinkle when the boiler is cold.

All canvas should be stopped 1-1/2" short of any hot metal surface to prevent the canvas from burning.

(f) Asbestos Cloth.

On areas which are too hot for the use of canvas, asbestos cloth is substituted for the canvas. The application is the same as for canvas except that asbestos paper is substituted for the resin-sized paper where specified.

The use of the asbestos cloth or canvas will be designated by the job drawings.

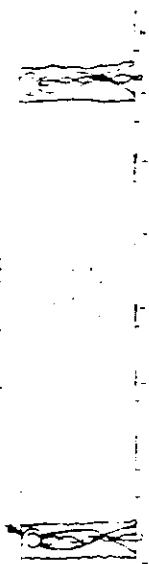
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550-310334

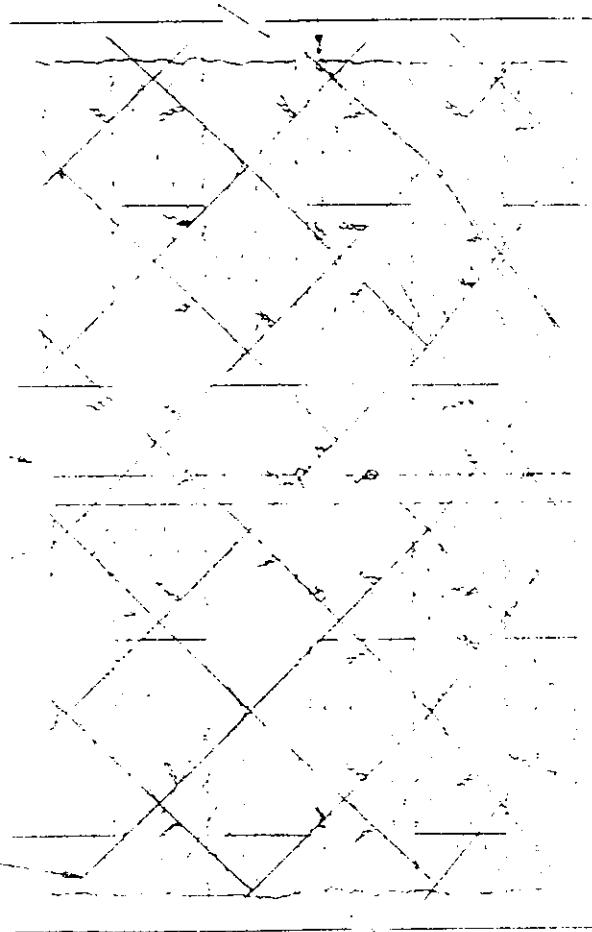
1/8" CLIP WASHER



ENLARGED SECTION "A-A"

BLOCK INSULATION
(AS SPECIFIED)

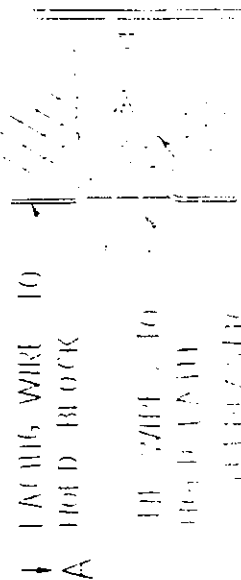
14 GA LATHING WIRE



4" 0" x 8" 0" SHEETS OF "18 GA x 1/2" EXPANDED METAL LATH WILL BE PLACED AGAINST THE BLOCK INSULATION & HELD FIRMLY IN PLACE WITH "14 GA. TIES, THE TIE WIRES ARE TIED DIRECTLY TO WASHERS, WELDED TO THE CASING ON APPROXIMATELY 18" x 14" CENTERS.

A SPACE OF 1/4" TO 1/2" WILL EXIST BETWEEN ADJOINING SHEETS OF LATH, THE SHEETS OF LATH MUST NOT BE TIED TOGETHER, IF NO WASHERS AND THE WIRE IS TIED AT THE EDGES OF THE LATH, THE LATH MUST BE PREVENTED FROM CURVING UP AT THE EDGES BY TIEING BACK TO THE LATHING WIRE, HOLDING THE BACK INSULATION IN PLACE.

EXPOSE "14 GA LATH WIRE"



18 GA LATHING WIRE

1/2" x 1/2" x 1/2" x 1/2"

1/2" x 1/2" x 1/2" x 1/2"

1/2" x 1/2" x 1/2" x 1/2"

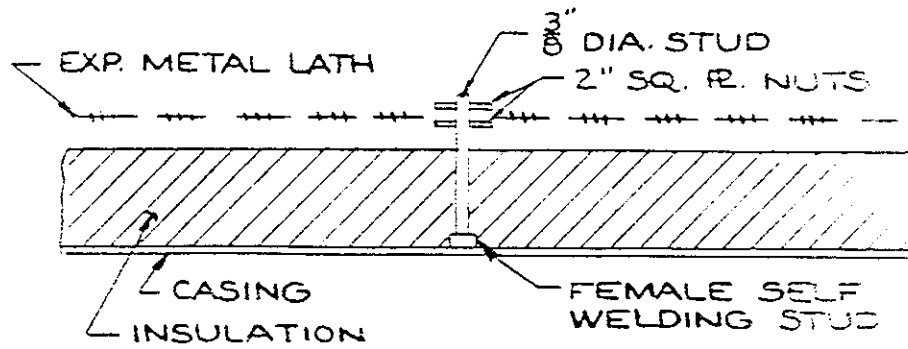
1/2" x 1/2" x 1/2" x 1/2"

1/2" x 1/2" x 1/2" x 1/2"

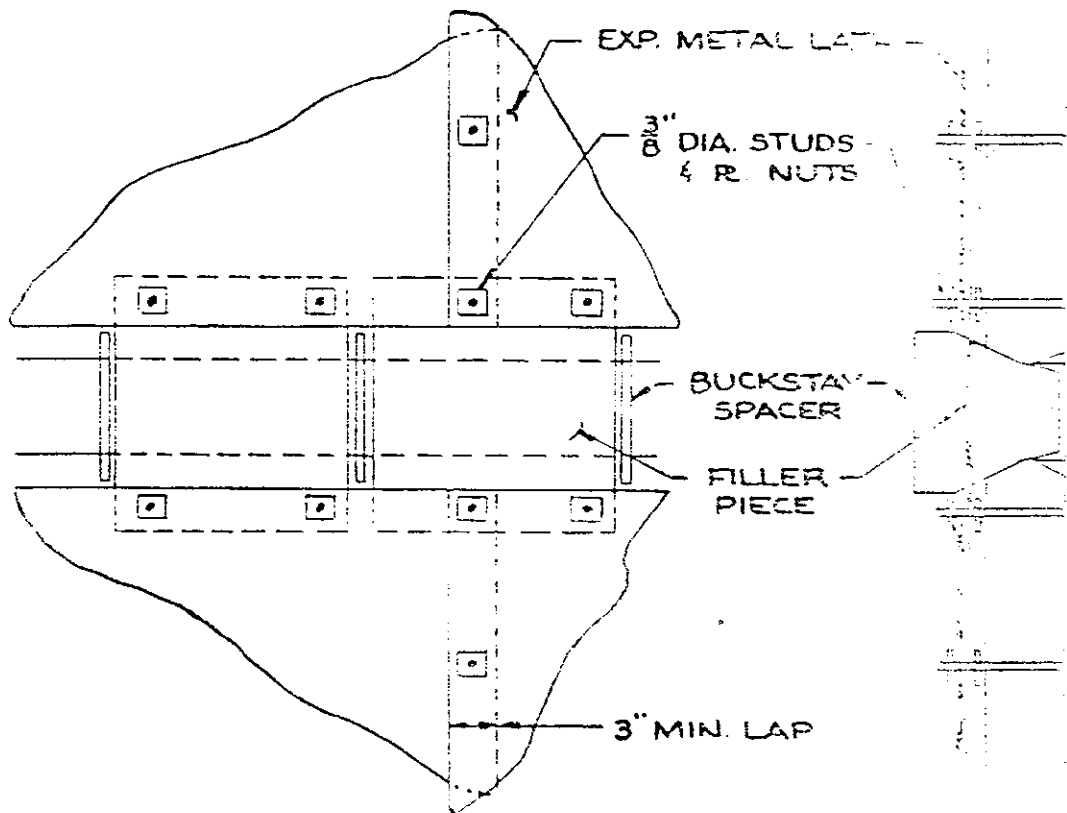
1/2" x 1/2" x 1/2" x 1/2"

FIG. 12

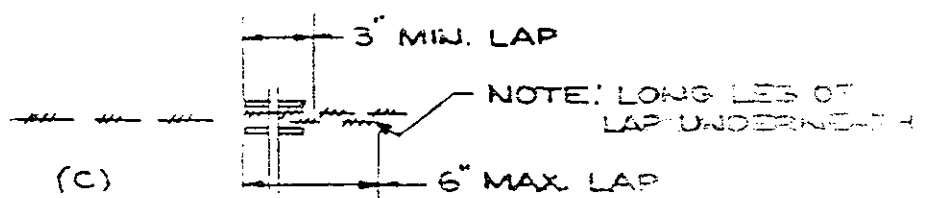
SKETCH SHOWING APPLICATION OF EXP. METAL
LATH FOR 1½" PLASTIC FINISH



(a)



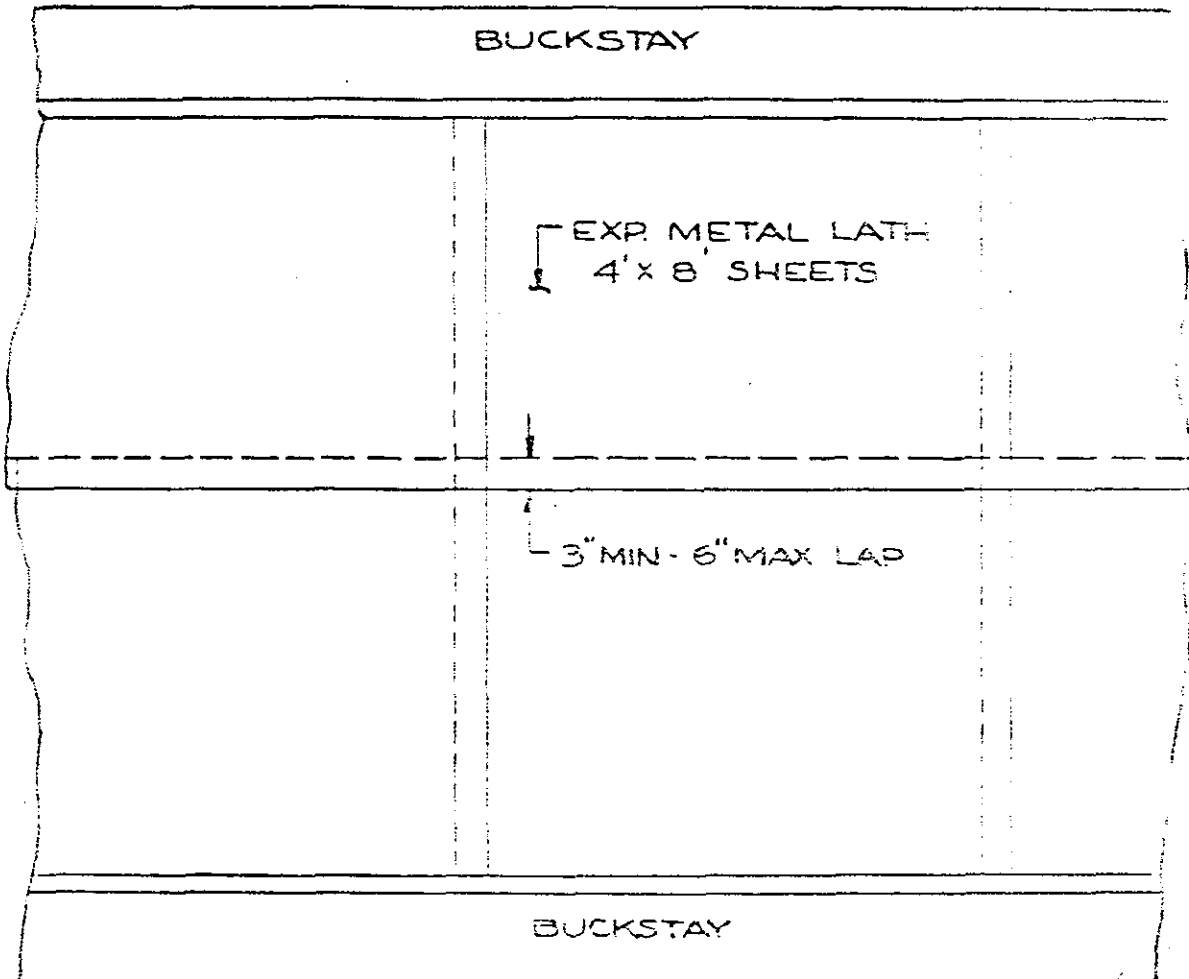
(b)



(c)

FIG. 13

SKETCH SHOWING CONTINUOUS LAP
LINES BETWEEN BUCKSTAYS



[illegible]

SEALING COATS

Sealing coats are required over finish coats in certain applications and are supplied as an extra coating in other applications usually on special request. On all outdoor units without outer casing or lagging, a sealing coat is required to weatherproof the insulation. On suction units having a plastic finish coat, the sealing coat serves to reduce the air infiltration into the setting. There are two types of sealing compounds in general use:

1. "Emulsion type" which is asphalt with an asbestos filler and emulsified with water. This type is more easily troweled than sprayed. When this type is specified it is usually used for major portions of the surface and the "cutback" type supplements for sealing to metal surfaces.
2. "Cut Back Type" which is asphalt with an asbestos filler blended with castor oil that may have naphtha added. This type is usually sprayed on to give a smooth finish.

The application of these sealing coats are as follows:

1. Emulsion Type Seal Coat

The emulsion type is best applied by trowelling it on in one coat at 1/4" thickness. When dry, this coat will shrink to 1/8". It should be applied after all shrinkage cracks have been filled in the finish coat. Reinforcement with hex wire mesh is used only on overhead application or where emulsion seal coat is used outdoors by special request. When hex wire mesh is used, it must be tied tightly on 12" centers to the finish coat by tie wires from lacing wires, metal lath and/or insulation fasteners. The mesh should be formed into all grooves. The grooves in the finish coat may be filled completely with this type of sealing compound since when it shrinks, the groove pattern will show up. (See Drawings SSD-310315, SSD-310316).

2. Cut Back Type Seal Coat

The cut back type seal coat is best applied by spraying. It is applied in two layers with a glass cloth reinforcement between the layers. The first layer is applied to a 1/16" thickness after all the cracks in the plastic finish coat have been repaired. Care must be taken to spray, for a distance of 2", the edges of door frames, buckstays and other metal surfaces which meet the finish coat. At the grooves, the seal coat should follow the contour of the groove.

While the first layer is still wet, a layer of glass cloth is applied to the surface taking care to lap the steel previously sprayed. The glass cloth should follow the contour of the first layer of seal coat in the grooves, and adjacent sheets of glass cloth should overlap at least 3" with overlaps bonded by sealing compound.

After the surface has been covered with glass cloth, the final 1/8" layer of sealing compound should be sprayed on covering the entire surface including the steel and following the contour of the grooves. (See

drawing SSD-310314). It is well to remember that this type of sealing compound is highly inflammable during the process of application, so that proper fire extinguishing equipment should be on hand, and all burning or welding forbidden in the immediate area of the spraying operation. Although the cut back type of sealing compound may be trowelled on, it is usually specified to be sprayed.

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2" OVERLAP 1/4" IN. 1" AT DOORS
WHERE BOLT HEADS INTERFERE

EMULSION TYPE SEALING COAT
GLASFAB REINFORCED
(SEAL @ STEEL)
CUTBACK TYPE
METAL SURFACE MUST BE
CLEANED BY ALL MEANS, GREASE,
RUST, SCALE, AND ANY
FOREIGN MATTER

APPROX. 6"

AFTER ALL CRACKS IN THE FINAL LAYER OF FINISH COAT INSULATION
HAVE BEEN FILLED IN, APPLY A 1/4" LAYER OF EMULSION TYPE SEAL-
ING COMPOUND TO THE FINISH COAT INSULATION. THE 1/4" APPLICATION
WILL SHRINK TO 1/8" WHEN DRY. COVER THE ENTIRE SURFACE AND FILL
THE GROOVES. AFTER DRYING, THE SEALING COAT WILL HAVE SHRUNK INTO
THE GROOVES.

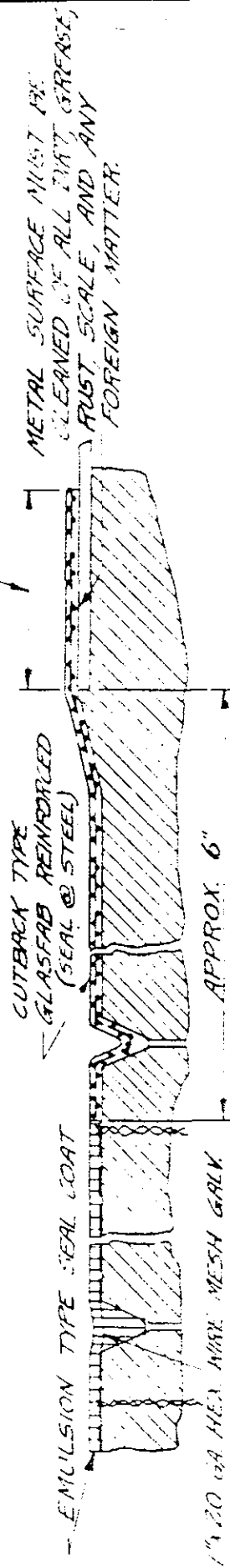
AT METAL SURFACES STOP THE EMULSION TYPE COMPOUND ABOUT 6" SHORT
OF THE EDGE OF THE METAL SURFACE. APPLY A 1/16" LAYER OF CUTBACK
TYPE COMPOUND OVER THE REMAINING SURFACE AND APPROXIMATELY 2"
ABOUT THE PERIPHERY OF THE METAL SURFACE. AN OVERLAP OF 1" WILL
BE SUFFICIENT AT DOOR FRAMES WHERE BOLT HEADS INTERFERE. AT GROOVES,
FOLLOW THE CONTOUR OF THE GROOVES. WHILE THE COMPOUND IS STILL WET,
APPLY A LAYER OF 20 MESH GLASFAB OVER THE CUTBACK TYPE SEALING COM-
POUND, LAPPING THE ADJACENT METAL SURFACES 2" EXCEPT AT SOME DOOR
FRAMES WHERE BOLT HEADS INTERFERE. UNDER SUCH CONDITIONS, LAP ONLY
1". AT THE GROOVES, PUSH THE GLASFAB INTO THE GROOVE, FOLLOWING
THE CONTOUR OF THE FIRST LAYER OF CUTBACK TYPE SEALING COMPOUND.

THE SECOND LAYER OF CUTBACK TYPE SEALING COMPOUND WILL BE APPLIED
1/8" THICK OVER THE GLASFAB. COVER THE METAL SURFACE BEYOND THE
GLASFAB TO ASSURE A PROPER BOND AND PREVENT PEELING OF GLASFAB.
AT THE GROOVES, SECOND 1/16" LAYER OF COMPOUND MUST FOLLOW THE
CONTOUR OF THE GLASFAB IN THE GROOVES.

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2" OVERLAP - MAY BE 1" AT DOOR FRAMES
WHERE BOLT HEADS INTERFERE



AFTER ALL CRACKS IN THE FINAL LAYER OF FINISH COAT INSULATION HAVE BEEN FILLED IN, HEX WIRE MESH IS STRETCHED TIGHTLY OVER THE FINISH COAT INSULATION. THE HEX WIRE MESH IS TIED DOWN ON APPROXIMATELY 12" X 12" CENTERS WITH THE WIRES EXTENDING FROM THE INSULATING STUDS AND ALSO BY TIES EXTENDING FROM THE LACING WIRES HOLDING BLOCK INSULATION WHERE THE LACING WIRES INTERSECT EACH OTHER. AT THE GROOVES, THE HEX WIRE MESH WILL BE PUSHED IN FAR ENOUGH TO ASSURE THAT IT WILL NOT PROTRUDE THROUGH THE SEAL COAT AFTER THE SEAL COAT SHRINKS. THE HEX WIRE MESH WILL TERMINATE APPROXIMATELY 6" FROM ANY METAL SURFACES AND WILL BE TIED DOWN WITH TIE WIRES TO PREVENT PEELING.

APPLY A 1/4" LAYER OF EMULSION TYPE SEALING COMPOUND TO THE ENTIRE SURFACE, FILLING THE GROOVES AND STOPPING APPROXIMATELY 6" SHORT OF ANY METAL SURFACES. THE 1/4" APPLICATION WILL SHRINK TO 1/8" UPON DRYING OVER THE FLAT SURFACE AND WILL SHRINK SLIGHTLY INTO THE GROOVES.

AT THE EXPOSED AREA ADJACENT TO THE METAL SURFACES, APPLY A 1/16" LAYER OF CUTBACK TYPE COMPOUND OVER THE SURFACE AND APPROXIMATELY 2" ABOUT THE PERIPHERY OF THE METAL SURFACE. AN OVERLAP OF 1" WILL BE SUFFICIENT AT DOOR FRAMES WHERE BOLT HEADS INTERFERE. AT GROOVES, FOLLOW THE CONTOUR OF THE GROOVES. WHILE THE COMPOUND IS STILL WET, APPLY A LAYER OF 20 MESH GLASFAB OVER THE CUTBACK TYPE SEALING COMPOUND. LAP THE METAL SURFACES 2" EXCEPT AT SOME DOORS WHERE BOLT HEADS INTERFERE. UNDER SUCH CONDITIONS, LAP ONLY 1" AT THE GROOVES. PUSH THE GLASFAB INTO THE GROOVES, FOLLOWING THE CONTOUR OF THE FIRST LAYER OF CUTBACK TYPE SEALING COMPOUND.

THE SECOND LAYER OF CUTBACK TYPE SEALING COMPOUND WILL BE APPLIED 1/8" OVER THE GLASFAB COVER THE METAL SURFACE BEYOND THE GLASFAB TO ASSURE A PROPER BOND AND PREVENT PEELING OF GLASFAB. AT THE GROOVES, THE SECOND 1/8" LAYER OF COMPOUND MUST FOLLOW THE CONTOUR OF THE GLASFAB IN THE GROOVES.

2" OVERLAP - MAY BE 1" AT DOOR FRAMES
WHERE BOLT HEADS INTERFERE

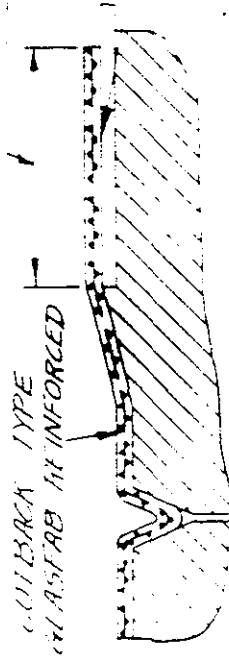
1. CHINA SECOND LAYER TO 8 INCHES 100-100-100

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OVERLAP MAY BE 1" AT
DOOR FRAMES WHERE DOOR
HEADS INTERFERE

METAL SURFACE MUST BE
CLEANED OF ALL DIRT, GREASE,
RUST, SCALE, AND ANY
FOREIGN MATTER.



AFTER ALL CRACKS IN FINAL LAYER OF FINISH COAT INSULATION HAVE BEEN FILLED IN, APPLY A 1/16" LAYER OF CUTBACK TYPE SEALING COMPOUND OVER THE ENTIRE SURFACE AND A 2" OVERLAP ON THE PERIPHERY OF ADJACENT METAL SURFACES. (OVERLAP OF 1" WILL BE SUFFICIENT AT DOOR FRAMES WHERE BOLT HEADS INTERFERE). AT THE GROOVES, FOLLOW THE CONTOUR OF THE GROOVES.

WHILE THE COMPOUND IS STILL WET, APPLY A LAYER OF 20 MESH GLASFAB OVER THE SEALING COMPOUND. LAP THE METAL SURFACES 2" EXCEPT AT SOME DOORS WHERE BOLT HEADS INTERFERE. UNDER THOSE CONDITIONS, LAP ONLY 1" AT THE GROOVES. PUSH THE GLASFAB INTO THE GROOVES, FOLLOWING THE CONTOUR OF THE FIRST LAYER OF SEALING COMPOUND. ADJACENT SHEETS ARE TO BE LAPPED AT LEAST 3", WITH A BONDING LAYER OF COMPOUND BETWEEN THE LAYERS OF GLASFAB.

THE SECOND LAYER OF SEALING COMPOUND WILL BE APPLIED 1/8" THICK. COVER THE ENTIRE SURFACE AND THE GLASFAB STRIP LAPPED OVER THE ADJACENT METAL SURFACES. THIS OUTER LAYER SHALL FOLLOW THE CONTOUR OF THE GLASFAB IN THE GROOVE.

SEALING COAT CAN BE SPRAYED OR TROWELLED ON

WHICH WITH SEAL COAT WITH
GLASFAB REINFORCED

THE HADCOCK & WILCOX CO.
5900 100-100-100

GROOVING

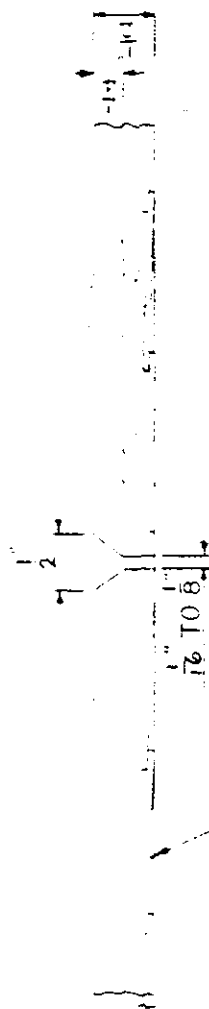
Since insulation does not expand readily when heated, it becomes obvious that as the boiler expands, cracks will develop in the plastic finish coat which surrounds the boiler. In order to make the cracks less objectionable, the finish coat is purposely cracked or grooved to control the location of these cracks. The grooving should be done while the finish coat material is still wet. Drawings SSD-310350 and SSD-310351 shows the details of the grooves. It should be noted that the grooves in the 1-1/2" metal lath reinforced plastic come at the edge of the outer layer of lath at the lap joint.

Drawing 23039D illustrates the grooving pattern to be used with the 1-1/2" plastic finish on boiler walls. Fig. 14 shows a typical groove pattern for flues and ducts. Since the grooves will be in constant view, care should be taken to make them uniform, straight, and level. They should be laid out so that they are continuous within open areas such as between buckstays on boiler walls. Special grooving locations will be shown on the drawings.

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1/2" HIGH TEMPERATURE PLASTIC FINISH WITH EXPANDED METAL LATH REINFORCEMENT

1/2" THICKNESS OF HIGH TEMPERATURE PLASTIC WITH EXPANDED METAL LATH REINFORCEMENT SHALL BE APPLIED WITH THE BOILER DRUM HEAD MUST BE TAKEN TO TROWEL THE PLASTIC BEHIND THE LATH TO BOND THE PLASTIC TO THE LATH. GROOVES IN PLASTIC WILL PENETRATE THROUGH TO THE BLOCK TO FORM A 1/8" PANELS AN OTHER GROOVE, IN THE CENTER OF THE 8 FT. DIM, WILL PENETRATE THROUGH TO THE LATH TO FORM A 1/8" PANELS.

END PANELS (HORIZONTAL DIM) ARE TO BE EQUAL AND TOP PANELS (VERTICAL DIM) VARIABLE. DRUM HEAD SHALL HAVE A CIRCUMFERENTIAL AND A HORIZONTAL GROOVE.

AFTER THE PLASTIC INSULATION HAS DRIED THOROUGHLY, AND PREFERABLY AFTER THE UNIT HAS GONE THROUGH ONE HEATING AND COOLING CYCLE, ALL SHRINKAGE CRACKS OTHER THAN IN GROOVE SHALL BE FILLED IN.

APPLICATION & SPECIFICATIONS PLASTIC FINISH

DATE

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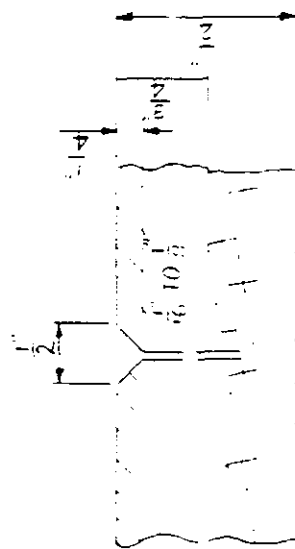
1/2" HIGH TEMPERATURE PLASTIC FINISH WITH EXPANDED METAL LATH REINFORCEMENT

1/2" HIGH TEMPERATURE PLASTIC FINISH WITH EXPANDED METAL LATH REINFORCEMENT WILL BE APPLIED IN TWO LAYERS. THE FIRST LAYER WILL BE APPROXIMATELY 1" THICK AND IS APPLIED WITH THE BOILER COIL THE PLASTIC MUST BE THROWN THROUGH THE METAL LATH WITH MAXIMUM FORCE TO ASSURE THAT THE SPACE BEHIND THE LATH IS COMPLETELY FILLED. CARE MUST BE EXERCISED TO SEE THAT ALL VOIDS ARE FILLED. THE FIRST LAYER WILL BE GROOVED AT THE JOINTS IN THE METAL LATH. THE RATE THROUGH TO THE LATH.

AFTER THE FIRST LAYER IS THOROUGHLY DRY, ALL SHRINKAGE CRACKS, EXCEPT AT THE GROOVES, MUST BE CUT OUT, PEEPED WITH A HAMMER AND FILLED WITH PLASTIC INSULATION.

THE SECOND LAYER WILL BE APPROXIMATELY 1/2" THICK AND PREFERABLY APPLIED WITH THE BOILER COIL. HOWEVER, IF JOBS, SCHEDULING REQUIRES, THE SECOND LAYER MAY BE APPLIED WITH THE BOILER HOT. THE GROOVES IN THE SECOND LAYER WILL COINCIDE WITH THE GROOVES IN THE FIRST LAYER AND WILL PENETRATE THROUGH TO THE METAL LATH.

AFTER THE SECOND COAT HAS THOROUGHLY DRIED AND PREFERABLY AFTER ONE HEATING AND COOLING CYCLE, ALL SHRINKAGE CRACKS (EXCEPT THOSE IN THE GROOVES) WILL BE CUT OUT, PEEPED WITH A HAMMER AND FILLED IN WITH PLASTIC INSULATION.



APPLICATION & GROOVING OF PLASTIC FINISH

DATE: 10/1/50

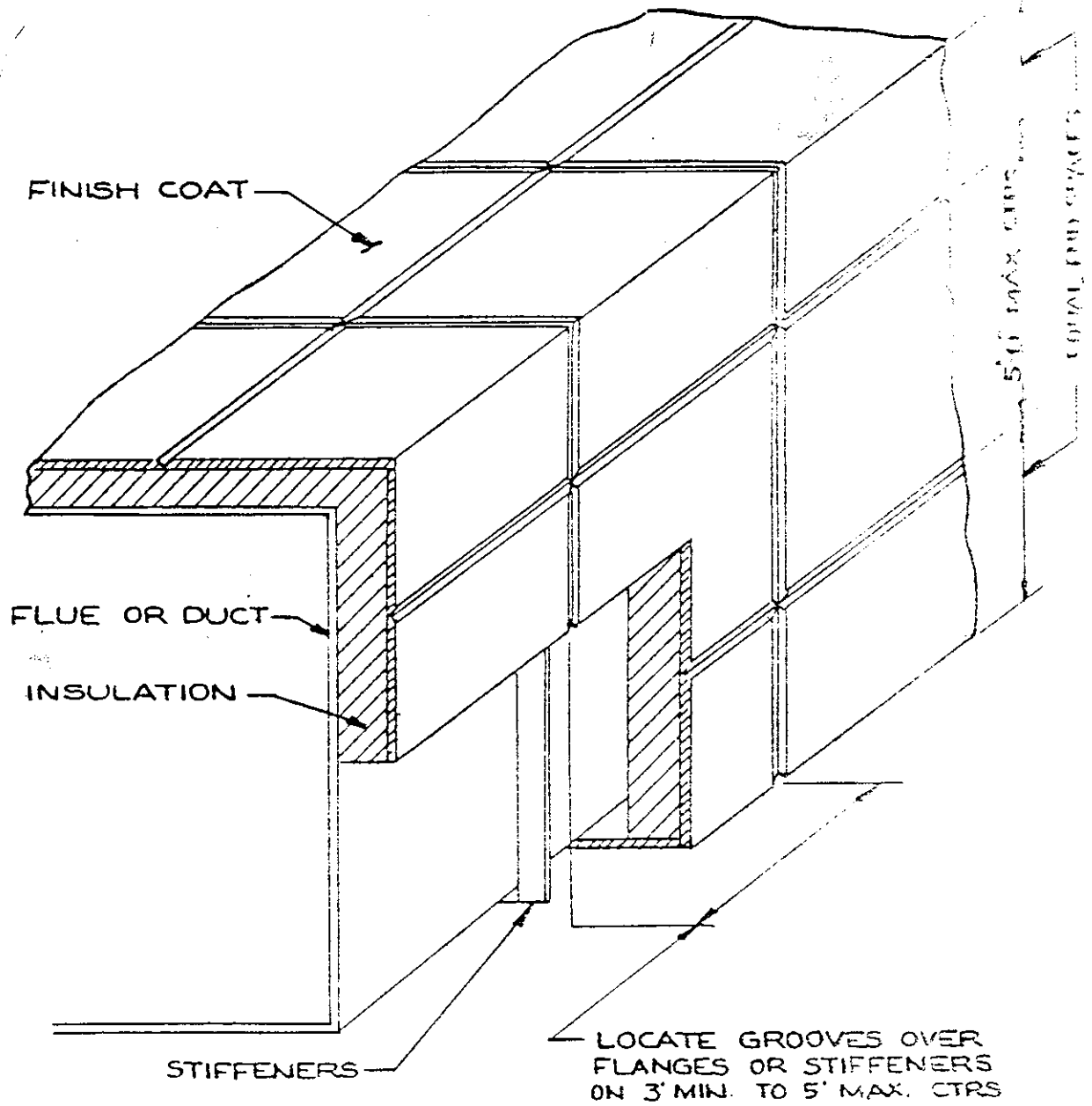
BY: J. W. WILCOX

THE BABCOCK & WILCOX CO.

156015-7150

FIG. 14

SKETCH SHOWING GROOVING PATTERN
FOR FLUES & DUCTS



STANDARD
 23039 J
 THE SLOCOX & WILCOX CO.
 1000 W. 10TH ST. ST. LOUIS, MO.
 MADE IN U.S.A.

7. LATHING SYSTEM C
 SEALING COAT
 TO COVER ALL JOINTS
 WITH 3" OVERLAP
 ADJACENT SHEETS & W/2"
 OVERLAP AT ALL JOINTS
 STEEL EXCEPT AS SHOWN
 IN SEC. D.D. TO BE
 BE PUSHED INTO GROOVES
 AS SHOWN.

6. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES

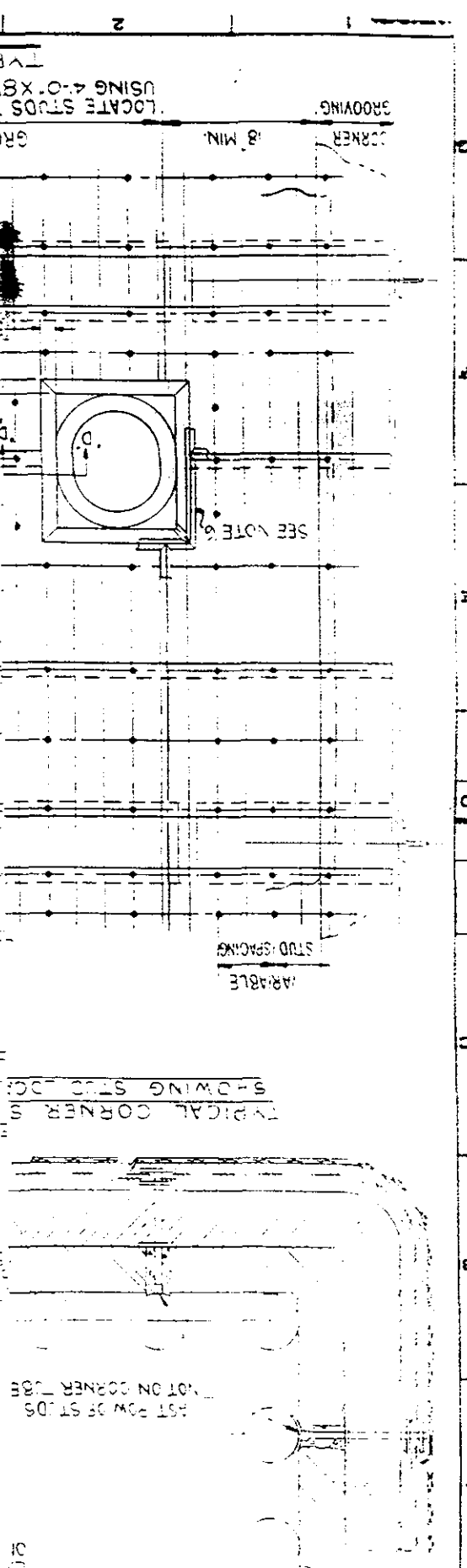
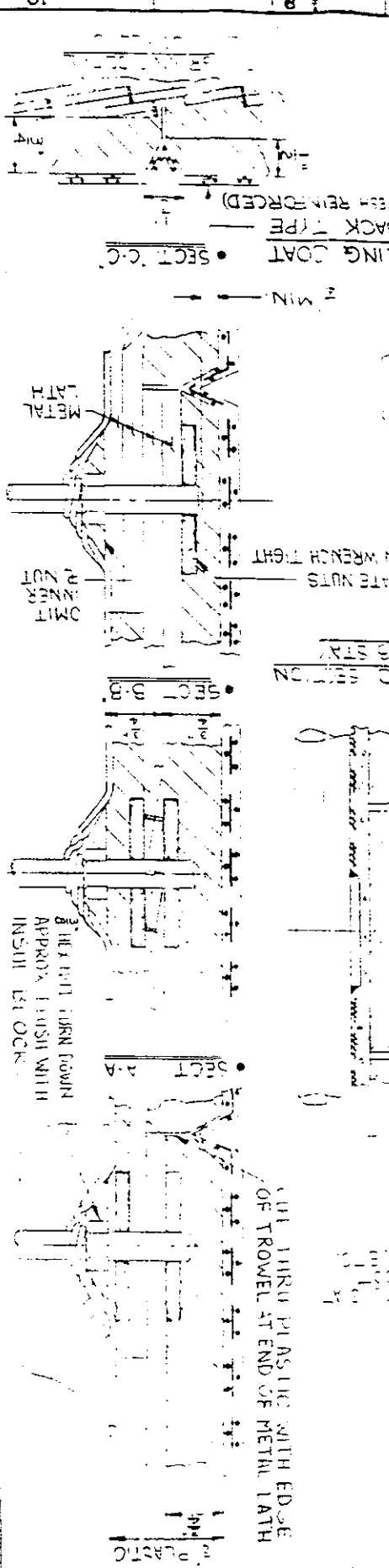
5. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES

4. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES

3. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES

2. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES

1. GROOVES ARE TO BE
 COVERED BY BOARD OR
 IN SINGLE CONTINUOUS
 HORIZ. & VERT. LINES
 ADDITIONAL EXIST. GROOVES
 ARE ADDED AT CENTER OF
 LATH SHEETS TO COMPLETE
 PATTERN AS SHOWN IN
 AT DOORS ETC. TO JOIN V
 HORIZ. & VERT. GROOVES



APPROVED INSULATING MATERIALS

The following list gives approved insulation substitutions which may be used in place of that which is called for on the contract. These substitutions should be made only in small quantities and when time does not permit checking with Barberton. If an insulation contractor wishes to substitute large quantities, the change should be checked through the sponsor in Barberton.

Only blocks of the same material and temperature limitation may be substituted for each other. For example:

If the contract called for Owens Illinois-"Kaylo" block, Johns-Manville-"Thermobestos," Ruberoid-"Calsilite," or Philip Carey Co.-"Alltemp" could be used as a substitute since they are all medium temperature block of a lime silica base. The other medium temperature blocks of mineral wool and medium diatomaceous earth base could not be substituted since their base is not the same even though the temperature limit is correct.

LIST OF APPROVED INSULATING MATERIALS

HIGH TEMPERATURE BLOCK - Temperature Use Limit - 1800°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Johns Manville	Superex	Diatomaceous Earth
Phillip Carey Co.	Hi-Temp #19	Diatomaceous Earth
Ehret	Enduro	Diatomaceous Earth
Keasbey & Mattison	Hy-Temp Block	Diatomaceous Earth
Ruberoid	High Temp.	Diatomaceous Earth

MEDIUM TEMPERATURE BLOCK - Temperature Use Limit - 1200°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Owens Illinois	Kaylo	Lime Silica
Johns Manville	Thermobestos	Lime Silica
Ruberoid	Calsilite	Lime Silica
Phillip Carey Co.	Alltemp	Lime Silica
Eagle Picher Co.	Supertemp	Mineral Wool
M. H. Detrick Co.	MW Block	Mineral Wool
Baldwin Hill	Monablock	Mineral Wool
Refractories & Insulation	#18 Insulating Block	Mineral Wool
Johns Manville	1500° Superex	Med. Diatomaceous Earth
Phillip Carey Co.	Tempchek	Med. Diatomaceous Earth

85% MAGNESIA BLOCK - Temperature Use Limit - 550°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Johns Manville	85% Magnesia	Magnesia Carbonate
Phillip Carey Co.	85% Magnesia	Magnesia Carbonate
Ehret	85% Magnesia	Magnesia Carbonate
Keasbey & Mattison	85% Magnesia	Magnesia Carbonate

HIGH TEMPERATURE PLASTIC CEMENTS - Temperature Use Limit - 1500°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Johns Manville	J-M 450	Mineral Wool
Phillip Carey Co.	MW50	Mineral Wool
Eagle Picher Co.	Eagle 66	Mineral Wool
Ehret	Ehret #18	Mineral Wool
Baldwin Hill	BH #1	Mineral Wool
Refractories & Insulation	Stic-Tite	Mineral Wool

ASBESTOS CEMENTS - Temperature Use Limit - 1000°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Johns Manville	#302	Asbestos Fibres
Phillip Carey Co.	#707	Asbestos Fibres
Ehret	#200	Asbestos Fibres
Keasbey & Mattison	#152	Asbestos Fibres
Ruberoid	#115	Asbestos Fibres
Eagle Picher	#20 or #99	Asbestos Fibres

INSULATING BLANKETS - Temperature Use Limit - 1000°F

<u>Manufacturer</u>	<u>Product Name</u>	<u>Base Material</u>
Baldwin Hill	Rockwool	Rockwool
Phillip Carey Co.	Industrial	Mineral Fibre
Johns Manville	Banroc	Mineral Wool
Webbers	"48" Copr-Fibre	Mineral Fibre
Eagle Picher Co.	--	Mineral Wool

SEALING COATS - INSULATION MASTICS

<u>Manufacturer</u>	<u>Product Name</u>	<u>Type</u>	<u>Application</u>
Synco Corp.	Powerseal	Cutback	Outdoor, Indoor
Johns Manville	Insulkote	Emulsion	Indoor
Johns Manville	Aertite	Cutback	Outdoor, Indoor
Eagle Picher Co.	Insulseal	Emulsion	Indoor
Eagle Picher Co.	Stalastic	Cutback	Outdoor, Indoor
Baldwin Hill	Weatherseal	Emulsion	Indoor
Insulmastic Corp.	Insulmastic	Cutback	Outdoor, Indoor
Benjamin Foster Co.	90-7 H.I.Mastic	Emulsion	Indoor

MATERIALS

INSULATION MANUAL

Part II

Materials

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INTRODUCTION

Heat insulation may be defined as those materials or combination of materials, with air or evacuated spaces, which will retard the transfer of heat with reasonable effectiveness under ordinary conditions. Heat may be transferred by conduction, convection, or radiation, or any combination of these three methods.

In the days when all boilers had solid brick settings without furnace water cooling, the outside temperature of the furnace walls was often as high as 350°F. - On most of these boilers, if insulation had been placed outside the walls to improve working conditions and to reduce heat loss, the temperature of the brick would have gone up enough to adversely affect its performance and life. Therefore, the only practical way of approaching comfortable conditions was by good boiler room ventilation, and in some instances, by the use of air-cooled furnace walls.

Water-cooled walls permit covering with any desired thickness of insulation without materially changing the inside temperature. It is now general practice to make the insulation thick enough to assure comfortable working conditions and, at the same time, to maintain a reasonable balance between the cost of the fuel saved by insulating the boiler and the cost of the insulation. The heat economy and comfort requirements, of course, can be satisfied with practically any arrangement and type of insulation if it is the correct thickness and the material will stand the temperature to which it is exposed. However, insulation can also be used as an effective seal against air infiltration into the boiler. Therefore, the possibility of using the insulation in this manner must also be considered in the economics of the design of suction furnace units.

WALL CONSTRUCTIONS

The most commonly used arrangement of water-cooled settings for "Suction" furnaces over which insulation is used are:

(a) Tube and Brick Walls. The arrangement of a tube and brick wall is shown in detail in Fig. 15. The tubes are spaced at intervals and are usually backed with 2-1/2" refractory tile. The brickwork is sufficiently cooled by the water circulating in the tubes to permit the use of this type of wall as a part of the setting envelope even in high duty furnaces fired by gas, stoker, pulverized coal or oil. Its location is limited to the cooler convection zones of the boiler adjacent to boiler tube banks, convection superheater banks, and economizers. This type of wall may also be used in the main furnace of most gas and oil fired boilers, but its use with stokers and particularly pulverized coal should be limited to units where the coals are of a relatively high ash fusion temperature, and to dry ash or hopper bottom furnaces only when pulverized coal is fired. This wall should not be used in the main furnace of slag tap boiler units.

In zones of high draft, where additional sealing against air infiltration is required, the refractory brick in back of the tubes is backed by castable refractory reinforced by metal lath. For this purpose, B&W K-20, a refractory concrete, is widely used with good results.

(b) Tangent Tube Walls. The closely spaced tube or tangent tube wall, illustrated in Fig. 16, where the tubes touch one another, may be used for any type of firing. This construction forms a continuous steel envelope which encloses the furnace of a steam generating unit. When its area is properly proportioned, an enclosure of this type will eliminate trouble from excessive accumulation of slag. It is usually sealed against air leakage with reinforced refractory concrete, backed with block and plastic insulation.

The castable refractory backing, as shown in Fig. 16, is reinforced with expanded metal lath, close to its outer surface, which makes the castable act as a reinforced concrete mat outside the tubes. The metal lath is installed on the wall first and the castable applied through it so that the lath acts as a reinforcement. Insulating block and a plastic finish or outer casing are installed outside the brick or castable refractory.

In some cases, the space between the tube surfaces to the outside tangent point is filled with refractory concrete. This space is filled flush with the concrete. Pressure casing or insulation is fitted directly against the tubes.

(c) Flat Stud Tube Walls. The flat stud tube wall, illustrated in Fig. 17, is intended for use under conditions similar to those that apply to the use of the closely spaced tube wall. It is somewhat more economical in the use of steel as it is made of tubes spaced at intervals.

Each tube has a series of flat rectangular steel plates welded along its entire length on both sides. The plates or studs on two adjacent tubes close the space between them and present a practically continuous metal surface to the furnace. This type of wall is backed by a comparable arrangement of castable refractory, insulation, and casing or plastic insulation finish described for the closely spaced tube wall.

(d) Partial or Full Stud Tube Walls. Where a higher furnace temperature is desired than it is possible to maintain with the closely spaced tube or flat stud tube wall because of their high absorption of furnace heat, the partial or full stud tube wall, illustrated in Fig. 18, is used. This type of wall is made of water wall tubes spaced at intervals. The space between tubes is (a) partially closed with two rows of round studs welded to each side of each tube, and (b) for the full stud wall the furnace side of each tube as well is covered with studs. Sometimes, close-spaced tubes are also full studded on the furnace side.

The studs are packed with a chrome base plastic pounded in place or a chrome base castable gunnited or trowelled in place to form a continuous wall. When plastic chrome ore refractory is used, it is put on in the closest possible contact with the tubes and studs and is itself thoroughly bonded as it is applied lump by lump. In service, the chrome refractory is, in effect, water-cooled because of the extended surface heat transfer effect of the studs.

The stud tube wall is sealed against air leakage and insulated in a manner similar to that used for closely spaced and flat stud walls.

One particular application of the full stud tube wall is in the lower portion of a slag tap furnace where it is necessary to keep the coal ash above its fluid temperature in order to remove it as a liquid. This construction is very resistant to the fluid slag found in this type of furnace. In the upper part of the furnace, a partial stud, flat stud or close-spaced tube wall construction may be used.

Fig. 15

This figure will be furnished at a later date.

Fig. 16

This figure will be furnished at a later date.

Fig. 17

This figure will be furnished at a later date.

Fig. 18

This figure will be furnished at a later date.

INSIDE CASING

This type of casing as differentiated from the outside casings is a pressure tight casing developed for pressure firing. It is also used on some suction fired units when a pressure tight casing is desired. Block insulation is secured to this casing and covered over with a plastic finish insulation or an outside casing.

PREVENTION OF LEAKAGE

In designing a waterwall, the refractory lining of tile or fire brick is made as air-tight as possible. Without any supplementary seal, where the draft within the setting is fairly low, this makes a commercially tight wall. However, in high draft zones, the brickwork is not sufficiently air-tight. Therefore, the entire wall may be covered with an outer casing which is sealed against air leakage by using welded casing. With a casing of this type, some slip seals may be required to take care of relative expansion caused by a temperature differential of about 400°F between wall tubes and casing. The refractory serves to limit the amount of leakage which occurs through the slip seals and often at casing terminals. Insulating block can be used to supplement the leakage resistance of the refractory by being tightly laid up.

The performance of many units indicates that an air-tight casing is not required if, by careful arrangement and installation, the insulation construction is made to act as an air seal by using multi-layer construction with the block laid up with staggered joints and having a layer of plastic cement.

INSULATION FOR BOILERS

Materials used in the insulation of waterwalls must have the following characteristics:

1. Reasonably low conductivity which will not increase appreciably in service.
2. Sufficient mechanical strength to withstand shipping, application and handling.
3. Resistance to moisture.
4. Low shrinkage when heated.
5. Good resistance to disintegration or settling by vibration even after prolonged service at operating temperature.
6. The ability to retain structural strength at operating temperature.

For some special applications, such as on boiler settings under pressure instead of suction, where the casing is over the insulation, the insulating material should be capable of retaining its strength and thermal properties after repeated exposure to dilute solutions of sulfuric or sulfurous acid.

INSULATING MATERIALS

The basic materials most frequently used in heat insulation and some of the commercial forms of insulation made of these materials and their use, are listed below:

(1) Diatomaceous Earth Base Blocks: At present this is the most widely used high temperature insulator. It is a silica composed of the skeletons of simple organisms, uncalcined or calcined, with asbestos fibre and clay molded under heat and pressure. This type of block is relatively expensive and is therefore confined to the temperature range of from 1200°F to 2000°F. It comes in rigid blocks 1" to 4" thick, or molded pipe covering from 1" to 3" thick for pipes up to 30" in diameter. A medium temperature Diatomaceous Earth Block is also available. This block differs from the high temperature block in density and its preparation at a lower firing temperature limits its usage to 1200°F to maximum. It is used principally for boiler walls, flues, ducts, fans and steam lines.

(2) Mineral Wool: This is made from molten slag, glass or rock blown into fibres by steam or air jet.

(a) Mineral Wool Base Block: This block is made of mineral wool fibres and clay molded under heat and pressure. Temperature limit (controversial) up to 1800°F is claimed by some manufacturers. Usual size, form and principal uses are the same as for (1).

(b) Mineral Wool Blanket: This is made of mineral wool fibres compressed into blanket form held in shape by retaining between chicken wire or expanded metal lath. Temperature limit is 1000°F maximum. Comes in 24" by 48" or 96" flexible blanket up to 6" thick. Used principally on cased boiler walls and tanks. It could be used on flues, ducts and uncased boiler walls, but it is difficult to cover with a good finish coat.

(3) 85% Magnesite Block: Magnesium carbonate ($MgCO_3$), asbestos fibres and clay molded under heat pressure. Temperature limit is 550°F maximum. Usual size, form and principal uses are similar to (1).

(4) Asbestos Fibres: Produced from the raw mineral asbestos by successive crushings. This material contains numerous small air spaces and is therefore a good insulator. For use as a high temperature insulator, the fibre is fitted and pressed into sheets or block to give it a high mechanical strength. The pressing necessary to give the high mechanical strength required for handling reduces the effectiveness of the air spaces, and consequently, the thermal conductivity of this product is not as low as that of other insulators in which many air cells are retained.

(5) Lime Silica Block: This is a lime silica based block made of reacted hydrous calcium silicate with sufficient mineral fibre included to give good handle ability. Temperature limit of 1200°F maximum warrants use of this block for medium temperature applications.

(6) Kaolin Wool: A pure white wool blown from melted Kaolin clay. Because of the high (3200°F) melting point of the clay, the final product retains its resiliency up to 2100°F. It can be used commercially in blanket or block form as described for mineral wool.

(7) High Temperature Plastic: Insulating cement made of mineral wool fibres processed into nodules and then dry mixed with clay. To apply, this shall be mixed with enough water to give good trowelling consistency. In final dried condition, it is a tough fibrous monolithic insulation. Drying shrinkage may be considerable, and therefore scoring of the surface is necessary to prevent random cracking upon driving. Temperature limit (controversial up to 1800°F maximum) is claimed by some manufacturers. This is used principally on boiler walls, irregular shaped valves and fittings and heated tanks. Thickness of applied layers should be limited to from 1/2" to 2", with suitable reinforcement.

(8) Asbestos Cement: Asbestos fibres dry mixed with clay. To apply, this shall be mixed with enough water to give good trowelling consistency. In its final dried condition, it is fairly hard but not as tough as the mineral wool base cement described in item (6) and is easily damaged. The drying shrinkage is comparable to that of high temperature plastic. Temperature limit is 1000°F maximum. It is used principally on indoor installation as a finish coat for insulation on pipes and ducts and also sometimes on uncased boiler walls.

(9) Sealing Coat Mastics:

(1) Cutback Type: Asphalt with an asbestos filler blended with castor oil that may have naphtha as a filler. Highly inflammable when applied, but tends to remain more flexible over a long period of time. Sprays fairly smooth but is difficult to trowel. POWERSEAL is a brand of approved cutback type sealing mastic.

(2) Emulsion Type: Asphalt with an asbestos filler and emulsified with water. Fireproof when wet, but tends to become stiff and hard over a long period of time. Sprays rough but is easy to trowel. INSULKOTE is a brand of approved emulsion type sealing mastic.

ADDENDUM

SPECIFICATIONS FOR INSULATION MATERIAL

ALL INSULATING BLOCKS SHALL MEET THE FOLLOWING REQUIREMENTS

- (a) The linear shrinkage shall not exceed 2% after a 24-hour soaking heat test at the following temperatures:

<u>TYPE OF BLOCK</u>	<u>SOAKING TEMP.(F)</u>
85% Magnesia Block (To Specification Listed Here In)	600
Medium Temp. Block (" " " " ")	1200
High Temp. Block (" " " " ")	1800

- (b) The compressive strength after a 24-hour soaking heat test at the temperature listed above shall not be less than three-quarters of the strength of unheated samples.
- (c) The flexural or breaking strength (measured by ASTM Designation C-203) after a 24-hour soaking heat test at the temperature listed above shall not be less than one-half of the strengths of unheated samples.
- (d) Unrestrained warpage of a 6" by 18" sample after 96 hours on a hot plate at the temperatures listed above shall not exceed 3/8 inches. The specimen shall have not more than one deep crack (extending 3/4 through it). Insulation thickness for the hot plate test shall be as follows:

Hot Face Temp.	Sample Thickness	Total Insulation Thickness Over Hot Plate (add insulation as necessary to sample)
600 85% Mag. Block	3"	3"
1200 Med. Temp. Block	4"	6"
1800 High Temp. Block	4"	8"

HIGH TEMPERATURE INSULATING BLOCK

This block shall be moulded type composed predominantly of calcined diatomaceous earth uniformly mixed with suitable proportions of mineral reinforcing fibre and of heat-resistant inorganic binder.

The physical properties shall be as follows:

Density	22 to 27 lb/cu.ft.
Compressive Strength (at 10% deformation)	50 psi minimum
Flexural Strength (lb/sq.in.)	2.5 x density minimum
Thermal Conductivity - maximum BTU/(hr.) (sq.ft.) (F/in.):	

Mean Temp.	Conductivity
400	0.70
800	0.80
1200	0.90

MEDIUM TEMPERATURE INSULATION BLOCK

Medium temperature insulating block may be any of the types listed below unless there is a customer objection to a particular one. If one or more of these materials is excluded by the customer's specifications the fact should be noted on the Contract Information Sheets.

- (1) Lime-Silica Base Block - This block shall be reacted, hydrous calcium silicate with sufficient mineral fibre included to give good handle ability. The physical properties shall be as follows:

Density (lb/cu.ft.)	11 to 16
Compressive Strength (at 10% reduction in thickness)	50 psi minimum
Flexural Strength (per ASTM C-203)	40 psi minimum

The thermal conductivity (expressed as BTU/sq.ft./hr./(F°/in.) shall not exceed the following:

Mean Temp.(F)	Maximum Conductivity
200	0.44
400	0.52
800	0.70

- (2) Medium Temperature Diatomaceous Earth Base Block - This block shall be moulded type composed predominantly of either calcined or uncalcined diatomaceous earth uniformly mixed with suitable proportions of mineral reinforcing fibre and of heat-resistant inorganic binder. The physical properties shall be as follows:

Density (lb/cu.ft.)	16 to 24
Compressive Strength (at 10% reduction in thickness)	50 psi minimum
Flexural Strength (per ASTM C-203)	40 psi minimum

The thermal conductivity (expressed as BTU/sq.ft./hr./F°/in.) shall not exceed the following:

Mean Temp.	Maximum Conductivity
200	0.54
400	0.60
800	0.72

- (3) Mineral Wool Block - This block shall be a moulded type composed of the best grade of mineral wool fibres with suitable heat resistant inorganic binding material. The physical properties shall be as follows:

Density (lb/cu.ft.)	16 to 24
Compressive Strength (at 10% deformation)	12 lb/sq.in. minimum
Flexural Strength (per ASTM C-203)	30 psi minimum

The thermal conductivity (expressed as BTU/sq.ft./hr./F°/in.) shall not exceed the following:

Mean Temp.	Maximum Conductivity
200	0.48
400	0.58
800	0.80

85% MAGNESIA INSULATING BLOCK

This block shall be made of 85% of pure carbonate of magnesia ($4MgCO_3, MgO_2H_2 \cdot 5H_2O$) and between 10 and 15% of asbestos fibre. The carbonate of magnesia, and asbestos shall be thoroughly mixed and uniformly distributed throughout the block. Carbonate and sulphate of lime shall not exceed 1-1/2% of the total compound. The thermal conductivity (expressed as BTU/sq.ft./hr./F°/in.) shall not exceed the following:

Mean Temp. (F)	Conductivity
200	0.47
300	0.50
400	0.53

The physical properties shall be as follows:

Density (lb/cu.ft.)	11 to 14
Compressive Strength (at 10% reduction in thickness)	50 psi minimum
Flexural Strength (per ASTM C-203)	40 psi minimum

MATERIAL CONTRACT

MINERAL WOOL BLANKET INSULATION

Shall be composed of the best grade of mineral wool fibres compressed between metal fabrics to a density of not less than 10 lbs. per cu. ft. Tie wires between the metal fabric on each side, shall be spaced on a maximum of 12 inches.

Thermal conductivity shall not exceed 0.70 BTU/sq.ft./hr./in./F° at 200°F (mean)
" " " " " 0.80 " " " " " " " 400° " "

FIBRE GLASS BLANKET INSULATION

Shall be composed of the best grade of glass wool fibres compressed between metal fabrics to density of not less than 10 lbs. per cu. ft. Tie wires between the metal fabric on each side shall be spaced on a maximum of 12 inches.

Thermal conductivity shall not exceed 0.70 BTU/sq.ft./hr./in./F° at 200°F (mean)
" " " " " 0.80 " " " " " " " 400° " "

HIGH TEMPERATURE PLASTIC INSULATION

High temperature plastic insulation shall be the best grade of mineral wool insulating cement, made predominantly of mineral wool fibres, dry mixed uniformly with other ingredients.

Thermal conductivity shall not exceed 0.70 BTU/sq.ft./hr./in./F° at 200°F (mean)
" " " " " 0.80 " " " " " " " 400° " "
" " " " " 0.93 " " " " " " " 800° " "

To insure a homogeneous structure in applied high temperature plastic, it is definitely required that factory premixed ingredients be supplied.

SEALING COMPOUND (EMULSION TYPE)

Insulkote or equivalent fibrated asphalt emulsion (long fibre asbestos with suitable binder and filler): This compound shall have 55% maximum shrinkage, with a minimum covering capacity, when dry of 42 sq.ft. 1/8" thick per 100 lb. It shall be capable of withstanding without blistering, cracking, melting, running, or continuing to support combustion after flame has been removed, when a dried test piece is placed vertically 2 in. from the end of a blowtorch with a 4 in. long blue flame, and exposed to flame 30 seconds.

SEALING COMPOUND (CUTBACK TYPE)

Shall be Powerseal or equivalent fibrated asphaltic type cutback. It shall be capable of good adhesion to steel having a temperature of 200°F to 250°F or to Plastic insulation.

ASBESTOS CEMENT

All asbestos cement shall be high quality long fibre. It shall not contain Portland cement and none shall be added.

SUBSTITUTIONS

No substitutions for material specified shall be made without approval of B&W Co.