

BONGAIGAON– 3X250 MW FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION FOR GLASS FLAKE LINING FOR GGH

CUSTOMER: NATIONAL THERMAL POWER CORPORATION LIMITED



NTPC: BONG: FGD: GLASS FLAKE LINING-GGH-SPEC-20: REV-00

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TECHNICAL SPECIFICATION FOR GLASS FLAKE LINING IN GGH

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1.0 PROJECT INFORMATION	
a) Owner	NTPC
b) Buyer	BHEL, Ranipet
c) Process / application	Wet Lime Stone FGD system
1.1 SITE CONDITIONS	
a) Ambient temperature (Guarantee)	27 Deg C
b) Ambient temperature (Design)	50 Deg C
c) Relative Humidity	60 %
1.2 LOCATION AND APPROACH	
Project location	
a) Place	Kumkuri near Salakati, Bongaigaon
b) District	Kokrajhar
c) State	Assam

2.0 INDENT OF SPECIFICATION

1. This Specification and the attached Data sheets defines the minimum requirements of glass flake lining for GGH in the Flue Gas Desulphurization (FGD) plant
2. The flue gas in temperature range of 40 to 120 deg C will be flowing through the different sections of GGH. These sections have to be glass flake lined due to the corrosive nature of low temperature flue gas (due to acid condensation). The glass flake lining offers better resistance for this application. The flue gas analysis is furnished in Table-1 and area to be lined is about 350 sq.m per GGH as per attached lining drawing (3 GGH are there in entire project), thickness of glass flake lining required is furnished in Section 7.2.
3. This specification covers the general design, selection of suitable glass flake material/resin, manufacture, shop inspection, testing at manufacturer's works (As per latest applicable statutes, regulation and safety codes in the locality where the lining are to be carried out) and delivery at site, surface preparation of lining surface, lining the surface to the satisfaction of the customer.
4. The glass flake lining shall conform to the latest applicable Indian/British/American Standards. Nothing in this specification shall construe to relieve the contractor of the required statutory responsibility.
5. Compliance to this specification shall not relieve the vendor of the responsibility of furnishing glass flake lining materials of proper design, materials and workmanship to meet the specified requirements.
6. In case of deviation, it shall be listed in the vendor's proposal under separate section titled as "list of deviations/exceptions to the enquiry documents.

3.0 SCOPE OF SUPPLY

1. Complete selection and procurement/manufacture of all materials required for lining, storage, preparation of the surfaces for lining near site welding and installation of lining. All equipments required for lining shall be arranged by the lining vendor. Testing and supply of glass flake lining material for the duty condition specified in Table-1.
2. Erection and Commissioning of the glass flake lining as per the requirement. Delivery of material to BHEL Bongaigaon site,

surface preparation of the surfaces to be lined, lining the surface to the satisfaction of the customer and testing the lined surface for proper adhesion, complete coverage and intactness with the base material/surface shall be under bidder's scope, cost for Erection and Commissioning shall be included in the offer.

3. 15 copies of Operation manuals containing all details of reference drawings and technical data shall be furnished by the Bidder.

4.0 ATMOSPHERIC CONDITION REQUIREMENTS

This section deals with the atmospheric condition requirements to be checked while doing the lining.

1. Blasting or Coating will not be applied if following conditions prevail.
 - When temperature of the surface to be coated is less than 3°C above the dew point, or the relative humidity is higher than 85%.
 - When the base metal temperature is greater than 60°C.
 - When the atmospheric temperature is below 4°C.
 - When there is, in the opinion of lining Contractor, the likely hood of an unfavorable change in the weather condition within 2 hours after coating.
 - When there is deposition of moisture in the form of rain or condensation.
2. Humidity shall be calculated by bidder using whirling hygrometer whose thermometers are calibrated.
3. Surface temperature shall be measured using steel temperature gauge and calibration certificate of the same shall be provided by bidder.
4. Record will be maintained throughout the execution period. Readings shall be taken once in every 4 hours up to the time work is in progress. The frequency of reading should be increased during adverse weather conditions.
5. While working in unfavorable weather conditions (like monsoons or winters or if provided for in the contract or in large confined spaces where blasting and priming of the entire surface cannot be completed in one days operation, use of dehumidifier shall be resorted to. The dehumidification equipment will have to be maintained in such a way that the humidity is around 65% -75% inside the duct at all times during the work. No flash rusting of the blast surface should take place till the time it receives a primer coat.
6. Where dehumidification equipment is to be used the humidity readings are to be taken inside and outside the equipments to be coated.
7. Dehumidification equipment may not be necessary for contained space working if work is done at near ideal atmospheric conditions as described above.

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8. In cases where dehumidification is not possible, alternate methods of warming up the work front like use of halogen lights, room heaters are to be adopted.
9. Humidity is to be taken at the location where the blasting coating operations taking place.

5.0 APPLICATION & MEDIUM:

Glass flake lining is done in order to protect the gas to gas heater steel surfaces from chemical attack due to high concentration sulphuric/sulphurous acid formation and limestone slurry. Coated surfaces are exposed to untreated gas temperature range of 170 to 100 C or treated gas with temperature range of 30 C to 105 C. Gas composition is given in Annexure-1.

6.0 PRELIMINARY CHECK REQUIREMENTS

This section deals with the preliminary check requirements to be done while doing the job.

6.1 CHLORIDE CONTAMINATION TEST:

The 2% ferricyanide paper method will generally be used to determine the chloride contamination as described below:

1. Apply de-mineralized water on approximate 12 cm² area of substrate and wait for 3 to 4 minutes.
2. Remove excess moisture by patting the substrate with clean lint free cloth.
3. Press a ferricyanide paper of approximate 12 cm² area against the substrate for approximately 5 seconds and remove the paper.
4. Total absence of blue spots on paper indicates the substrate is free from soluble salts
5. Light speckling paper indicates the substrate has still contamination but it is as the acceptance level. The component should be released for further process.
6. Large blue spots on the paper indicate the substrate is heavily contaminated.
7. In this case the following procedure to be done before coating.
 - a. Pressures wash the substrate with copious amount of town water.
 - b. Dry the substrate completely.
 - c. Re-blasts the surface.
 - d. Follow the salt contamination checking procedure again till you get the desired results.

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8. The Ferricyanide papers should be stored in air tight container before and after use and the shelf life of Ferricyanide paper is one month.

6.2 ABRASIVE DRYNESS CHECK:

The abrasive to be used will be checked for dryness by taking a small quantity of abrasive on a filter /tissue paper and checking of traces of moisture absorbed in the filter/tissue paper. Frequently of test, once in day prior to blasting operation.

6.3 COMPRESSED AIR DRYNESS CHECK:

Compressed air to be used for blasting shall be free from oil & moisture and it will be tested adopting "Blotter Test". A piece of blasting Paper will be held in front of blast hose nozzle to check for traces of oil/moisture captured by the blotting Paper. It shall be carried out frequently of test, once in a day prior to blasting operation.

6.0 SURFACE PREPARATION

This section deals with the methods of surface preparation before coating application.

6.1 MASKING:

1. Bidder to ensure that areas not being coated are fully and adequately masked.
2. Bidder to ensure that stud holes, dowel/oil ways etc. are suitably masked or plugged to prevent ingress of blasting abrasives.

6.2 SURFACE PREPARATION METHODS FOR METALLIC SURFACES:

The method of surface preparation dry abrasive manual blasting shall be done as follows:

1. Surface to be coated shall be abrasive blasted. Before this operation, removal of existing coating to be carried out by chipping, grinding or by other suitable means. Clean & dry Copper Slag Abrasive shall be used for ferrous base substrate.
2. The minimum recommended compressed air required for Blasting shall be 7.0 m³/min at 6 kg/cm² pressure. NACE No.1/SSPC-SP-5 equivalent to SA 2½ of Swedish Standard blast profile (75 to 100 Microns) to be followed for cleaning the surface.
3. The blasted surface shall be cleaned with dry compressed air/vacuum cleaner or with clean brush so that there is no presence of Dust & other foreign material. The surface will be then checked for chloride contamination (Refer Clause.5.1 for Chloride contamination check

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procedure). If contamination is found then the surface to be washed and reblasted till contamination gets removed. Vendor to ensure that the blasted surface free from chloride contamination

4. When cleanliness and blast profile are acceptable, the masking tape adjacent to the area to be coated shall be peeled back to prevent overlap and subsequent edge contamination.
5. If the blasted surface has not been primed within specified time or if there is any previous visible sign of blast condition change then the surface shall be checked for metallic salt contamination and shall be reblasted. Where large areas are required to be blasted in a day, blasting shall be carried out from morning to evening ensuring weather condition. This shall be followed by a light sweep blast of the entire area, before priming. The blast cleaned surface shall be blown off with dry oil free compressed air or vacuum cleaned. A cell tape shall be thoroughly pasted to the cleaned surfaces. The tape shall be removed after a minute to check presence of dust if any. Comparator shall be used for check the blast profile.

7.0 COATING APPLICATION

This section deals with the methods & requirements of coating application.

The application methods to be used shall be either hand application or airless spray application as per standards followed for

7.1 MIXING:

1. All coating material tins shall be individually stirred thoroughly to obtain a homogenous consistency.
2. While doing spray application, the tins which come in pre measured kits will be fully mixed individually using a pneumatic stirrer. While doing hand application only small batches of 1 Kg. capacity shall be taken. Here the mixing will be done by using a metal spatula.
3. The mixing ratios as specified in the respective data sheet will be strictly adhered to. The base will be weighed out in kgs using mechanical weighing machines calibrated at site using any standard factory packed commercial product available freely in the market. The catalyst will be measured out in ML using marked syringes or measuring cylinders.

7.2 APPLICATION PROCESS:

1. The preparation and application of coating is done as per relevant product data sheet. Reference will be made to product datasheet or where appropriate, contract specifications for carrying out coating.
2. Coating in confined spaces should be done when the ambient temperature is low to avoid excess buildup of styrene fumes.
3. The entire thickness will be built in multiple coating.
4. Each coat will consist of minimum two passes of wet on wet in perpendicular directions.

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5. The Dry film thickness will built of each coat will be checked and recorded.
6. All the other people working with the paint will be provided with eye splash goggles and masks.
7. Minimum and maximum intercoat intervals are as follows.
 - a. For primer coat -At 20°C minimum 2 hours, maximum 14 hours.
 - b. For build up coats-minimum tack free of previous coat, maximum 3 days.
8. Primer coat shall be of 75-100 µm thickness
9. Built up Coat shall be of 2000-2100 µm in multiple coats.
10. 10. Total System DFT: 2000 microns
11. All weld joints phase transition joints will receive a stripe coat by brush in the same sequence of coating on the shell.

7.3 CURING & FINISH:

1. Curing:
The initial cure and final cure shall be as given in respective product data sheets. The Corrocoat data sheets give cure times as at 20 deg C. The initial cure time shall come down with the increase in the ambient temperature. The initial cure time is judged by touching the coated surface with gloved hand. Total tack freeness shall indicate initial cure releasing the coated component for further processing activities like final coats, grinding, buffing, cleaning, DFT testing etc. The final cure has relevance to taking the coated component into services. Hence, irrespective of ambient Temperatures the final cure period in terms of days as given in Corrocoat data sheet shall be adhered to.
2. Finish:
It is to be noted that the coating will follow the profile of substrate. Any unevenness or other defects in the substrate will be reflected in the finish coating also. The finished coating shall have a matt/semi-glossy finish. A few local paint sag marks will not affect performance of coating and cannot be completely avoided. Hence it is permitted.

8.0 INSPECTION AND TESTING OF GLASS FLAKE LINING

After the completion of lining, the following tests shall be conducted by the vendor to assess the quality of glass flake lined surfaces.

1. Lining shall be visually inspected to ensure that it shall be free from poor weed out fibers, entrapped air and exposed fires. The Glass flake lining shall also be subjected to testing at site as per relevant standards.
2. Testing of coatings is normally carried out as soon as they are sufficiently cured to give true thickness & to withstand damage by the test

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equipment. If defects are found, repair will be carried out as per clause 9.0

3. Spark test shall be carried out at appropriate areas in the presence of Purchaser. Vendor should conduct holiday test as per relevant standards. If the performance is found not to meet the requirements as specified, the Glass flake lining shall be rectified or replaced by the Vendor without any additional cost to the Purchaser. The repair shall be carried out as per clause 9.0
4. Proper documentation with details of tests conducted by the vendor for evaluation of glass flake lining shall be submitted to the purchaser.

9.0 REPAIRING PROCEDURE FOR CORROGLASS COATING

1. If the exposed or damaged surface less than 10cm² then such repair can be carried out without grit blasting. Any area in excess of this amount should be grit blasted using a vacuum blaster where possible.
2. In case of damage area less than 10cm² then it can be repaired as following.
 - a. De-contaminate surrounding area by using a suitable solvent such as methylated spirit, acetone, xylene etc. After washing clean and allow solvent to evaporate.
 - b. Roughen up exposed metal & clean using rotary wire brush or a coarse emery paper with at least 60 grade grit. Brush away residues then further roughen surface of the existing coating up to 100 mm away from the damaged area. Brush away residues & ensure the whole area is clean.
 - c. Apply a thin coat of material to the surface of the exposed metal only taking care not to cover more than a few millimeter of the existing coating. Allow this freshly applied material to become tack-free.
 - d. Brush styrene monomer over the whole surface to be repaired (i.e. the whole area roughened by emery) & allow to evaporate from the surface.
 - e. Apply at least 2 main coats material over the treated area taking care not to brush on to any roughened or contaminated areas. The Corroglass should be allowed to harden sufficiently to bear the weight of next coat before application of further coats. However it does not need to be tack-free between coats.

10.0 PERFORMANCE GUARANTEE

Performance parameters to be guaranteed by the vendor and tolerances permitted shall be as indicated in the data sheet. Glass flake lining or any portion thereof is liable for rejection if it fails to give any of the guaranteed performance parameters. The lining should be guaranteed for faultless material and workmanship, for a period of 24months from the date of handing over. During Guarantee period any defects noticed due to faulty material and workmanship shall be rectified by vendor free of cost.

11.0 PACKING

The part items of the Glass flake lining should be identified by Tag numbers and should be packed as to minimize the possibility of damage during storage or transit. The packing should be suitable for tropical conditions. Vendor should specify the storage requirements for the Glass flake lining materials. The list of items identified as dispatchable units shall be furnished along with unit weight and the quantity for preparation of packing slip at BHEL end for dispatch to site and for easy identification, storage and erection at site.

12.0 DOCUMENTATION

12.1 DOCUMENTS TO BE ENCLOSED ALONG WITH THE OFFER

1. Write-up on technical features of glass flake lining offered along with Catalogues, Resin composition, drawings etc.
2. Data sheets duly filled in for the Glass flake lining material.
3. The erection sequence/Procedure of the Glass flake lining. Detailed flow chart from start to finish of the lining to be furnished. Detailed glass flake lining application procedure to be submitted.
4. Storage methods to be followed at site and the shelf life of glass flake shall be suitably indicated in the offer
5. Man days required to complete the Glass flake lining for each area is to be spelt from start to finish.
6. Vendor should clearly indicate the following:
 - a. Utility/Utilities from customer/purchaser required for Glass flake lining at site.
 - b. Storage facility requirement for Glass flake lining materials
7. Vendor should clearly indicate the price for Glass flake lining of carbon steel
 - a. Construction per Square meters to enable to meet any additional lining areas.

12.2 DATA TO BE FURNISHED BY THE VENDOR AFTER RECEIPT OF PURCHASE ORDER

1. List of Drawing and documents to be submitted for review, approval and information with submission dates
2. Quality Assurance Plan to be submitted for approval.
3. Detailed dimensional General Arrangement drawing of the lining surfaces.
4. This drawing shall indicate all the design data and information about the material, scope of work and weight of the material supply, Packing procedure etc.
5. Installation, operation and maintenance manual.
6. Surface preparation and Lining procedures.
7. Catalogues, data sheets and drawings for Glass flake lining

Table -1 FLUE GAS ANALYSIS

ANNEXURE-1

		Guarantee Point
Boiler Load		250 MW
Type of Coal		Design Coal
Ambient Conditions		27°C Temp, 60% RH
Coal Flow, t/hr		133.0
Flue gas flow, Nm ³ /s at ID Fan Outlet (Wet Basis)		263.8
Flue Gas Temperature, deg. C		160
Density of Flue gas, kg/m ³		0.819
Flue Gas Composition at ID Fan Outlet		
SO ₂ % by Vol (Wet Basis)		0.193
SO ₃		1.5% Conversion from SO₂
Moisture % by Vol (Wet Basis)		10.571
CO ₂ % by Vol (Wet Basis)		10.912
O ₂ % by Vol (Wet Basis)		5.964
N ₂ % by Vol (Wet Basis)		72.360
HCl		Not Applicable
HF		
NH ₃		
NO _x PPM		322
CO PPM		100
Dust mg/Nm ³		< 50
Inlet SO ₂ Concentration, mg/Nm ³ (Wet Basis)		5559.3
SO₂ Removal Efficiency		95 % (Minimum)

TECHNICAL DEVIATION (IF ANY)

ANNEXURE - II

Sl. No	Sec / Clause no.	Specification	Statement of deviations/ variations	Reason for deviation	Cause of withdrawal
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Date:

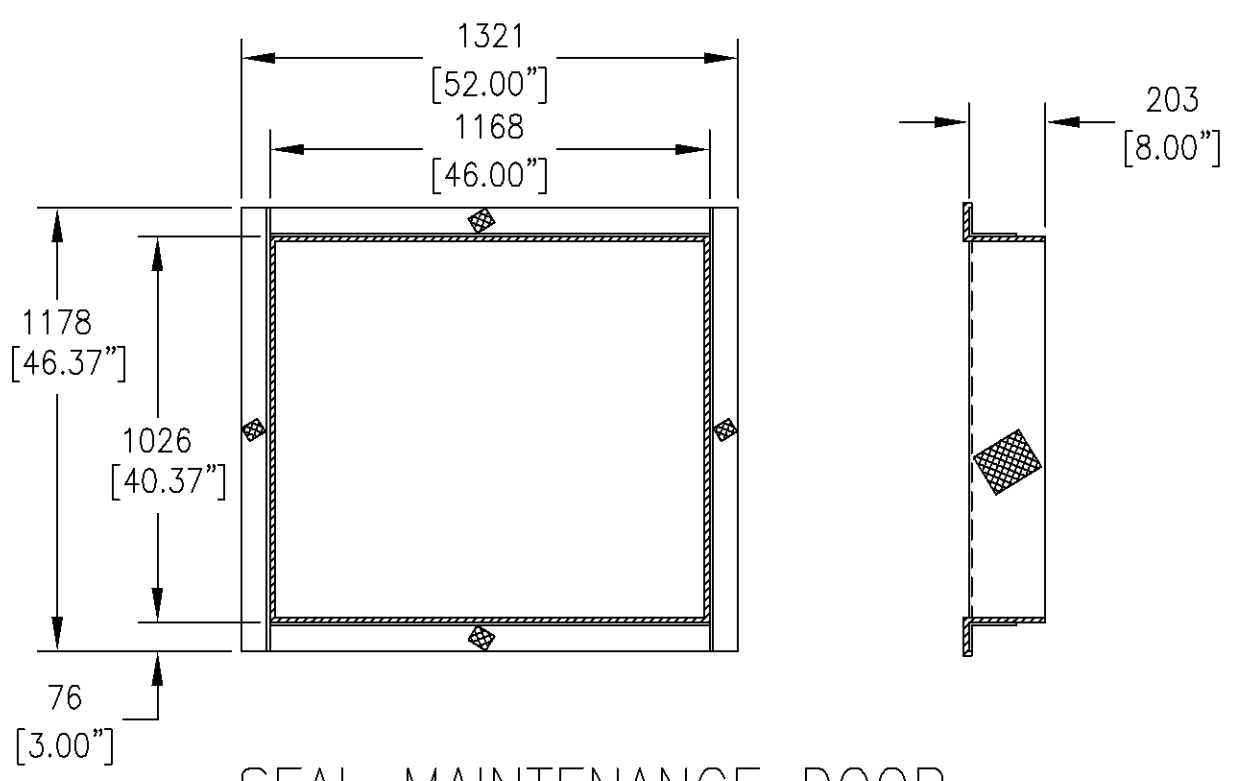
Signature & seal of the Bidder

D

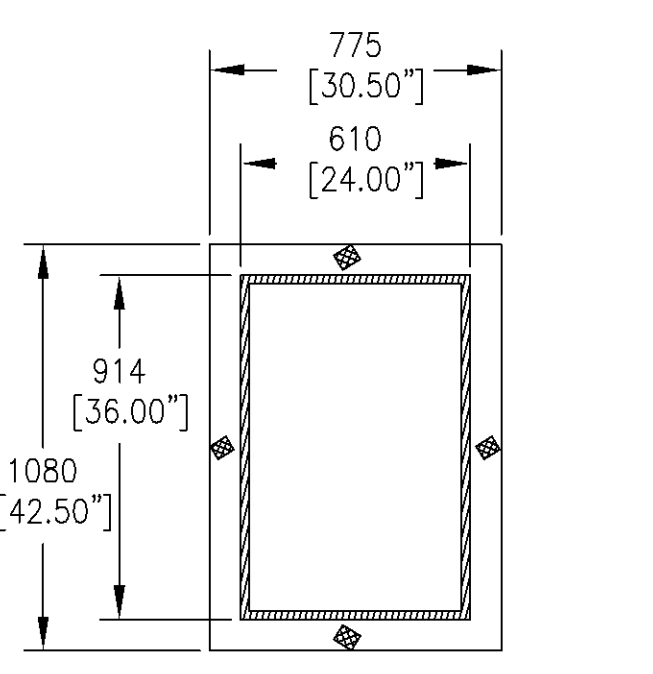
C

B

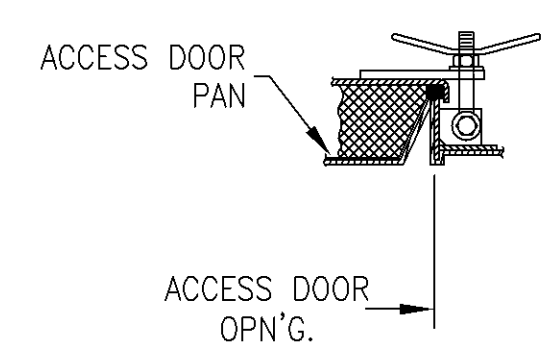
A



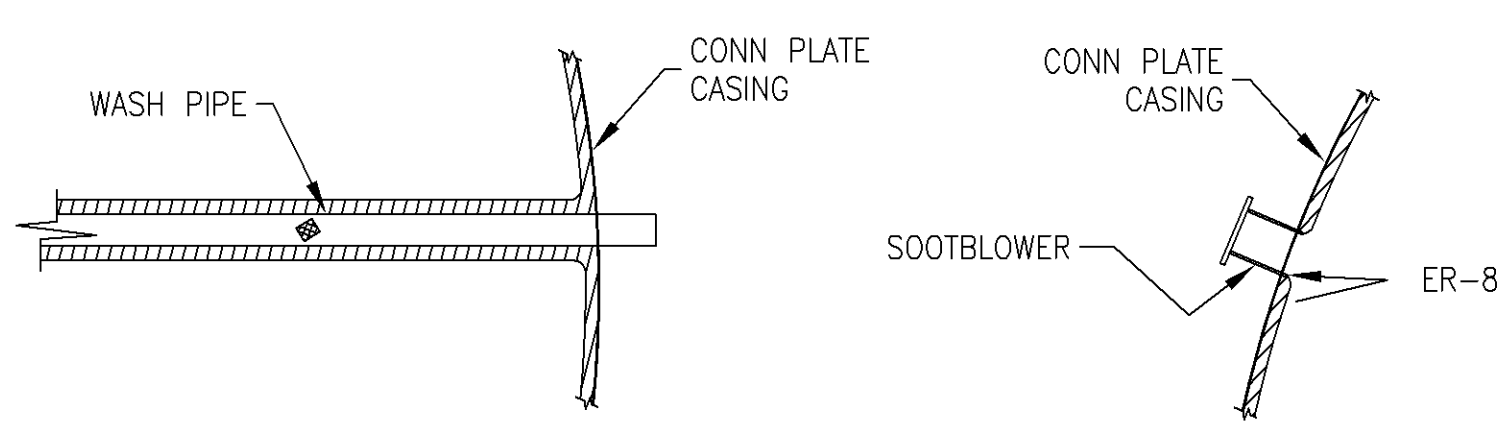
SEAL MAINTENANCE DOOR
(DOOR REMOVED FOR CLARITY)



ACCESS DOOR OPN'G

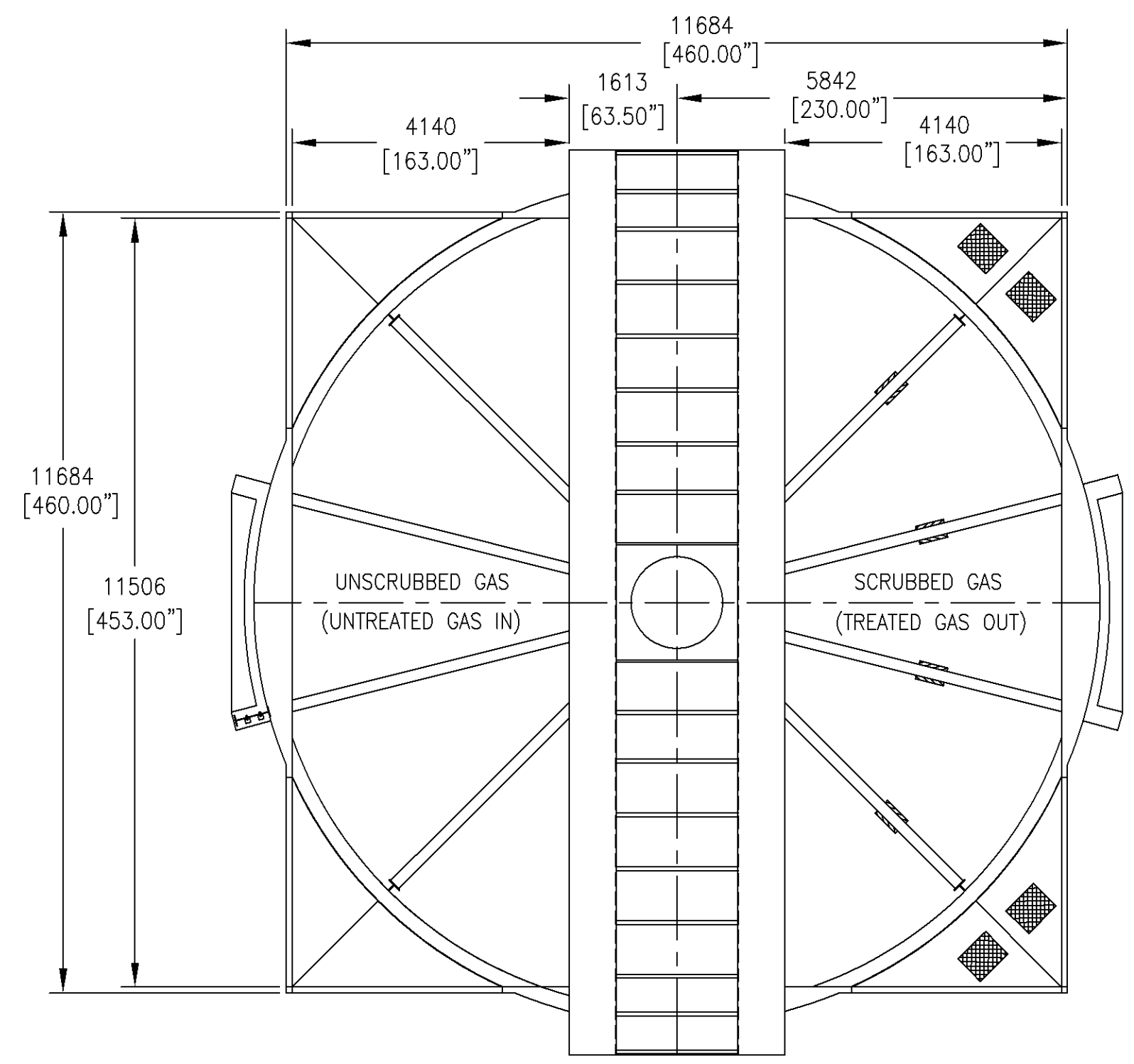


ACCESS DOOR
(CLOSED POSITION)

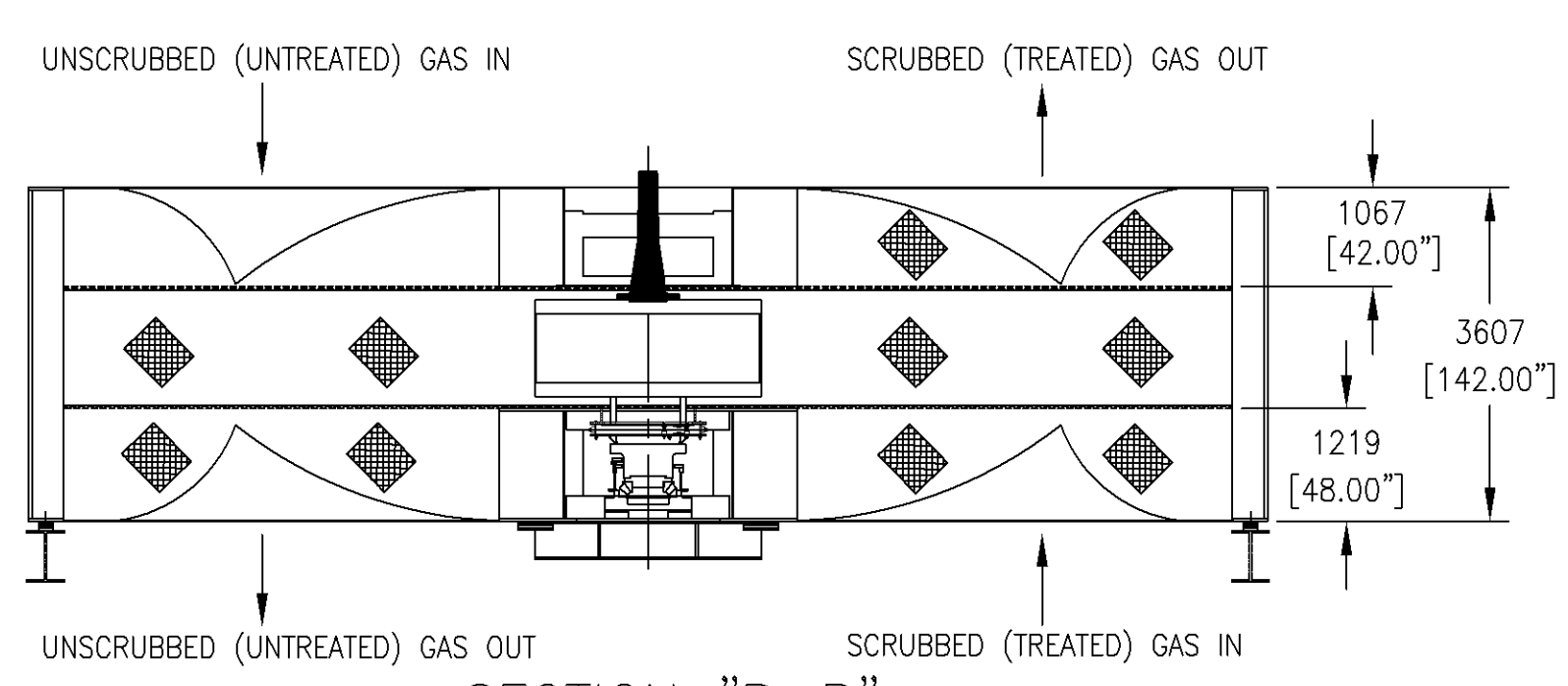


LINING OF WASH PIPE

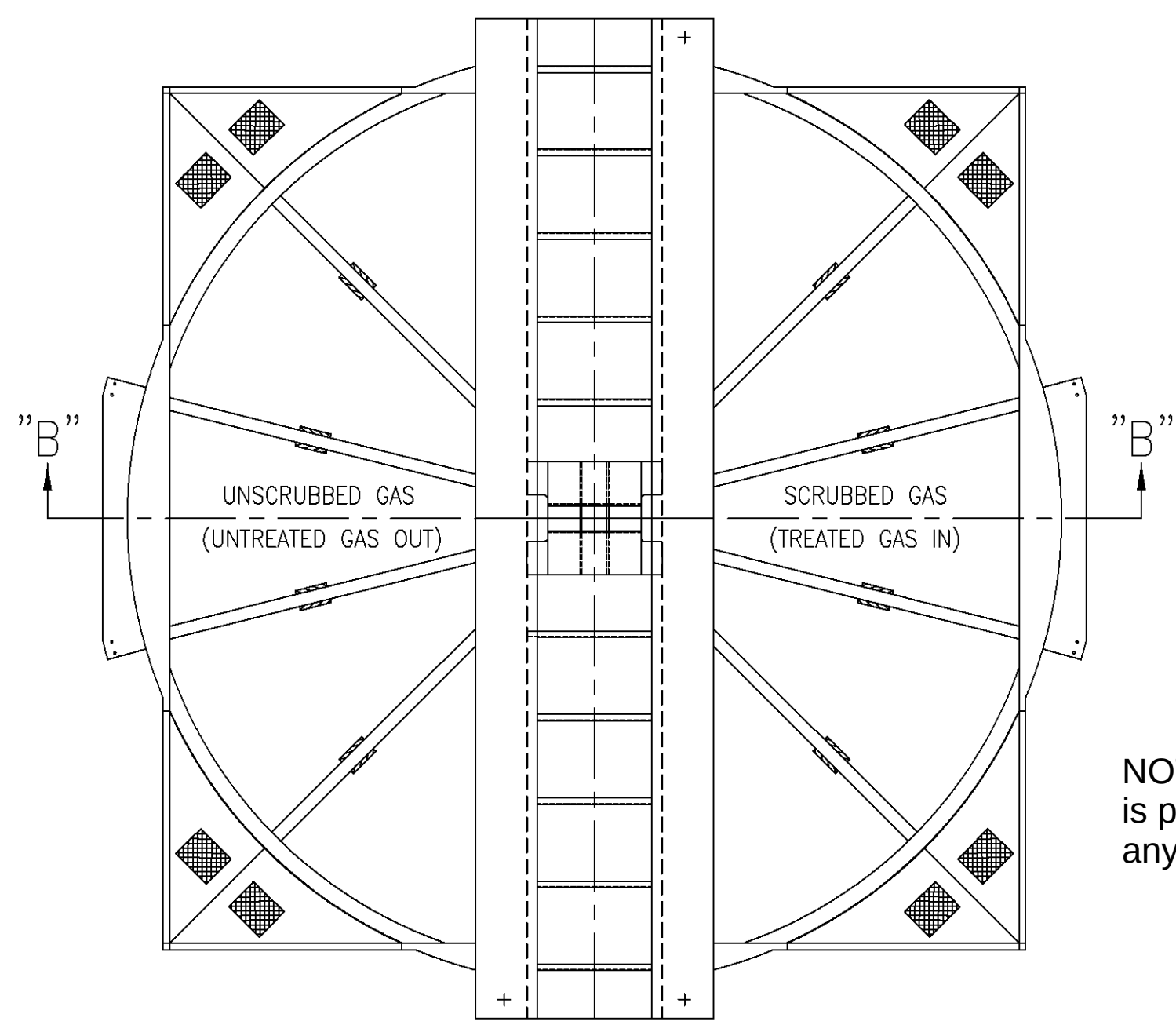
① LINING OF SOOTBLOWER
(UNTREATED GAS OUT ONLY)



TOP PLAN VIEW

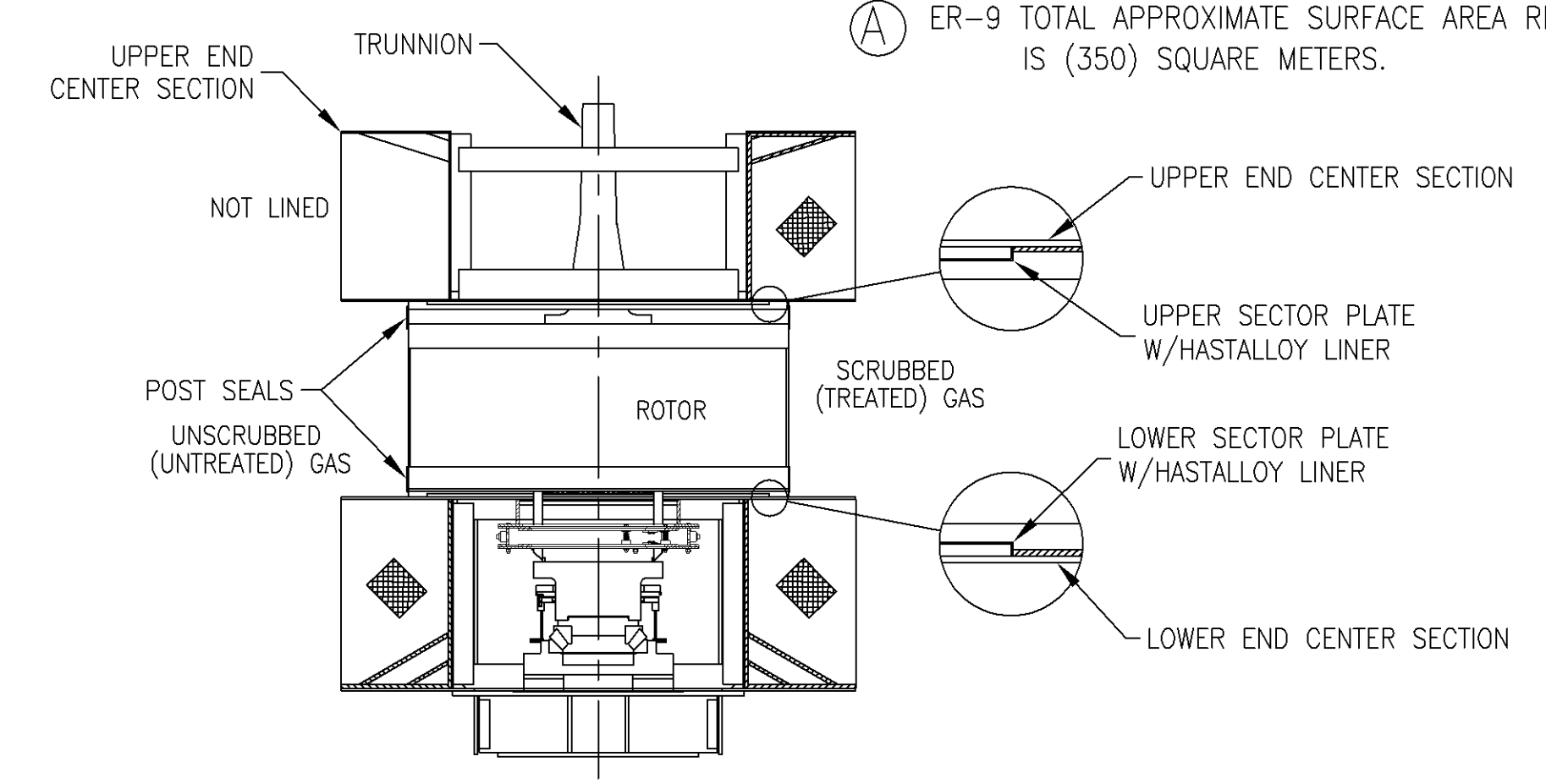


SECTION "B-B"

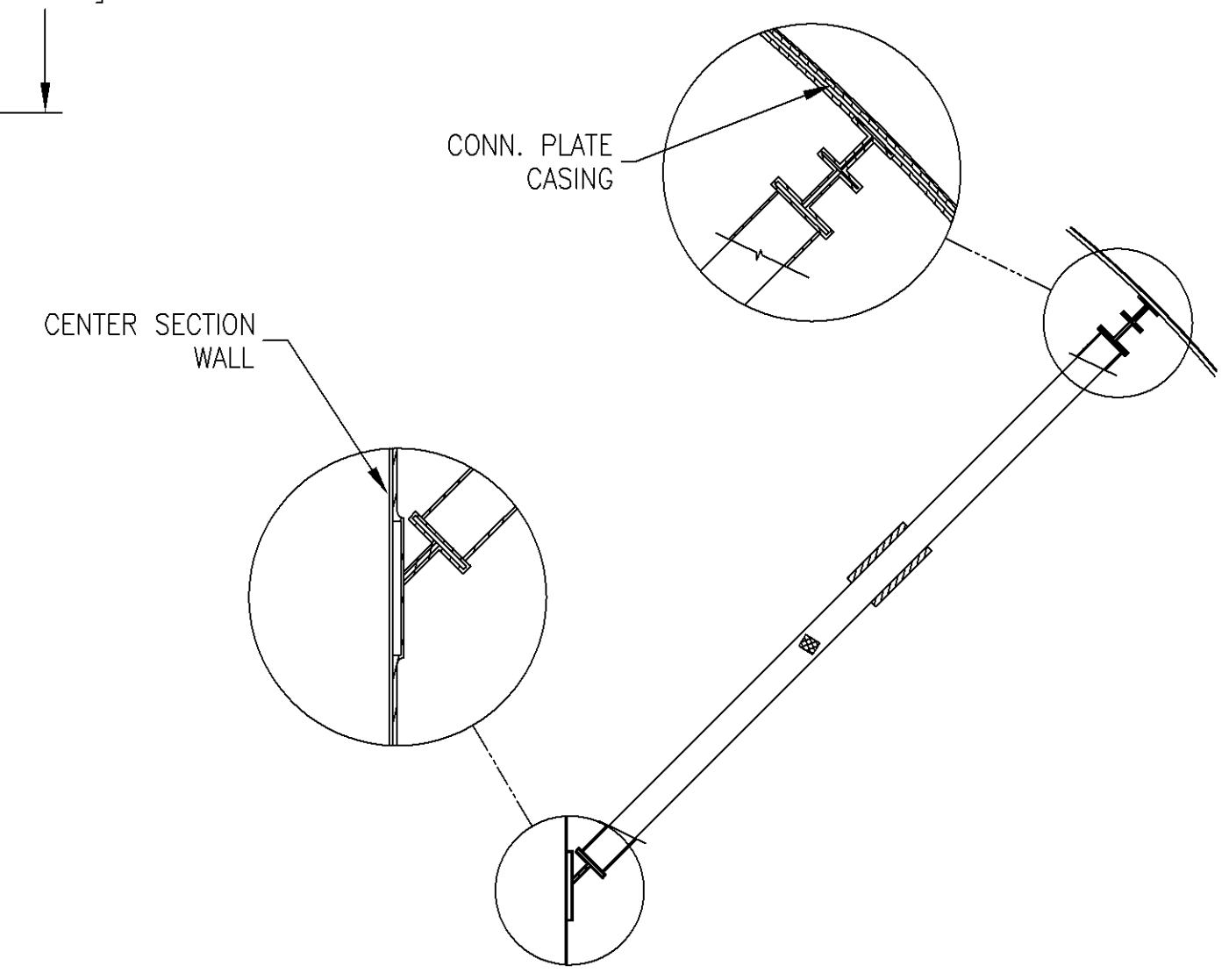


BOTTOM PLAN VIEW

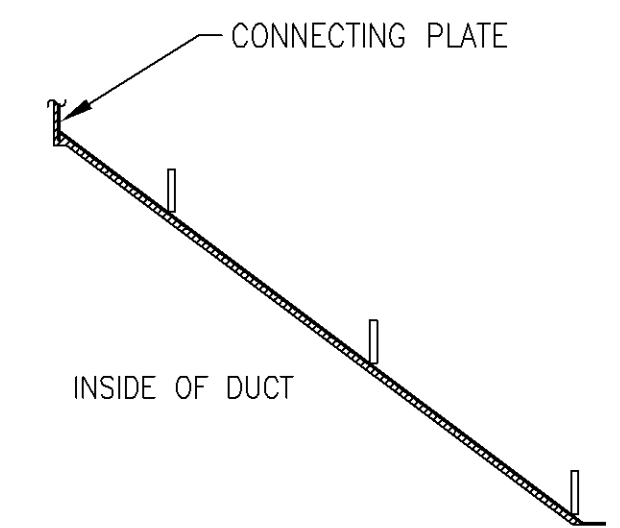
- LINING PROCEDURE NOTES:
SEE GENERAL ARRANGEMENT DRAWINGS FOR ORIENTATION
- ER-1 USE WEATHERING STEEL ELECTRODES IN ALL WELDS.
 - ER-2 AND INDICATE AREAS TO BE LINED.
 - ER-3 ALL WELDS TO BE CONTINUOUS AND SMOOTH, BUT NOT NECESSARILY FLUSH WITH THE ADJACENT SURFACE.
 - ER-4 SURFACE WELD DEFECTS SUCH AS CREVICES OR DEPRESSIONS SHALL BE FILLED BY REWELDING. RIPPLES SHALL BE BLENDED TO A SMOOTH FINISH BUT NOT NECESSARILY FLUSH WITH THE ADJACENT SURFACE.
 - ER-5 REMOVE ALL WELD SPLATTER BY CHIPPING OR GRINDING.
 - ER-6 BREAK ALL CORNERS AND EDGES TO A RADIUS OF 3mm (1/8") MINIMUM.
 - ER-7 SURFACE PREPARATION AND LINING SHALL BE DONE IN ACCORDANCE WITH THE LINING MANUFACTURER'S SPECIFICATIONS.
 - ER-8 COVER INBOARD END OF SOOTBLOWER WALL SLEEVE WITH LINING.
 - ① ER-9 TOTAL APPROXIMATE SURFACE AREA REQUIRED FOR GLASS FLAKE LINING IS (350) SQUARE METERS.



CROSS-SECTION THROUGH
HOT & COLD END CENTER SECTIONS
& ROTOR



TYPICAL AT PIPE BRACE & GUSSET
(HOT AND COLD ENDS)



TYPICAL DUCT CORNER
(HOT AND COLD ENDS)

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ALL PRIMARY DIMENSIONS ARE IN mm.
ALL SECONDARY DIMENSIONS ARE IN [INCHES]

H				
G				
F				
E				
D				
C				
B				
A	2/10/11	JDP	JDP	UPDATED SOOTBLOWER VIEW, ADDED LINING AREA
MARK	DATE	DR.	CK.	DESCRIPTION
ALTERATIONS				

L:\CONT\LJUNG\4482\NEW\2200

LINING PROCEDURE DRAWING				
CODE	GROUP	SIZE	DWG NO.	REV
ER	2200	D	15100155	A
SCALE NTS		WT	SHEET OF	