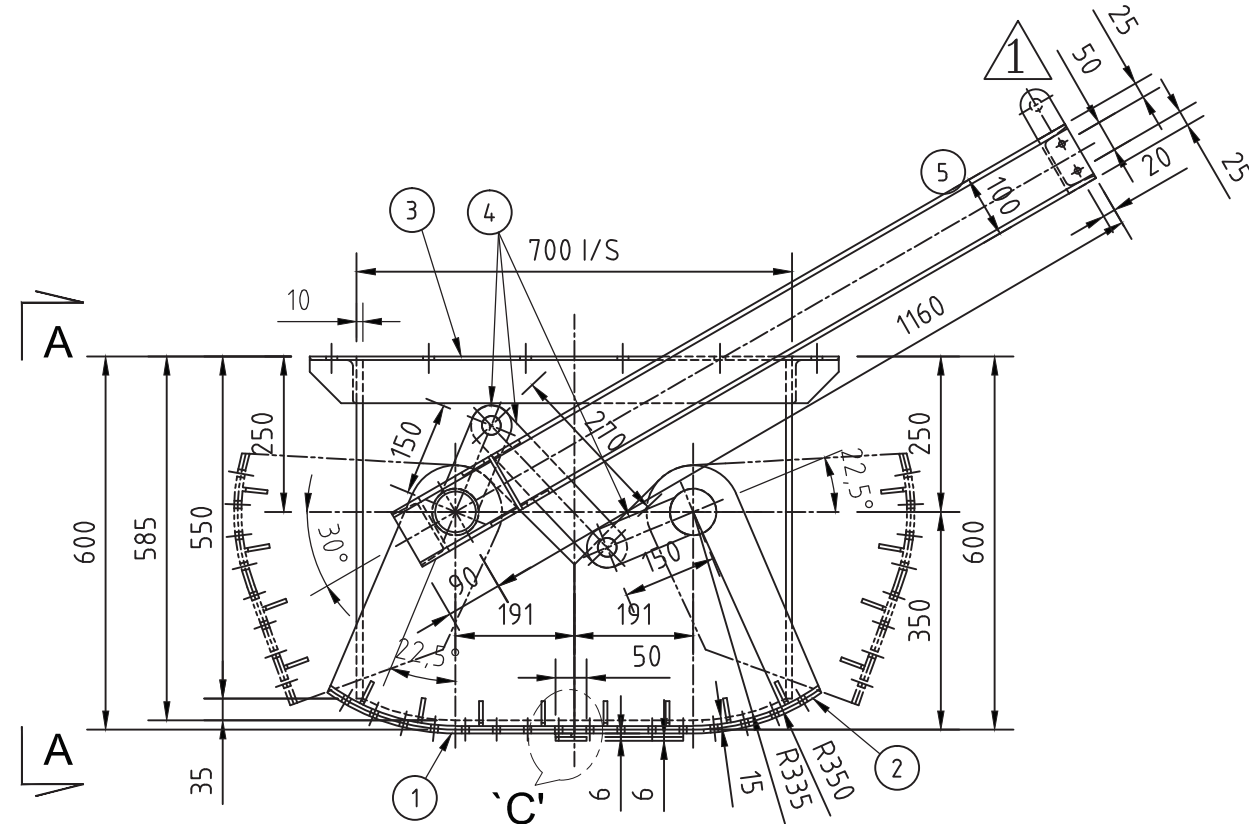
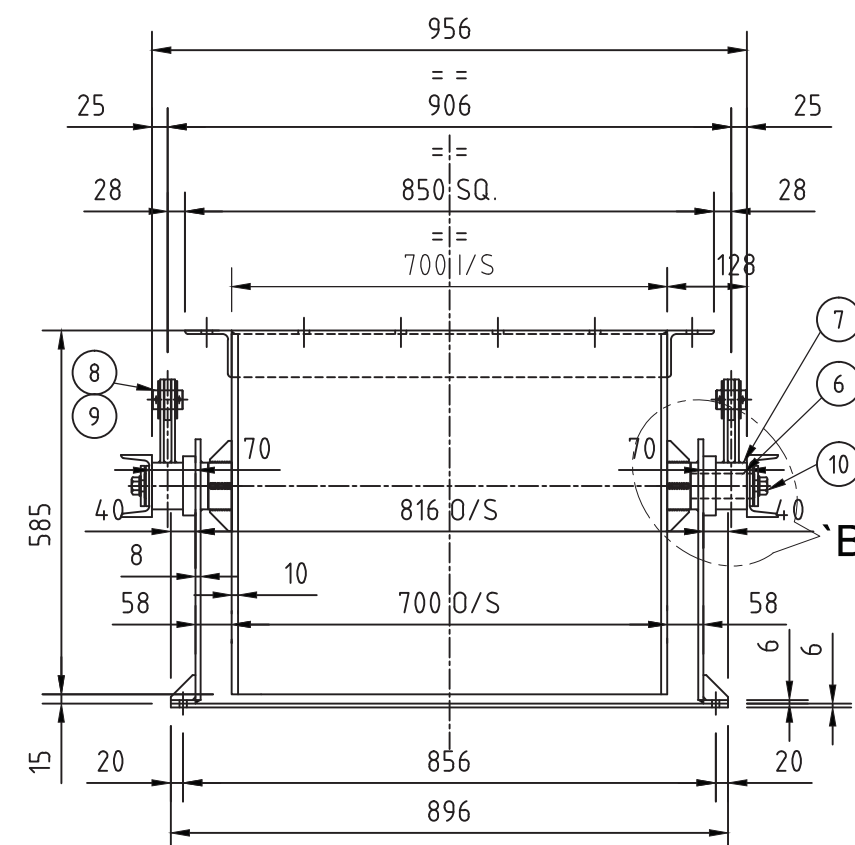


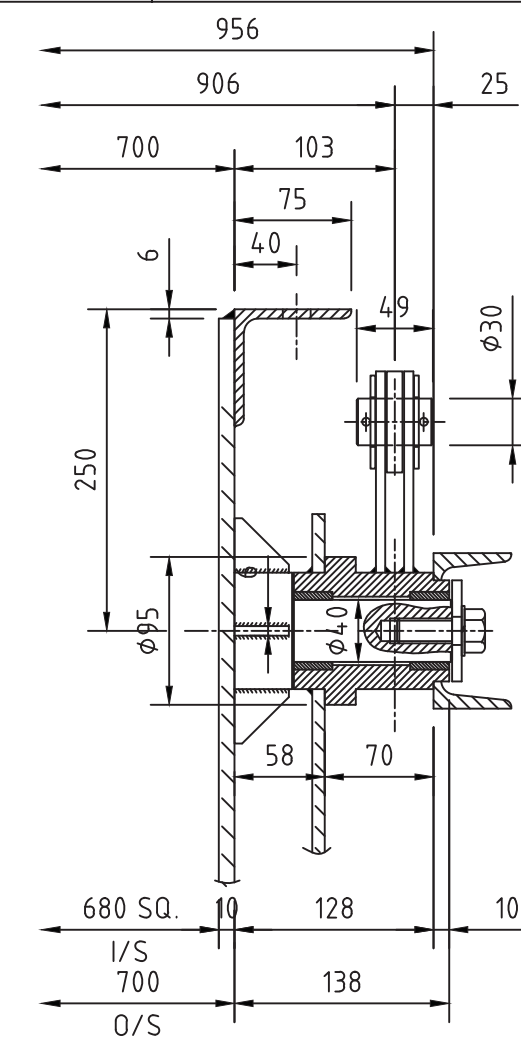
				MANUFACTURING QUALITY PLAN								Project : NTPC KAHALGAON STPS STAGE-I (4 X 210 MW)					
				ITEM: SECTOR GATE (CAT-I)													
				Page 2 of 2		Package : MRS											
Sl No.	Components	Characteristic	Class	Type of check	Quantum of check		Reference DOC	Acceptance Norms	Format of Record	Agency				Remarks			
					M	C/N				D	M	C	N				
C	FINAL INSPECTION																
1	Assembly	Visual, Dimension & Orientation	Major	Measurement	100%		AD	AD	IR	✓	P	W	W				
2	Operational Check	Smooth Operational	Minor	Visual	100%		AD	AD	IR	✓	P	W	W				
D	PAINTING	Visual / Physical	Minor	DFT / Finish Measurement	100%		Approved Painting Schedule	Approved Painting Schedule	IR	✓	P	V	V				
E	QA DOCUMENTATION																
1	IR/TC	Completeness	Major	Verification / Approval	100%		Approved Quality Plan	Approved Quality Plan			P	V	V				
Note :- 1)*When back wall echo (BWE) set to 100 % Full screen height (FSH), a defect echo > 20% FSH is not acceptable. Also loss of BWE > 20% is not acceptable. 2) Sector Gate shall be dispatched to site complete with accessories.																	
					LEGEND: Records identified with (✓) shall be essentially included by supplier in O.A. document. M : Manufacturer C : BHEL / Authorized inspection agency N : NTPC ; W: Witness ; P: Perform ; V: Verify IR : Inspection Report ; TC: Test Certificate AD: Approved Drawing DPT: Dye Penetrant Test ; DFT: Dry Film Thickness							REVIEWED BY BHEL		APPROV. BY NTPC		SEAL	
										FOR NTPC USE							



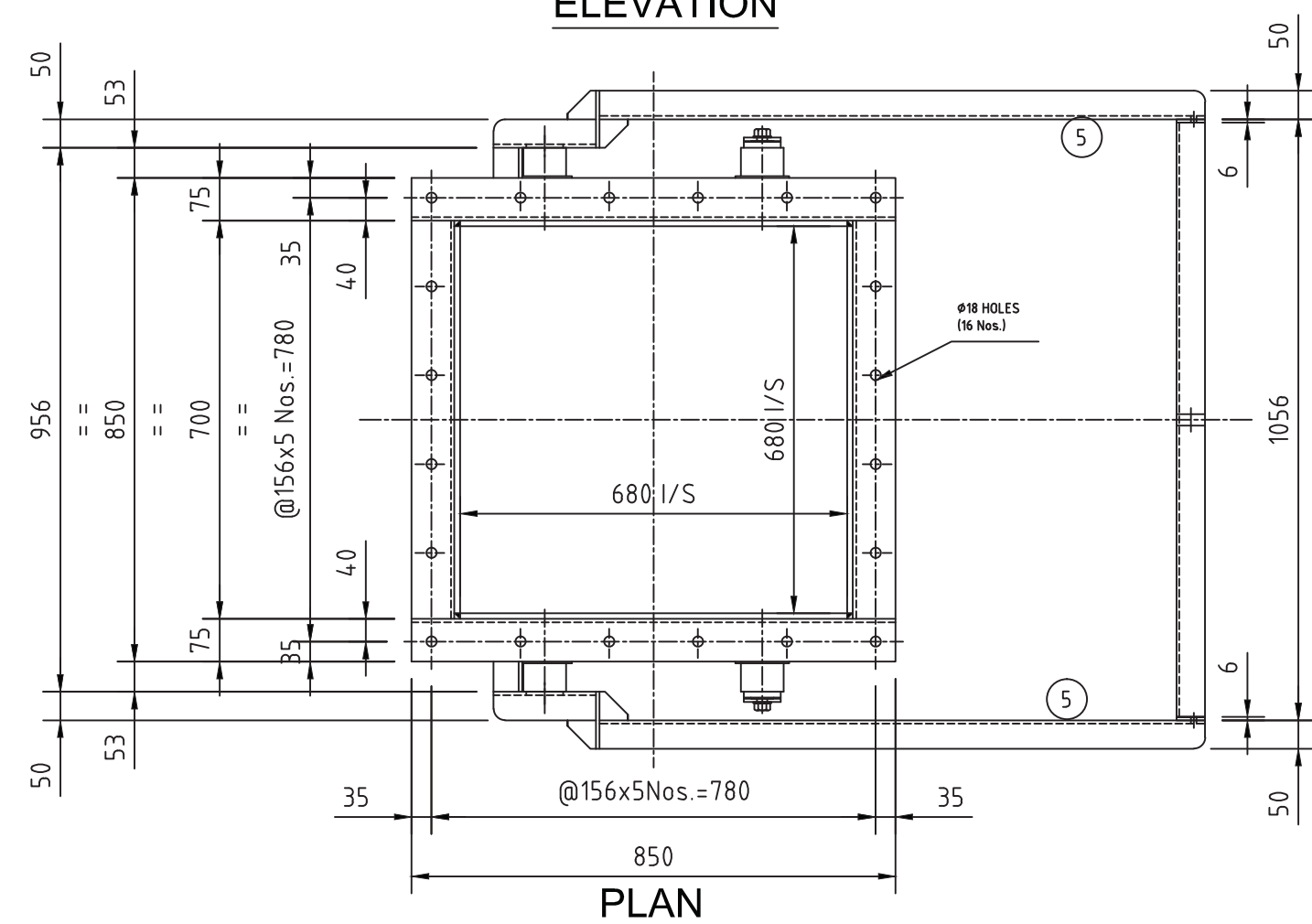
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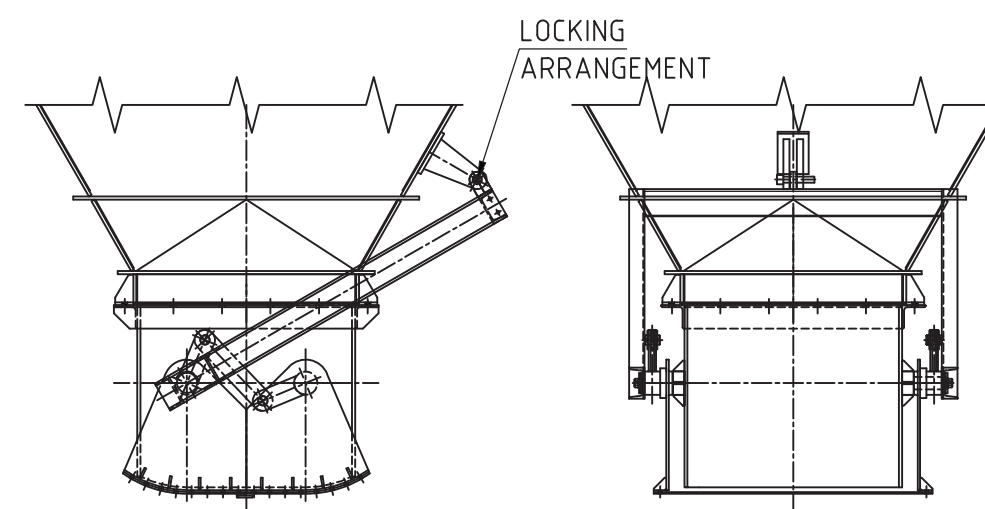
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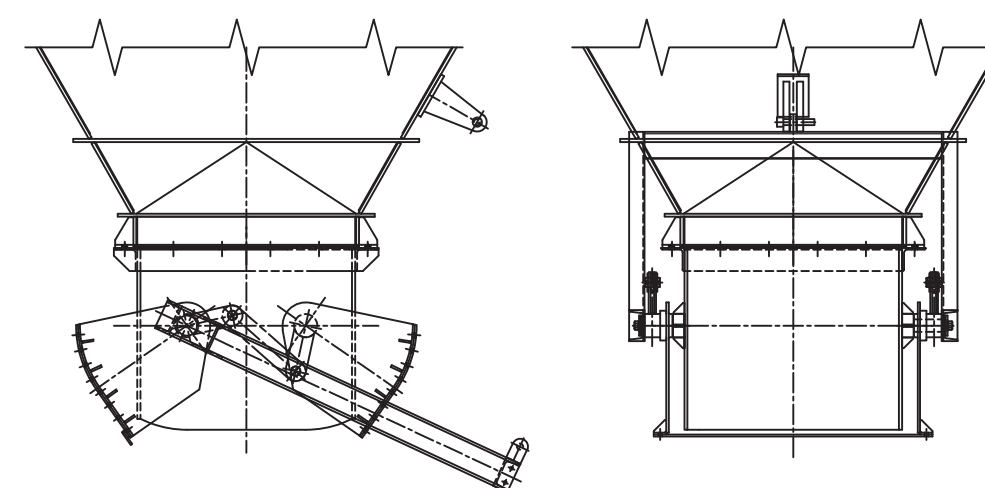
DETAIL OF 'B'



PLAN



1 CLOSING POSITION



1 OPEN POSITION

NOTES:-

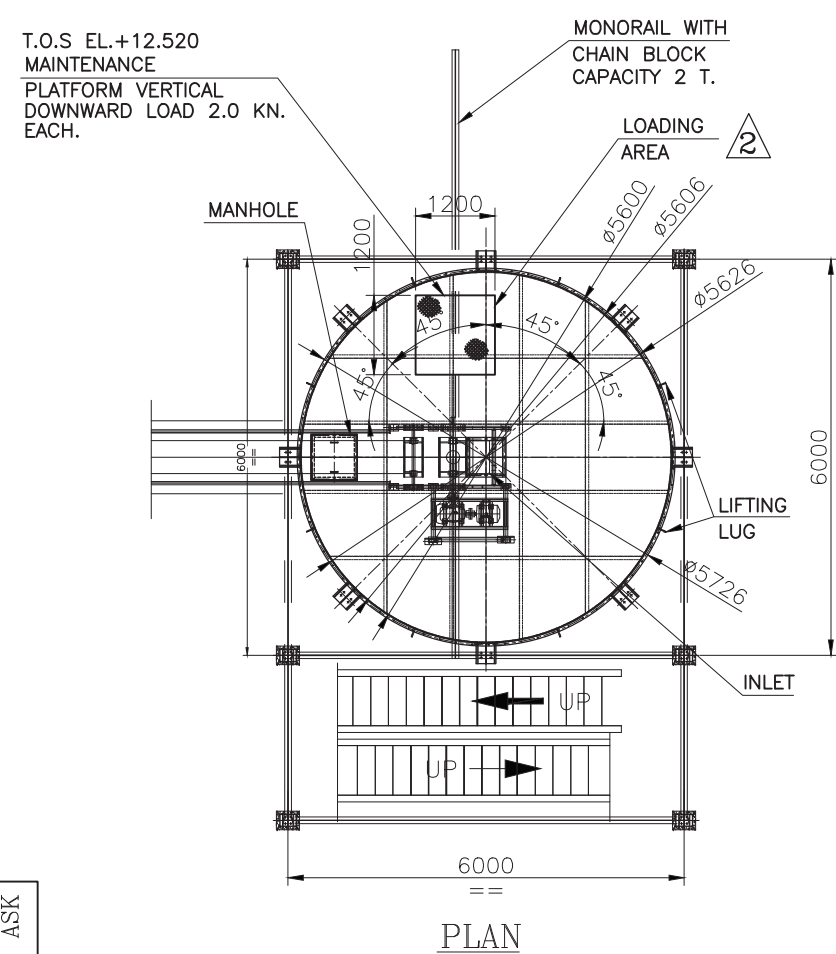
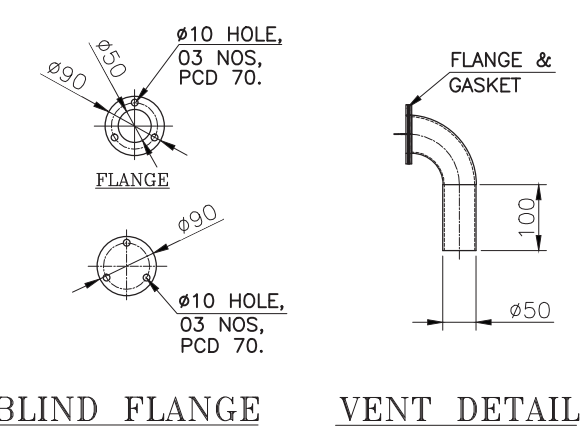
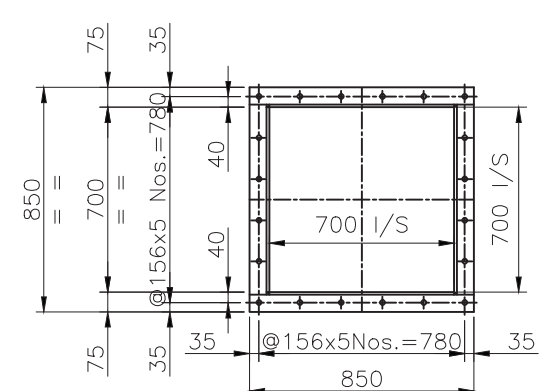
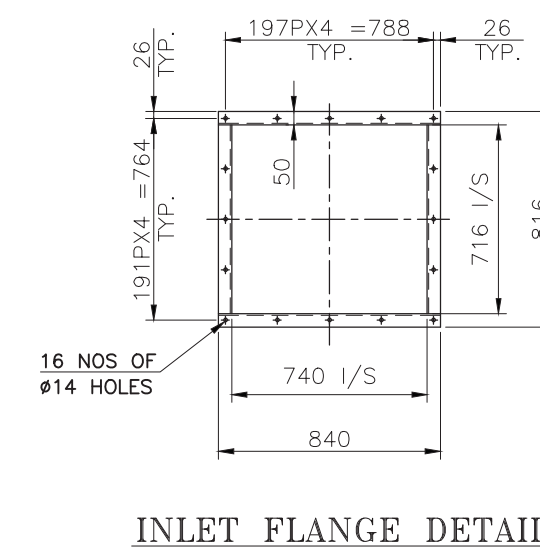
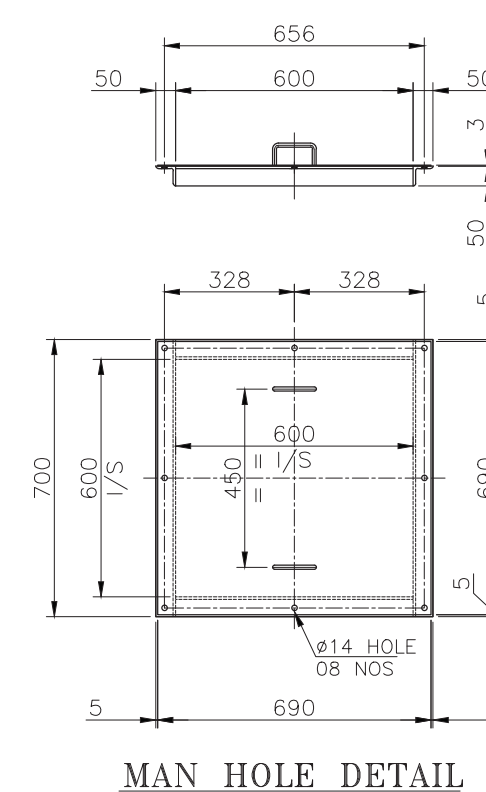
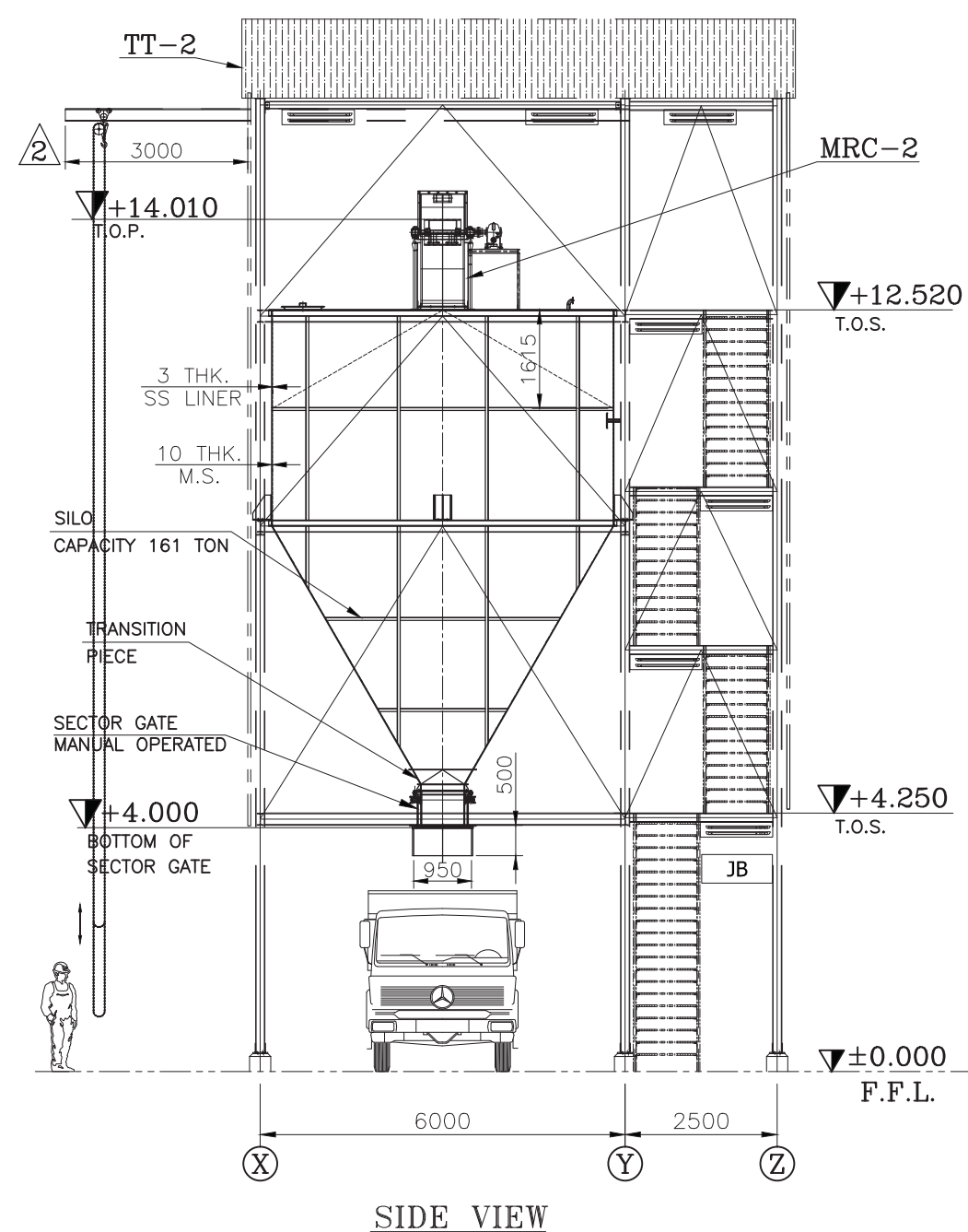
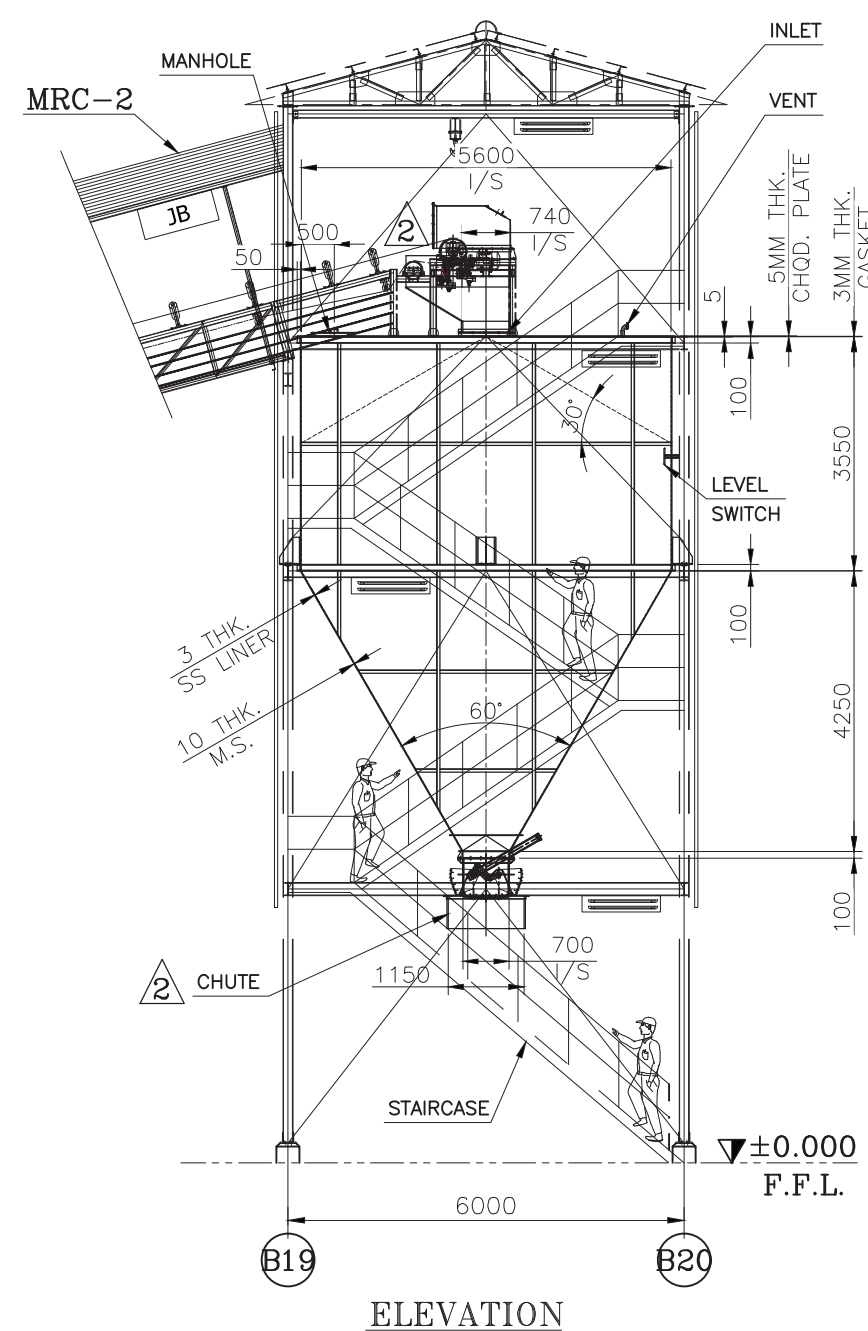
1. ALL DIMENSIONS ARE IN mm.
2. ALL LEVELS ARE IN METER.
3. ALL HOLES ARE 18Ø U.O.N.
4. APPROX WEIGHT OF THE SECTOR GATE = 300 Kg.

NTPC KAHALGAON STAGE-I
4X210MW

TITLE G.A. OF SECTOR GATE FOR MRS UNDER SILO
CONV.NO.-MRC-2 (500 B/W) AT MRS

9	SPLIT PIN	STD.
8	PIN	IS 2062
7	LIVER PIN HOUSING	IS 2062
6	LIVER PIN	IS 2062
5	LIVER	IS 2062
4	LINK PLATE	IS 2062 Gr.-A
3	ANGLE FRAME	IS 2062
2	BUCKET-2	IS 2062 Gr.-A
1	BUCKET-1	IS 2062 Gr.-A
Sr. No.	DESCRIPTION	MATERIAL

DO NOT SCALE
IF IN DOUBT PLEASE ASK



TECHNICAL-DATA

SR.NO	ITEM	SILO
1	MATERIAL TO HANDLE	PYRITES/HARD COAL/SHALE/STONE CHIPS
2	CAPACITY	161 TON
3	QUANTITY	01 NO.
4	MOTHER PLATE	M.S. PLATE 10Thk. IS:2062
5	TOP COVER PLATE	CHEQUERED PLATE 5Thk. IS:2062
6	LINER PLATE	PLATE 3Thk. S.S.409

NOTES:-

- 1) ALL DIMENSIONS ARE IN mm.
- 2) THIS IS A G.A. DRAWING & MINOR CHANGES IN DESIGN AND DIMENSIONS MAY OCCUR WHILE DETAILING.
- 3) EL (+) 0.000M CORRESPONDS TO THE GROUND FLOOR LEVEL OF THE POWER HOUSE BUILDING WHICH IS RL 292.760M ABOVE MSL.
- 4) PAINTING AS PER NTPC APPROVED PAINTING SCHEDULED.

REF. DRG NO.:-

- 1) GA OF MRC-1 AND MRC-2 FOR MRS - 4210-104-PVM-B-068
- 2) G.A. OF SECTOR GATE FOR MRS UNDER SILO - 4210-104-PVM-B-108

NTPC KAHALGAON STAGE-I
4X210MW

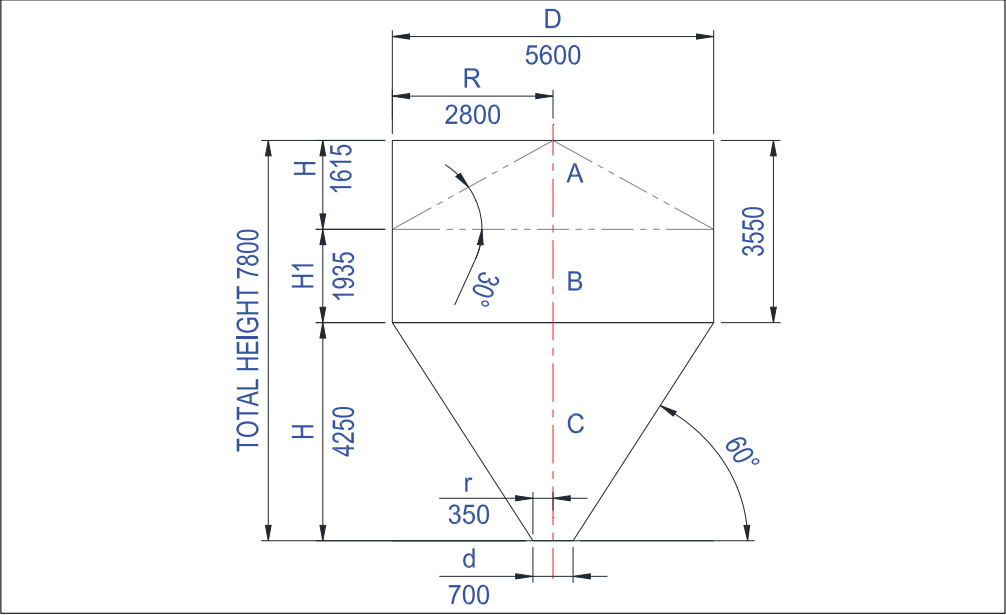
TITLE	G.A. OF SILO FOR MRS
-------	----------------------

PROJECT:- KAHALGOAN STPS STAGE-I(4X210 MW)		
STAGE-I(4X210 MW)		
Client: NTPC Ltd.		
Package: MILL REJECT HANDLING SYSTEM FOR KAHALGAON PROJECT		
Sl. NO.	Input Data	
	Description	Value
1	Total Nos. of silo	1
2	Storage Capacity of silo	161 ton
3	Bulk Density	1.6 Ton/m3

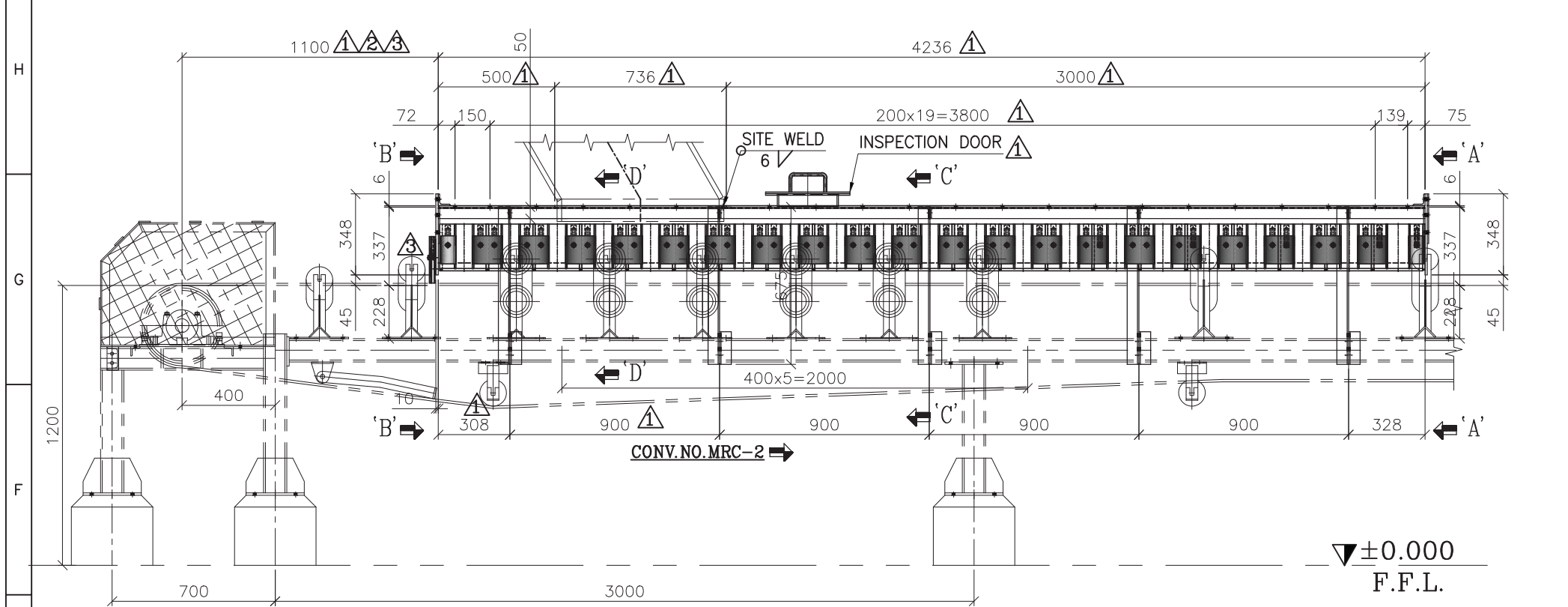
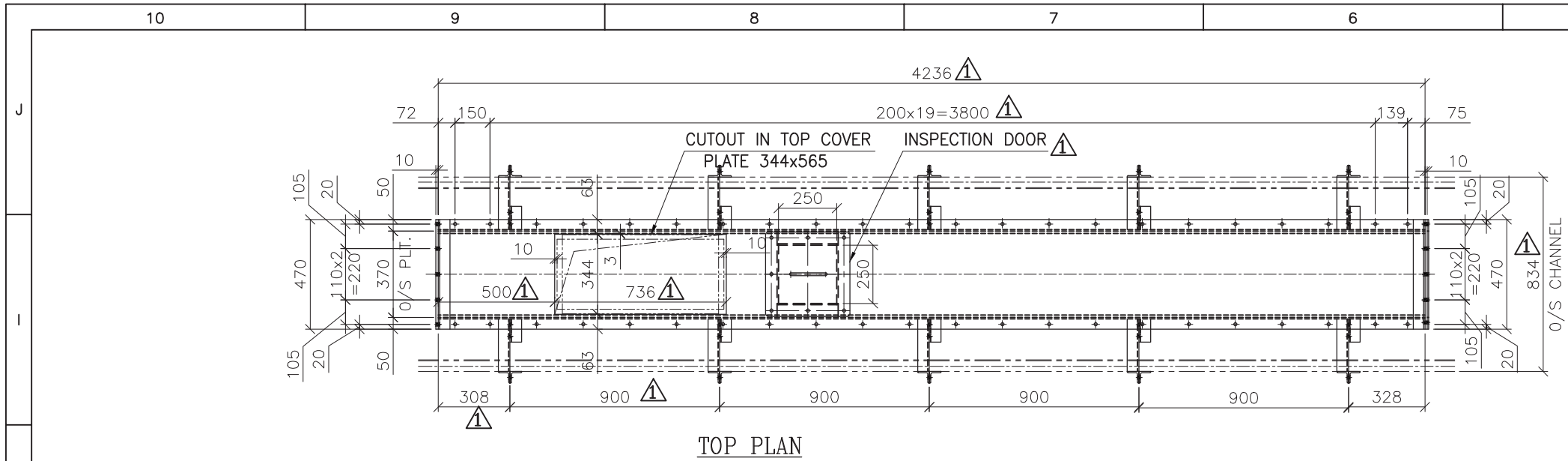
PROJECT:- KAHALGOAN STPS	
STAGE-I(4X210 MW)	
CLIENT:- NTPC LTD.	
Package: MILL REJECT HANDLING SYSTEM FOR KAHALGAON PROJECT	

A Volume of Frustum			
Degree	30		
tan value	0.5770		
Perpendicular ht. H		1.6156	
R		2.8	
$\pi/3H(R^2)$	13.2573155		
Note :- For A Volume Of Frustum small r is 0			
B Volume of Cylinder			
		D	H1
		5.6	1.935
$\pi R^2 H1$	47.6351		2.8
C Volume of Frustum			
Perpendicular ht. H2	H2	4.25	
	R	2.8	
	r	0.35	
$\pi/3H2 \{R^2 + r^2 + R \times r\}$	39.7792		
Volume Total		100.6716	
Bulk Density	1.6		
Capacity of Silo		161.0745 ton	

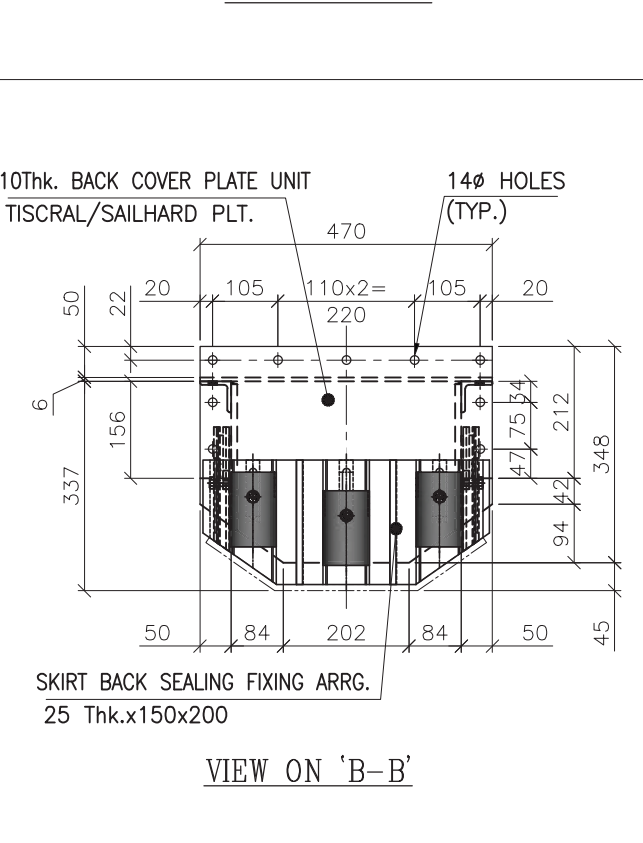
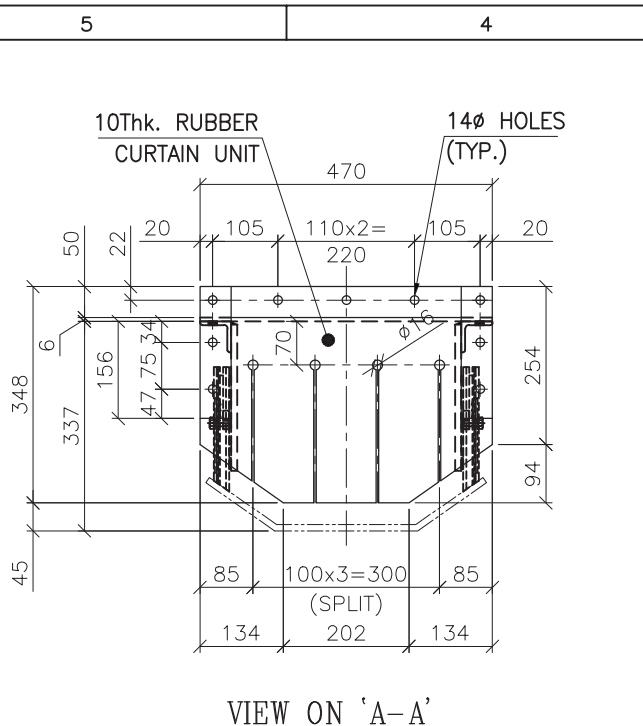
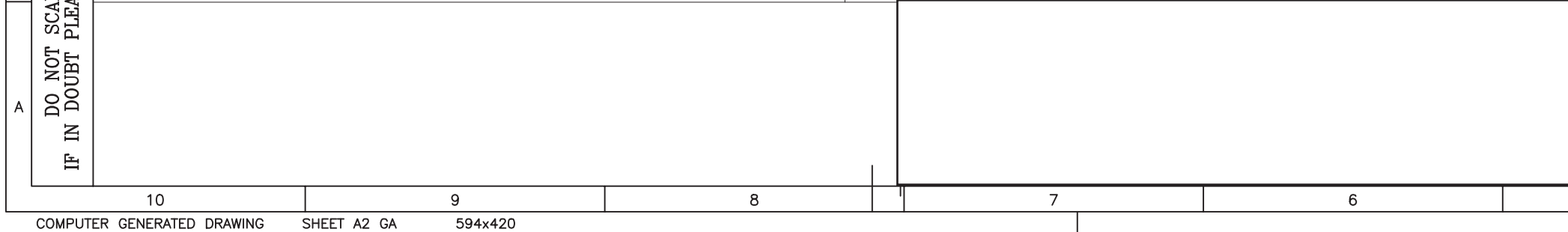
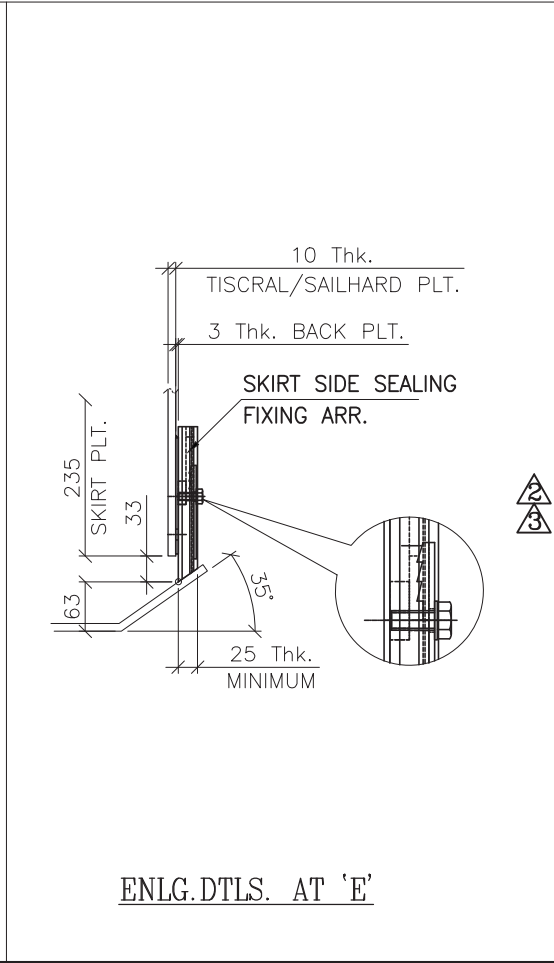
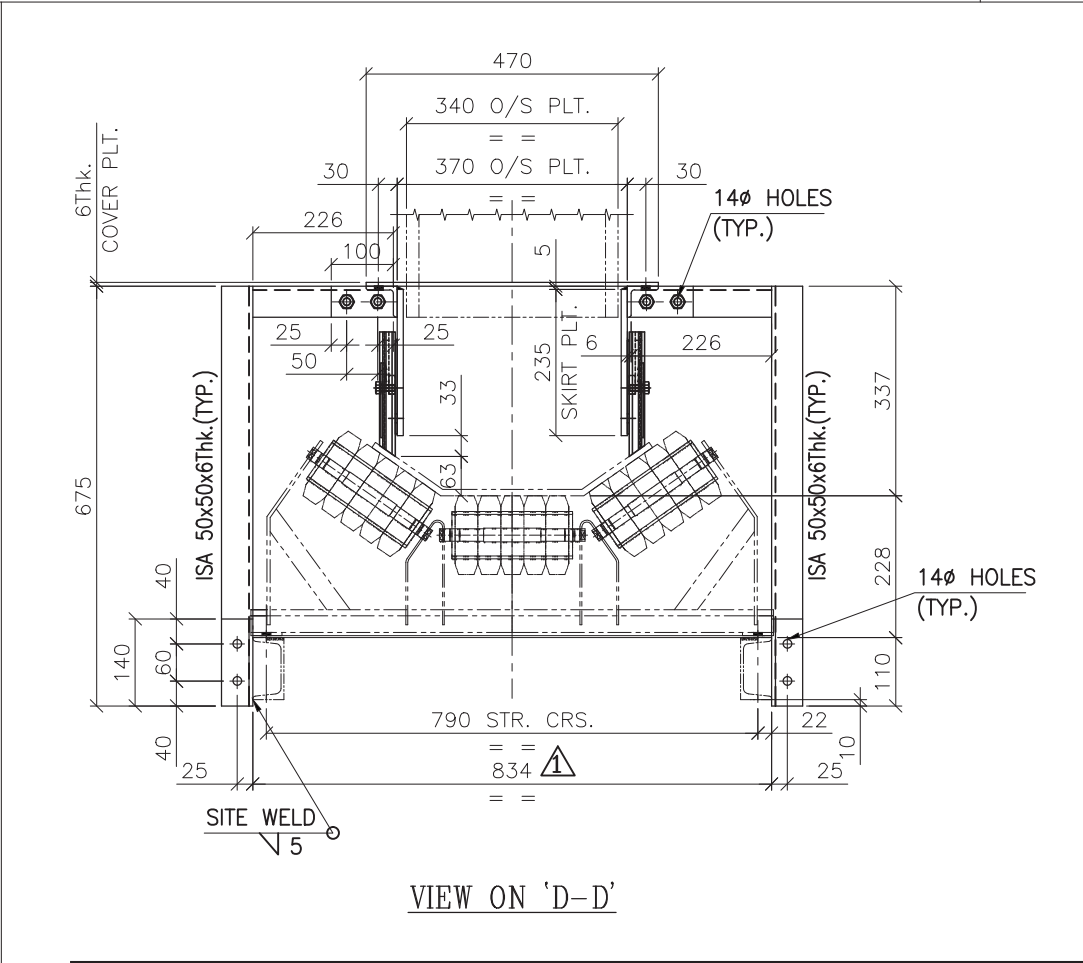
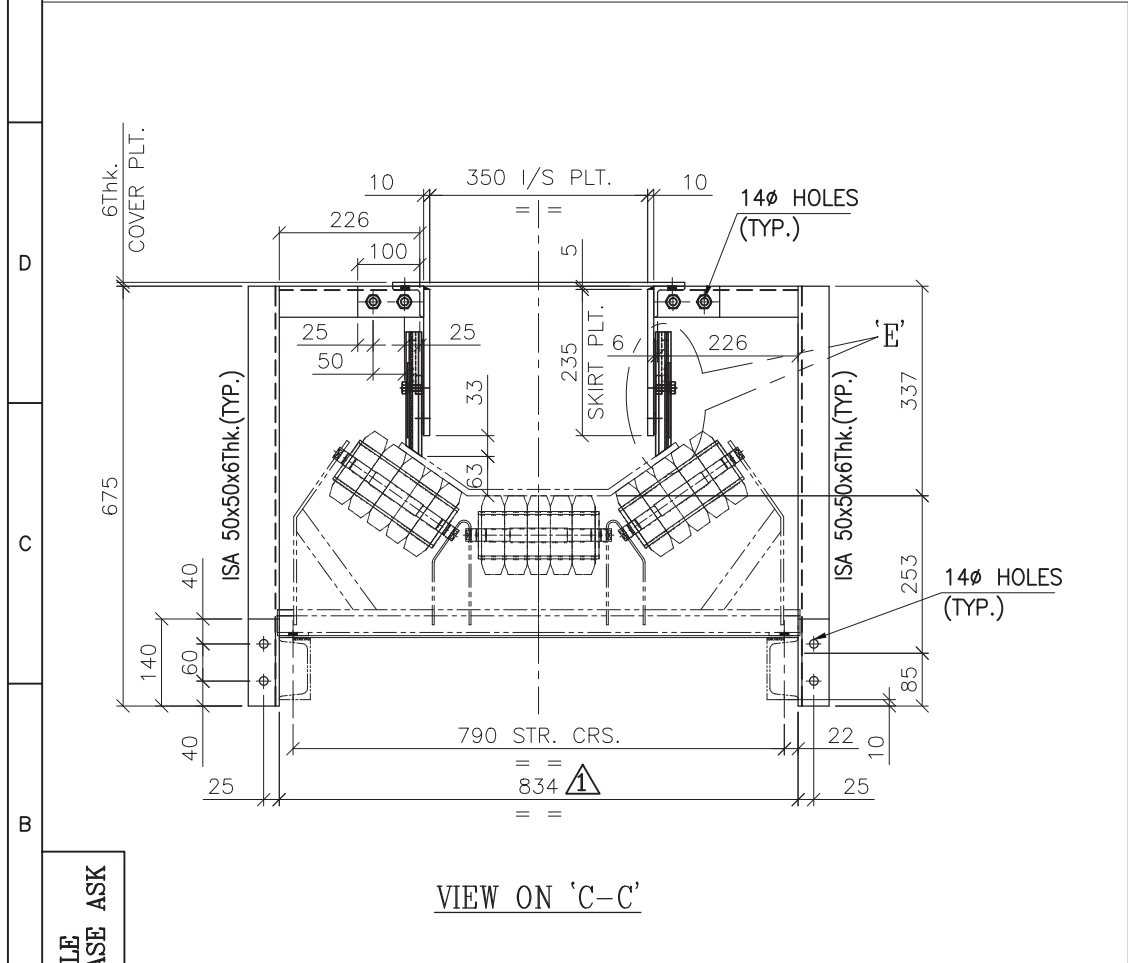
DESCRIPTION		
1) SILO CAPACITY	161	Tonnes
2) Material Bulk Density	1.6	Ton/m3
3) Required/Gross Silo Volume	127.17	M3
4) Net Total Volume	100.67	M3
5) Diamter At Top	5.6	Meter
6) Horizontal height	3.55	Meter
For Cylindrical Portion		
7) Height For Conical	4.25	Meter
Bottom Potion		
8) Total Height	7.8	Mter



PROJECT:-	KAHALGOAN STPS STAGE-I(4X210 MW)
Client:-	NTPC LTD.
TITLE:-	SIZING CALCULATION OF MRS SILO
NTPC Dwg. No.	
BHEL Dwg. No.	



ELEVATION OF SKIRT PLATE FOR CONV. NO.-MRC-2



- NOTES:-
- 1) ALL DIMENSIONS ARE IN mm.
 - 2) THIS IS A G.A. DRAWING & MINOR CHANGES IN DESIGN AND DIMENSIONS MAY OCCUR WHILE DETAILING.
 - 3) SKIRT PLATE OF EACH SIDE SHALL BE IN SINGLE PIECE.
 - 4) ALL MAKE SHALL BE AS PER NTPC APPROVED VENDER LIST.
 - 5) PAINTING AS PER NTPC APPROVED PAINTING SHUDULED.

Sl. No.	Particulars	Method of Check	Value
1	Specific Gravity	Manufacturer Std.	1.16 to 1.2 gms/cc
2	Hardness	IS 3400 Part-2	55±5 Shore - A Scale
3	Abrasion Loss	DIN 53516	100 mg. Maximum
4	Tensile Strength	IS 3400 Part-1	180 min. kg/sq.cm
5	Elongation at Break	IS 3400 Part-1	>350%

BILL OF MATERIAL	
ITEM	DESCRIPTION
SKIRT PLATE	TISCRAI/SAILHARD PLATE 10Thk.
TOP COVER PLATE	M.S. PLATE 6Thk. IS:2062
BACK PLATE	M.S. PLATE 3Thk. IS:2062
RUBBER CURTAIN	NATURAL RUBBER 10Thk. SHORE HARDNESS-55-65 ON A SCALE
SEALING	SEGMENTED BLOCK TYPE RUBBER SEALING

NTPC KAHALGAON STAGE-I
4X210MW

TYP. G.A. OF SKIRT BOARD SINGLE FEEDING
CONV.NO.-MRC-2 (500 B/W) AT MRS

		ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.): CONVEYOR IDLERS	STANDARD QUALITY PLAN CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC				QP NO.: 0000-999-QOM- S - 063 REV. NO: 01 DATE : 08/07/2015 PAGE 1 OF 3 VALID UPTO :07/07/2018		REVIEWED BY: ANKUSH BIRLA U SUDEEP RAJEEV KUMAR JAIN		APPROVED BY:  K.M. JAIN Dt..... Approved			
			SI NO		COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M C/N		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N
1		2	3	4	5	6		7	8	9	D*	** 10	11	
1.0 Raw Materials														
1.1	Tube for Roller	Surface Defects OD, Thickness, Nominal Mass, Ovality, Eccentricity & Straightness Chemical Properties Physical Properties (Tensile, Yield Stress, % Elongation, Flattening & Drift Expansion Test)	Major Major Major Major	Visual Measure Chemical Analysis Mechanical Test	100% IS 9295 IS 9295	100% IS 9295 IS 9295	IS 9295 IS 9295 / NTPC Tech Spec		IR Manufacturer TC	√ √	P P	V V	- V	See Note 1
1.2	Bar for Shaft/Spindle	Chemical & Physical Properties	Major	Chemical & Mechanical Test	1 /Heat	1/Heat	Relevant Material Standard as per Approved Drg/Datasheet /NTPC Tech Spec		TC	√	P	V	V	
1.3	Bearing Housing, and Sections & Flats for Idler Frames	Chemical & Physical Properties	Major	Chemical & Mechanical Test	1 Sample/ Procurement Batch	1 Sample/ Procurement Batch	Relevant Material Standard as per Approved Drg/Datasheet /Tech Spec		TC	√	P	V	V	
1.4	Rubber Disc for Impact Idler & Self Cleaning Idler	Tensile & Elongation, Hardness, Specific Gravity, Abrasion Loss, Ash Content	Major	Mechanical Test	1% Samples /procurement Batch	1% Samples /procurement Batch	Relevant Material Standard as per NTPC Approved Drg/Datasheet /Tech Spec NTPC Approved Drg/Datasheet /Tech Spec	IR	√	P	V	V		
1.5	Bearings	Type/Size/Dimension/ Make	Major	Verification	100%	100%	Approved Drg/Datasheet /Tech Spec		IR	√	P	V	V	See Note 2
1.6	Labyrinth, Dust seal	Dimension, Condition	Major	Verification	100%	100%	Approved Drg/Datasheet /Tech Spec/Mfg Standard		IR	√	P	V	V	

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
 ** M: MANUFACTURER / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION.
 AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'.

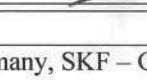
	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.):	STANDARD QUALITY PLAN	QP NO.: 0000-999-QOM- S - 063	REVIEWED BY: ANKUSH BIRLA	APPROVED BY:
	CONVEYOR IDLERS	CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC	REV. NO: 01 DATE : 08/07/2015	U SUDEEP	K.M. JAIN
			PAGE 2 OF 3	RAJEEV KUMAR JAIN	
			VALID UPTO :07/07/2018		

2.0	In-process Inspection													
2.1	Fabrication of Roller	Dimension , Runout		Verification /Measurement	Mfg Std Practice	Mfg Std Practice	Mfg Drg / IS 8598	Mfg Drg / IS 8598			P	V	V	
2.2	Machining of Spindle	Dimensions including end Dimensions , Surface Finish at Bearing area	Major	Measurement	100%	100%	NTPC Approved Drg/Datasheet /NTPC Tech Spec		√	P	V	V		
2.3	WPS, Procedure & Welder Qualification (for Frame Fabrication)	Conformance to Standards	Major	Verification / Mechanical Test	100%	100%	ASME Sec IX	ASME Sec IX	WPS, PQR & WPQ	√	P	V	V	See Note 3
2.4	Fabrication of Housing, Bracket & Frames	Surface Defects on final welds	Major	DPT	Random 10%	Random 10%	ASTM E 165	ASME Sec VIII Div 1 Appendix 8	DPT Report	√	P	V	V	
3.0	Final Inspection													
3.1	Rollers	Dimensional	Critical	Measurement	Random 10%	1/Lot	NTPC Approved Drg/Datasheet /NTPC Tech Spec		IR	√	P	W	W	
		Free Rotation	Critical	Visual	Random 10%	1/Lot	Approved Drg/Data sheet / IS 8598		IR	√	P	W	W	
		Run out	Critical	Measurement	Random 10%	1/Lot	Approved Drg/Data sheet / IS 8598		IR	√	P	W	W	
		Dust Ingress Test #	Critical	Measurement	1/Lot	1/Lot	Approved Test Procedure (see Note D)		IR	√	P	W	W	# Not applicable for Impact Idlers & Self- cleaning idlers See Note 4 & 5
		Water Ingress Test #	Critical	Measurement	1/Lot	1/Lot	Approved Test Procedure (see Note D)		IR	√	P	W	W	
		Friction Factor#	Critical	Measurement	1/Lot	1/Lot	Approved Test Procedure (see Note D)		IR	√	P	W	W	
3.2	Frames	Dimensions, Forward Tilt of Frames	Critical	Measurement	10%	1/Lot	NTPC Approved Drg/Datasheet /NTPC Tech Spec		IR	√	P	W	W	
		Fitment of roller to Bracket	Critical	Visual	10%	1/Lot	Free Drop, Rolls shall be interchangeable,		IR	√	P	W	W	
		Marking on Brackets	Critical	Visual	100%	100%	Direction of Belt travel to be embossed / punched on the brackets		IR	√	P	V	V	
3.3	Painting	DFT & Paint Shade	Major	Measurement & Visual	Random 1%	Random 1%	Approved Drg/Data sheet/ Tech Spec		IR	√	P	V	V	
3.4	Packing	Conformance	Minor	Verify	100%		Manufacturer Std Practice		IR		P			Refer Note 6

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: MANUFACTURER / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION.

AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'.

	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.): CONVEYOR IDLERS	STANDARD QUALITY PLAN CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC	QP NO.: 0000-999-QOM- S - 063 REV. NO: 01 DATE : 08/07/2015 PAGE 3 OF 3 VALID UPTO : 07/07/2018	REVIEWED BY: ANKUSH BIRLA U SUDEEP RAJEEV KUMAR JAIN	APPROVED BY:    
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Note 1: Tubes for Rollers shall conform to IS : 9295 and shall be procured from BIS approved sources with valid license

Note 2: Type of bearings as per NTPC Approved drg/DS/Tech Spec. Acceptable makes for Bearings are ABL – Hosur/NEI (NBC) – Jaipur, FAG – Germany, SKF – Germany, NSK – Japan, FAG(INDIA) – Vadodara, SKF (INDIA) - Pune

Note 3: NTPC /Lloyds/BVQI approved WPS, PQR & WPQ are acceptable. Only Qualified welders to be deployed.

Note 4: Lot means 1000 Nos or Part thereof offered per Visit

Note 5: Test procedure specific to the manufacturer shall be finalized with the manufacturer, prior to start of manufacturing of Idlers. However, following procedures are being given as guidelines, which are inline with the procedure followed by Major Manufacturers , for easy reference

a) **Dust Ingress Test:** The selected Roller is mounted horizontally on a suitable fixture in a test rig located in a closed dust chamber and made to rotate at the operating speed range of the roller.

A continuous dust cloud is maintained in the dust chamber throughout the test period. Test is carried out for duration of 180 minutes. There after roller is dismantled

Acceptance Norm for Dust Ingress Test: No Dust particle to be found beyond inner labyrinth ring zone. If Dust particle are physically visible following procedure may be followed to ascertain the percentage of dust presence in the grease. Approximate 2 gms of “Grease” from the bearing of this dismantled roller is taken and dissolved in a solvent and residue content weighed. Similarly same weight of fresh unused grease is dissolved in the solvent and residue content weighed. The difference in the weights of the two residue content shall be within 5%.

b) **Water Ingress Test:** The selected Roller is mounted horizontally on a suitable fixture in a test rig and made to rotate at the operating speed range of the roller for a duration of 180 minutes.

During running of roller, water is sprayed from both sides at an angle of approx 35 degree at a min. pressure of 1 kg per cm square directly on the roller face near end cap. After testing roller is dismantled and check for water particles at the bearing area.

Acceptance Norm for Water Ingress Test: Roller is accepted if there is no ingress of water on bearing and there is no emulsification of grease. Presence of water after outer labyrinth seals shall be considered as improper sealing. In case of improper sealing observed on the selected sample then two more random sample from the lot shall be tested as per the above procedure and if both samples are accepted then lot shall be considered as accepted.

c) **Friction Test:** The selected Roller is mounted horizontally on a suitable fixtures and made to rotate at the operating speed range of the roller for determining the friction factor.

Testing Methodology 1: Test idler is driven to rotating speed above the operating speed after that Drive disconnected. Idler allowed to decelerate freely after disengaging the drive, rotating speed recorded. Dying time (ie time to decelerate from operating speed to zero speed) is noted.

Friction Factor = $K^2 \times 2 \times 3.1416 \times N / 60 \times t \times 9.81 \times R1$ where

K = Radius of Gyration i.e. as $\sqrt{(D_1^2 + D_2^2) / 4}$

D1 = Roller outside diameter in mtr

D2 = Roller inner diameter in mtr

N = Actual operating speed in rpm

R1 = Outside radius of roller in mtr

t = Deceleration time in sec

Testing Methodology 2: The test roller is rotated under a known load on a test rig (keeping the load on the shaft while the rollers are running). The resisting force in measured using a spring balance (connected through a lever arm). Taking moments of the above two forces (ie load applied on the roller & the resisting force) at the roller center the Frictional Factor is calculated

Acceptance Norm for Friction Test: Friction factor shall be within 0.02

Note 6: Care to be taken to reduce metal to metal contact & relative motion between Rollers

LEGEND: * RECORDS, IDENTIFIED WITH “TICK” (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: MANUFACTURER / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION.

AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN “N” AS ‘W’.

		ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.):		STANDARD QUALITY PLAN		QP NO.: 0000-999-QOM- S - 088		REVIEWED BY: M KHALIQUZZAMA		APPROVED BY:	
		CONVEYOR PULLEYS		CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC		REV. NO: 00 DATE : 27/11/2017		K J RAO		K K OJHA	
						PAGE 1 OF 5		R K JHA			
						VALID UPTO :26/11/2020					

SI NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N				D*	M	C	N	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.0 Raw Materials														
1.1	Plate for shell & end disc	Chemical Physical Lamination	Major Major Major	Chemical Analysis Tensile, yield, % elongation Ultrasonic	1 per heat 1 per heat 100%	1 per heat 1 per heat 100%	Approved Drawing/ Datasheet/Technical Specification ASTM A 435	Approved Drawing/ Datasheet/Technical Specification ASTM A 435	MTC MTC UT Report	✓	P	V	V	UT for plate thickness > 25 mm
1.2	Plate for shell & end disc for nonmagnetic pulley	Chemical Physical	Major Major	Chemical Analysis Tensile, yield, % elongation	1 per heat 1 per heat	1 per heat 1 per heat	Approved Drawing/ Datasheet/Technical Specification	Approved Drawing/ Datasheet/Technical Specification	MTC MTC	✓	P	V	V	Refer Note 5
1.3	Forged rounds for shaft	Chemical Heat treatment Physical Micro structure Internal defect	Major Major Major Major Major	Chemical Analysis HT. Chart Tensile, yield % elongation & hardness Grain size Ultrasonic test	1 per Heat 100% 1 per heat 1/ HT batch 100%	1 per Heat 100% 1 per heat 1/HT batch 100%	Approved Drawing/ Datasheet/Technical Specification ASTM E 112 ASTM A388	Approved Drawing/ Datasheet/Technical Specification Minimum grain size 5 Note-1	MTC HT Chart Lab report UT report	✓	P	V	V	UT for shaft dia > 40 mm
1.4	Forged rounds for Hub	Chemical Heat treatment Physical Micro structure Internal defect	Major Major Major Major Major	Chemical Analysis HT. chart Tensile, yield, % elongation & hardness Grain size Ultrasonic test	1 per Heat 100% 1 per heat 1/ HT batch 100%	1 per Heat 100% 1 per heat 1/ HT batch 100%	Approved Drawing/ Datasheet/Technical Specification ASTM E 112 ASTM A388	Approved Drawing/ Datasheet/Technical Specification Minimum grain size 5 Note-1	MTC HT Chart Lab report UT report	✓	P	V	V	UT for hub dia > 40 mm

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
 ** M: MANUFACTURER / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION.
 AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'.

		ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.):		STANDARD QUALITY PLAN				QP NO.: 0000-999-QOM- S - 088		REVIEWED BY: M KHALIQUZZAMA		APPROVED BY:				
				CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC				REV. NO: 00 DATE : 27/11/2017		K J RAO		K K OJHA				
		CONVEYOR PULLEYS						PAGE 2 OF 5		R K JHA						
						VALID UPTO :26/11/2020										
1.5	Cast steel Hub	Chemical Heat treatment Physical	Major Major Major	Ch. Analysis HT. Chart Tensile Yield % elongation bend test impact test Ultrasonic	1 per heat 100% 1 per heat	1 per heat 100% 1 per heat	Approved Drawing/ Datasheet/ Technical Specification	Approved Drawing/ Datasheet/ Technical Specification ASTM A-609 (Level II for rim zone and Level III for core zone)	MTC MTC HT. Chart	√ √ √	P P P	V V V	V V V			
		Internal Defect	Major	100%	100%	ASTM A-609		UT Report	√	P	V	V				
1.6	Cast steel hub for nonmagnetic pulley	Chemistry	Major	Ch. Analysis	1 per heat	1 per heat	Approved Drawing/ Datasheet/ Technical Specification	Approved Drawing/ Datasheet/ Technical Specification	MTC	√	P	V	V	Refer Note 5		
		Physical	Major	Tensile Yield % elongation	1 per heat	1 per heat			MTC	√	P	V	V			
		Heat treatment	Major	HT Chart	100%	100%			HT. Chart	√	P	V	V			
		Internal defect	Major	Radiography	100%	100%			EN12681	EN12681(Level III)	RT film & RT report	√	P		V	V
		Surface Defect	Major	DPT	100%	100%			EN 1371 Level 2	EN 1371 Level 2	DPT Report	√	P		V	V
2.0	IN PROCESS															
2.1	Welding procedure & welder qualification	Welding procedure & welder qualification	Major	Verification	100%	100%	ASME Sec. IX	ASME Sec. IX	Records	√	P	V	V	Refer Note 2		
2.2	Long seam welding of shell	NDT	Major	Ultrasonic	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 12	UT Report	√	P	W	W	RT film review by NTPC		
		NDT(for SS shell)	Major	Radiography	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 UW51/52	RT film & Report	√	P	W	V			
		NDT	Major	DPT	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 8	DP test Report	√	P	W	V			
2.3	Welding of shell with end plate	NDT	Major	Ultrasonic	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 12	IR	√	P	W	W			

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		ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.):		STANDARD QUALITY PLAN			QP NO.: 0000-999-QOM-S - 088		REVIEWED BY: M KHALIOUZZAMA		APPROVED BY:			
CONVEYOR PULLEYS				CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC			REV. NO: 00 DATE : 27/11/2017		K J RAO		K K OJHA			
							PAGE 3 OF 5		R K JHA					
							VALID UPTO :26/11/2020							
		NDT	Major	DPT	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 8	DP test Report	√	P	W	V	
2.4	Welding of hub and end disc	NDT	Major	DPT	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 8	DP test Report	√	P	W	V	
2.5	Welding of cast steel hub to shell	NDT	Major	Ultrasonic	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 12	UT Report	√	P	W	W	RT film review by NTPC
		NDT(for SS shell and hub)	Major	Radiography	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 UW51/52	RT film & Report	√	P	W	V	
		NDT	Major	DPT	100%	10%	ASME Sec V	ASME Sec VIII, Div 1 Appendix 8	DP test Report	√	P	W	V	
2.6	Shaft after machining	NDT(on machined surface)	Major	DPT	100%	10%	ASTM E 165	No linear indication	DP test Report	√	P	V	V	
3.0	FINAL INSPECTION													
3.1	Assembly of pulley before Lagging	Dimension	Major	Measurement	100%	10%	Approved Drawing	Approved Drawing	IR	√	P	W	V	
		Run out	Major	Measurement	100%	10%	Approved Drawing	IS:8531	IR	√	P	W	V	
		Static Balancing	Major	Balancing	100%	10%	Approved Drawing	Approved Procedure	IR	√	P	W	V	
3.2	Pulley after rubber Lagging	Visual & Dimension	Major	Visual/ measurement	100%	10%	Approved Drawing	Approved Drawing	IR	√	P	W	W	

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 AS APPROPRIATE, **CHP:** NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'.

		ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.):		STANDARD QUALITY PLAN			QP NO.: 0000-999-QOM- S - 088		REVIEWED BY: M KHALIQUZZAMA		APPROVED BY:		
		CONVEYOR PULLEYS		CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC			REV. NO: 00 DATE : 27/11/2017		K J RAO		K K OJHA		
							PAGE 4 OF 5		R K JHA				
							VALID UPTO :26/11/2020						
3.3	Rubber lagging (Hot Vulcanizing)	Surface finish	Major	Visual	100%	10% from the offered lot	Approved Drg. / Mfr Drg.	Approved Drg. / Mfr Drg.	TR	√	P	W	W
		Thickness	Major	Measurement	100%		Approved Drg.	Approved Drg.	TR	√	P	W	W
		Shore Hardness	Major	Measurement	100%		Approved Drg. / IS:3400	Approved Drg.	TR	√	P	W	W
		Abrasion Loss	Major	Measurement	100%		Approved Drg. / DIN 53516	Approved Drg.	TR	√	P	W	W
		Peel off test	Major	Measurement	100%		Approved Drg. / IS 3400	Approved Drg.	TR	√	P	W	W
		Ash Content	Major	Measurement	100%		Manufacturer Std Practice	12% Max.	TR	√	P	W	W
		Tensile strength & % elongation	Major	Physical Test	100%		Approved Drg./ IS:3400	Approved Drg.	TR	√	P	W	W
		Spark test	Major	Physical Test	100%		Approved Drg. / IS: 4682	IS: 4682	TR	√	P	W	W
		Specific gravity	Major	Physical test	100%		Approved Drg. / IS:3400	Approved Drg.	TR	√	P	W	W
3.3	Static Balancing after lagging	Measurement	Major	Measurement	100%	100%	Approved Drawing/ Datasheet/Technical Specification/Approved procedure		IR	√	P	W	W
4.0	Cleaning & Painting	Paint shade & DFT	Major	Visual & Measurement	100%	100%	Approved painting schedule/Technical Specification		IR	√	P	V	

Note:

- When Back Wall Echo (BWE) set to 100% Full Screen Height (FSH) in sound area of the material, a defect echo > 20% FSH is not acceptable. Also loss of BWE > 20% is not acceptable.
- Welding procedures and welders qualified in presence of NTPC/Lloyds/BVQI/TUV shall be deployed for welding
- Rubber lagging checks on integral samples, procedure: Additional plate on the hub portion shall be tack welded and rubber lagging shall be done on the tack welded plate along with the pulley lagging. Tests shall be done on the integral test piece. Also specific gravity & ash content shall be checked on actual job also & the variation in the corresponding values shall not be more than 5% of the integral sample test result. Integral samples shall be removed in the presence of NTPC. These tests are done at rubber lagging manufacturer's premises.
- In case of any doubt, NTPC inspector may take sample from the actual job for tensile, elongation and hardness test. Manufacturer shall repair the same before dispatch to site.
- Random 1% grade verification for stainless steel material shall be carried out by NTPC during inspection.

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	ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.): CONVEYOR PULLEYS	STANDARD QUALITY PLAN CONFORMING TO CODE: AS PER NTPC APPRD DRG/DS/TECH SPEC	QP NO.: 0000-999-QOM- S - 088 REV. NO: 00 DATE : 27/11/2017 PAGE 5 OF 5 VALID UPTO : 26/11/2020	REVIEWED BY: M KHALIOUZZAMA K J RAO R K JHA	APPROVED BY:  K K OJHA
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PROCEDURE FOR PULLEY STATIC BALANCING

1. The pulley is put on stand fitted with Anti-Friction Ball Bearing.
2. Rotate the pulley in one direction.
3. Let the pulley come to rest on its own. The pulley comes to rest at a place where its mass is highest due to gravity. Mark this position.
4. Rotate the pulley again in the same direction and allow it come to rest on its own and see, whether the pulley stops at the same marked area.
5. This ensures that imbalance is present at the marked portion.
6. To counteract this imbalance keep the 'weights' 'clamped' to top of the pulley shell opposite to the marked portion and add 'weights'.
7. Repeat stage 2 to 5 by addition or removal of weights to ensure that the pulley comes to rest at different position when rotated every time.
8. Repeat the above by rotating the pulley in opposite direction also.
9. Note the added weight and mark its position.
10. Tack weld equivalent weight on shell inner periphery.
11. Repeat procedure and ensure pulley comes to rest at different position after every rotation.
12. Run weld the added weight and recheck balancing.
13. Total weight added should not be more than that allowed as per approved drawing.

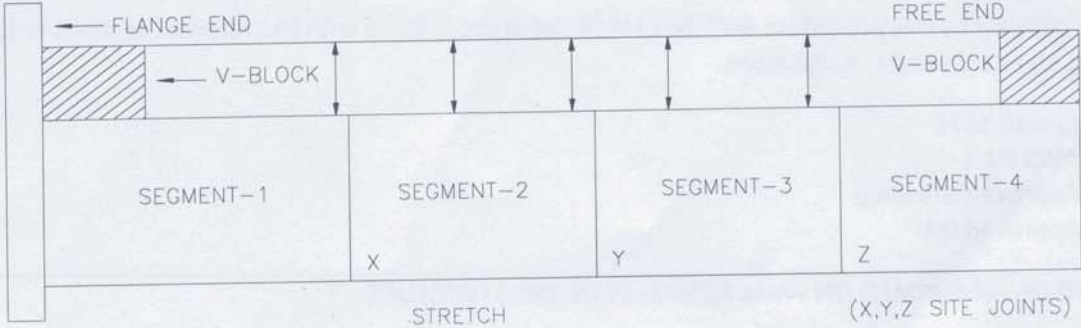
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		MANUFACTURING QUALITY PLAN FOR STRUCTURAL STEEL FABRICATION								Project : NTPC KAHALGAON STPS STAGE-I (4 X 210 MW)						
		ITEM: Conveyor Structure and Silo of MRS (CAT-I)								Page 1 of 2						
										Package : ESP R & M (MRS)						
Cat-I- Built up beams, columns, conveyor gallery, Silo Cat-II- Rolled section, Trestle, Truss, Runner, Bracing, seal plate, mono rail Cat-III- Hand railing, stair case, chequered plate, stool, purlin and other miscellaneous components.																
Sl No.	Components/Stage of Manufacturing	Checks to be performed	Class of Check	Type of check	Quantum of check			Reference DOC	Acceptance Norms	Format of Records	D	Agency			Remarks	
					M	C	N					M	C	N		
A RAW MATERIALS																
A.1	Structural steel Section, Plates	Visual	Major	Visual	100%	100%	100%	Approved Drawing & Relevant material specification	Approved Drawing Relevant material specification	NAN	2019.08.12	CAT IV	P	V	V	1) For Manufacturer TC Annexure-I shall be followed 2) Manufacturer's TC's shall be submitted for review 3) Refer Note-1
		Dimensional check		Measurement	10%	10%	10%									
		Chemical & Mechanical Properties		review of Mfg TC	1 / Heat	1 / Heat	1 / Heat									
		UT on plate >40mm thk		UT report	100%	100%	100%									
A.2	Liner Plate of Silo	Chemical & Mechanical Properties	Major	Mfg TC for Chemical & Mechanical Properties	1 / Heat	1 / Heat	1 / Heat	Approved Drawing/Mfg Drawing	Approved Drawing/Mfg Drawing				P	V	V	
B Welding & Weldors Qualification																
B.1	WPS, PQR & WPQ	Welding parameters, mechanical tests of test specimen	Major	Review of approved document	100%	100%	100%	ASME Section-IX / AWS D1.1	ASME Section-IX / AWS D1.1	WPS, WPQ, PQR format			P	V	V	WPS for similar & dissimilar material shall be approved by Main Contractor/ BV/Lloyd's/TUV, Procedure & welders qualified by TUV shall be deployed
C IN-PROCESS INSPECTION.																
C.1	Fit-up structure	Marking & Cutting	Major	Visual and Dimensions	100%	100%	-	Approved Drawing/Mfg Drawing	Approved Drawing/Mfg Drawing	IR			P	V	-	
		Match marking for trial, assembled components	Major	Visual and Dimensions	100%	100%	-	Approved Drawing/Mfg Drawing	Approved Drawing/Mfg Drawing	IR			P	V	-	
		Weld Fit-up	Major	Visual and Dimensions	100%	100%	-	Approved Drawing/Mfg Drawing	Approved Drawing/Mfg Drawing	IR			P	V	-	
C.2	Pre-heating (If applicable)	Recording pre-heating temperature	Major	Measurement	100%	100%	100%	Approved Drawing/Tech Spec/Approved WPS	Approved Drawing/Tech Spec/Approved WPS	Heat treatment chart			P	V	V	
C.3	Post weld heat treatment (PWHT) If Applicable	Recording temperature periodically	Major	Time & Temperature	100%	100%	100%	Attached Procedure	Attached Procedure	Heat treatment chart			P	V	V	
				LEGEND: Records identified with (v) shall be essentially included by supplier in Q.A. documentation W: Witness, P: Perform, V: Verification, IR=Inspection Report, Mfg. TC=Manufacturer's Test certificate, PT=Liquid Penetrant Examination, RT=Radiographic Examination, UT=Ultrasonic Examination, MT=Magnetic Particle Examination, M: Manufacturer, H, C: BHEL / Authorized inspection agency, N : NTPC							REVIEWED BY BHEL		APPROV. BY NTPC		Seal	
									FOR NTPC USE							

ANNEXURE-I					
Main Contractor/Sub vender procuring the materials	Test Certificates	Invoice (at the time of offering the material)	Test Reports	Requirements of Check Tests	Grade Identification through PMI
Directly from Approved Manufacturer	Yes	Yes	In the name of main contractor/sub-vender	-----	-----
From Authorized Agent See Note-1	Yes	Invoice In the name of agent	In the name of the Agent	Yes Dimensional checks	Yes
From trader (who must source the material directly from authorized agent)	Yes	Invoice In the name of trader issued by the Authorized agent/ Approved Manufacturer	Yes	Yes All the test as per applicable. Code.(expect hydro test)	Yes
Note-1: Authorized Agents: They are the entities who are authorized and decleared by any approved manufacturer to stock, distribute and /or sale of raw material on behalf of the approved manufacturer. Such an authorized agent is to possess letter from approved manufacturer to this effect, a copy of which is to be submitted by main contractor/ sub-vender while seeeking material clearance					

PROCEDURE FOR TRIAL ASSEMBLY OF CONVEYOR AND FABRICATED STRUCTURE

1.0	SCOPE
	This Procedure covers various checks / verification to be carried out for shop fabricated structures. This help in reducing mismatches, rework at site during erection
2.0	STANDARD AND SPECIFICATIONS
	All work covered by this procedure shall be carried out in accordance with the relevant sections of the following standards and specifications. - IS7215:1974 - AWS D1.1 - Approved drawings - Approved QAP
3.0	CHECK TO BE PERFORMED ON TRIAL ASSEMBLY OF THE STRUCTURE
3.1	Weld joints shall be free from surface defect like spatters, slag, undercut etc.
3.2	Trial assembly shall be done for individual column in horizontal condition.
3.3	Up to 40 meters length structure (3 to 5 segments), assembly shall be done in one stretch
3.4	Up to 40 meters length structure the assembly shall be done in 3 to 4 stretches. In this case minimum 4 segments shall be attached together for first stretch, balance segments for second stretch. Segment having free space during assembly of stretch one and two shall be assembled together in third stretch.
4.0	ALIGNMENT CHECK
4.1	The structure lying in horizontal condition shall be leveled with the water level and plumb.
4.2	The fit up shall be done for site weld joints
5.0	DIMENSIONAL TOLERANCES
5.1	TOLERANCE ON LENGTH For girders and beams, tolerance on length shall be as per IS 7215 clause no. 3.2.1 and for columns up to and including 10 meter length: +/- 5mm and above 10 meter length: $0.0005 \times \text{length}$ subject to max 8mm.
5.2	TOLERANCES ON PLUMB AND WATER LEVEL (as per manufacturer's standard)
	Plumb check: 1mm tolerance for 1 meter, limited to maximum 2mm
	Water level check: 1mm tolerance for 10 meters, limited to maximum 5mm.

PROCEDURE FOR TRIAL ASSEMBLY OF CONVEYOR AND FABRICATED STRUCTURE	
5.3	STRAIGHTNESS: Straightness shall be checked with Plano wire, stretched from one end to other end on V-block of equal height and ordinate measured at different location as given below maximum variation from straightness or specified sweep at the midpoint shall be 1mm for 1meter length, subject to maximum of 10mm 
5.4	The gap between top plate& base plate, during trail assembly shall be 3mm max
5.5	Gap between splice joint shall be as per fabrication drawing and tolerance is +/-1mm.
5.6	DOCUMENTATION: Dimensional report shall be prepared and signed by concerned persons.

PROCEDURE FOR ASSEMBLY OF SILO

This procedure includes assembly fitment of Silo in 2 parts as below procedure.

Step-1

- 1) Cylindrical portion:
 - a) All sub-plates will be inspected for dimensional & geometrical accuracy as per the manufacturing drawing
 - b) Fit-up assembly will be done as per the drawing & will be inspected for dimensional & geometrical accuracy as per the manufacturing drawing
- 2) Conical Portion:-
 - a) All sub-plates will be inspected for dimensional & geometrical accuracy as per the manufacturing drawing
 - b) Fit-up assembly will be done as per the drawing & will be inspected for dimensional & geometrical accuracy as per the manufacturing drawing

Step-2

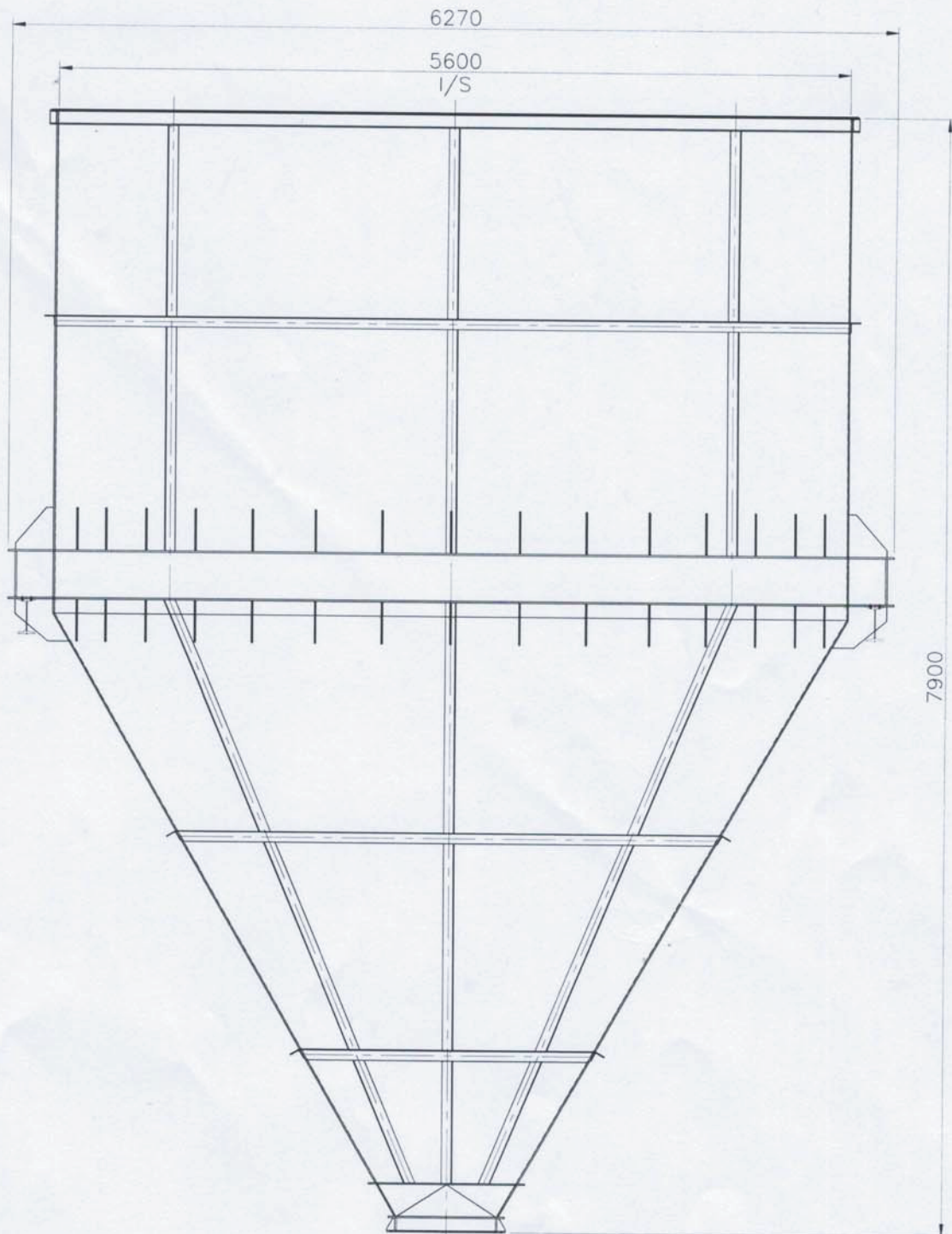
Both the parts i.e Cylindrical & Conical portion will be assembled for trial assembly with help of weld tack. Fitment will be ensured dimensionally & visually.

Dismantle the Cylinder & Conical portion, to be dispatched in 2 parts as Cylinder & Conical portion.

Full welding will be done at site for Cylinder & Conical portion as per the WPS.

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SILO ASSLY.

HEAT TREATMENT PROCEDURE

MATERIAL SPECIFICATION: IS2062 E250 Grade BR	
1.0	Type of Heating: Resistance coil
2.0	No. of thermocouples required and their location: Minimum two thermocouples shall be placed on opposite side at the weld joint
3.0	Minimum width of circumferential heat band to be heated around the structure shall be 3 time thickest part join with weld
4.0	Minimum width insulation band: 12 times wall thickness of thickest part joined
5.0	PWHT Cycle Rate of heating above 300° c : 140° c per hour (Maximum) Holding Temperature : 600° c to 650° c Hold time : 1 hour (Minimum)/60 minutes per 25mm tck, up to 50mm 120 minutes plus 15 minutes for each additional 25mm for above 50mm thickness. Rate of cooling up to 300° c :140° c per hour(Maximum)
6.0	Precaution to be taken during heat treatment: i) Necessary support shall be provided to take care of expansion, contraction, distortion during the heat treatment. ii) Temperature difference between thermocouples: 30 c maximum
7.0	Valid calibration certificates for thermocouples and recorder shall be ensured and copies collected.

PACKAGE/SUB PACKAGE: R&M OF ESP/MILL REJECT SYSTEM PROJECT:KAHALGAON ST-II(4X210 MW)		SUB VENDOR LIST			NTPC DOC NO			
NTPC		QP/ Insp. Cat.	ACCEPTABLE SUPPLIER AS PER DATABASE	PLACE OF MANUFACTURING	REVISION NO			
					DATE			
Sl No.	Item				APPROVAL STATUS	APPROVAL CONDITIONS		
1	FABRIC BELTING (HR GRADE)	I	PHOENIX CONVEYOR BELT	KOLKATA	DR			
		I	IMASS S.A	GREECE	DR			
		I	MRF	CHENNAI	DR			
		I	SEMPELTRAN NIRLON	MUMBAI	A	UP TO 800 MM WIDTH		
		I	HINDUSTAN RUBBER	SILVASA	DR			
		I	NORTHLAND RUBBER	SONEPAT	DR			
		I	SOMI CONVEYOR	JODHPUR	DR			
		I	RAVASCO TRANSMISSION LTD.	VAPI	DR			
		I	ORIENTAL RUBBER	PUNE	DR			
		I	FORECH	CHENNAI	DR			
		I	YOKOHAMA	JAPAN	DR			
		2	IDLERS	II	ELECON	V V NAGAR	A	
II	MBE			KUMARDHUBI	A			
II	KALI			KUMBAKONAM	A			
II	AMPS			JAMSHEDPUR	A			
II	A.ADAK			HOWRAH	A			
II	INDIANA CONVEYOR			PUNE	A	FOR UP TO 50 TPH RATING LIME HANDLING / GYPSUM HANDLING PLANT.		
II	BENGAL TOOLS			KOLKATA	A			
II	V V N MFG			V V NAGAR	A	Upto 150 NB Dia		
II	TKII			HYDERABAD / PUNE	A			
II	PROMAC			BANGALORE	A			
II	L & T - EWL			KANCHEEPURAM	A			
II	ROLLWELL			HINDUPUR	A			
II	OEM				DR			
2A	PIPES FOR IDLERS IS 9295			III	MAIN CONT. APPRD SOURCES			SUBJECT TO VALID BIS LICENCE
2B	BEARINGS FOR IDLERS			III	MAIN CONT. APPRD SOURCES	HOSUR	N	
3	PULLEYS	II	ELECON	V V NAGAR	A			
		II	PROMAC	BANGALORE	A			
		II	MBE	KUMARDHUBI	A			
		II	BENGAL TOOLS	KOLKATA	A			
		II	TNS HEAVY	CHENNAI	A			
		II	INDIANA CONVEYOR	PUNE	A	FOR UP TO 50 TPH RATING LIME HANDLING / GYPSUM HANDLING PLANT.		
		II	KALI	THIRUBUVANAM	A			
		II	TKII	HYDERABAD / PUNE	A			
		II	L & T - EWL	KANCHEEPURAM	A			

SI No.	Item	Q/ Insp. Cat.	SUB VENDOR LIST		NTPC DOC NO	APPROVAL CONDITIONS
					REVISION NO	
					DATE	
	PACKAGE/SUB PACKAGE: R&M OF ESP/MILL REJECT SYSTEM PROJECT:KAHALGAON ST-I(4X210 MW)					
3A	RUBBER LAGGING FOR PULLEYS	II	ACCEPTABLE SUPPLIER AS PER DATABASE	PLACE OF MANUFACTURING	APPROVAL STATUS	
		II	V V N MFG	V V NAGAR	A	Upto 800 NB Dia
		II	OEM		DR	
		II	ROLLWELL	HINDUPUR	A	
		Refer Resp Eqpt QP.	RISHI INDUSTRIES	SONEPAT	A	
			WAHEGURU	KOLKATA	A	
			SUDEEP RUBBER	V V NAGAR	A	
			DEBDIP RUBBER	KOLKATA	A	
			CORI RUBBER	CHENNAI	A	
			PRADEEP RUBBER	CHAKULA	A	
			PRESIDENCY RUBBER	KOLKATA	A	
			THEJO ENGG	CHENNAI	A	
			CENTURY RUBBER	KOLKATA	A	
3B	BEARING FOR PULLEYS	III	MAIN CONT. APPRD SOURCES			
4	HELICAL GEARBOX	I	SHANTI GEARS	COIMBATORE	A	Upto size 560
		I	ELECON	V V NAGAR	A	
		I	SIEMENS	CHENNAI	A	
		I	PREMIUM TRANSMISSION LTD	PUNE/FALTA	A	Up to size 710 / 450
		I	SIEMENS (FLENDER)	GERMANY	A	
		I	NEW ALLENBURY WORKS	KOLKATA	A	
5	FLUID COUPLING (SCOOP AND TRACTION TYPE)	I	FLUIDOMAT	DEWAS	A	Scoop type upto SC-1330
		I	PTL	AURANGABAD	A	SCOOP TYPE UPTO PST 1150
		I	ELECON	V V NAGAR	A	Scoop type upto model ESC 760. 1. As part of Type test M/s Elecon will demonstrate Scoop tube in & Scoop tube out 1000 times on first coupling of each model. 2. M/s Elecon will conduct full load test for each type and model of coupling as per approved quality plan.
6	GEARED COUPLING	I	VOITH	HYDERABAD	A	SCOOP TYPE UPTO SVNL 1330
7	FLEXIBLE COUPLINGS	III	MAIN CONTRACTOR APPROVED SOURCES			
8	SECTOR GATE & ROD GATE(CAT-III FOR ROD GATE)	III	MAIN CONTRACTOR APPROVED SOURCES			
9	SUMP PUMP	I/III	OEM		DR	
		II	MCNALLY SAYAJI	BANGALORE	A	up to 80 M3/hr capacity and head up to 25 MWC
		II	SAM TURBO	COIMBATORE	A	

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					DATE	
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		II	KISHORE PUMPS	PUNE	A	
		II	SU MOTORS	MUMBAI	A	
		II	AQUA MACHINERY	AHMEDABAD	A	
		II	FLOWMORE PUMP	GHAZIABAD	A	
		II	DARLING PUMP	INDORE	A	
10	CI GATE/GLOBE/CHECK VALVES (Upto 600 NB PN 16)(Main Contractor Approved source with inspection category-III up to 600 NB & Class 300)	II	LEADER	JALANDHAR	A	GATE 300NB AND PN16,GLOBE 150 NB AND PN16 & 450NB PN10,CHECK 600NB CLASS #150
		II	A V VALVES	AGRA	A	UPTO 500 NB PN16
		II	H SARKER	HOWRAH	A	
		II	BANKIM	HOWRAH	A	
		II	KBL	KONDHAPURI	A	SWING CHECK UP TO 600 MM
		II	HAWA ENGINEERS	AHMEDABAD	A	
		II	WEIR BDK	HUBLI	A	Conventional CCS Gate / Globe / Check Valves up to 600MM and Class # 1500, CSS Gate/ Globe/ Check Valves up to 200MM and Class # 600, up to 500MM and class #300 , FCS Gate / Globe / Check Valves up to 50MM and Class # 2500.
11	CS/ FS GATE/GLOBE/CHECK VALVES (CS upto 600 NB Class 150, FS upto 50 NB class 800)(Main Contractor Approved source with inspection category-III up to 600 NB & Class 300)	II	LEADER	JALANDHAR	A	CS GATE 600MM CLASS#600, SS GLOBE 600MM CLASS#600, CS CHECK 600MM AND CLASS#600
		II	OSWAL INDUSTRIES	AHMEDABAD	A	ONLY FOR CCS VALVES UPTO 300 NB
		II	FOURESS	AURANGABAD	A	
		II	FOURESS	THANE	A	CS 600 NB CL 150, 500 NB CLASS 300, 400NB CLASS 600 AND 50NB CLASS 800.

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		II	BHEL IVP	GOINDWAL	A	GATE UP TO 600NB CLASS 150, 500 NB CLASS 300, 300 NB CLASS 600. GLOBE 250 NB CLASS 400, CHECK 500 NB CLASS 150, 300 CLASS 300,150NB CLASS 600.
		II	HITECH ENGG PVT LTD	AHEMDABAD	A	250 NB CLASS 150, 50 NB CLASS 800.
		II	STEEL STRONG	RABALE	A	GATE VALVE- CS UPTO 600NB, SS UPTO 300NB; GLOBE VALVE- CS/SS UPTO 300NB; CHECK VALVE- CS UPTO 600NB, SS UPTO 250NB
		II	KSB PUMPS LTD	COIMBATORE	A	300NB CLASS 2500.
		II	HAWA ENGINEERS	AHMEDABAD	A	CS UPTO 450NB, CLASS #300, 500NB CLASS 150 AND SS 300NB CLASS 300, FCS / FSS 50 NB CLASS 800.
		II	NITON VALVES INDIA PVT LTD	NAVI MUMBAI / AURANGABAD	A	CS GATE 900 NB CLASS 600, GLOBE 400 CLASS 300, CHECK 300 NB CLASS 600.
		II	L&T VALVES LIMITED	COIMBATORE	A	650 MM CLASS 600, 50 NB CLASS 800.
		II	WEIR BDK	HUBLI	A	Conventional CCS Gate / Globe / Check Valves up to 600MM and Class # 1500, CSS Gate/ Globe/ Check Valves up to 200MM and Class # 600, up to 500MM and class #300 , FCS Gate / Globe / Check Valves up to 50MM and Class # 2500.
12	CHAIN PULLEY BLOCK	II	TRACTEL TIRFOR	PALWAL	A	UPTO 20 TON
		II	LIFTING EQUIPMENT	DELHI	A	UPTO 12 TON

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		II	ACCEPTABLE SUPPLIER AS PER DATABASE	PLACE OF MANUFACTURING	APPROVAL STATUS	
		II	ARMSEL	BANGALORE	A	UPTO 5 TON
		II	CENTURY CRANE ENGINEERS PVT. LTD	BALLABHGARH	A	UPTO 7.5 TON
		II	HERCULES HOIST	RAIGAD	A	UPTO 15 TON
13	EOT CRANE / ELECTRIC HOIST (upto 25 Tons for both)	I	REVA INDUSTRIES	FARIDABAD	A	
		I	EDDY CRANE	PUNE	A	UPTO 10 TON
		I	CONSOLIDATED HOIST	SATARA /PUNE *	A	*PUNE FOR ELECTRIC HOIST UPTO 15 TONS
		I	ELECTROTHERAPY	RISHRA	A	UPTO 15 TON FOR ELECTRIC HOIST ONLY
		I	HERCULES HOIST	RAIGAD	A	UPTO 15 TON FOR ELECTRIC HOIST ONLY
		I	TUBRO FERGUSSON	KOLKATA	A	UPTO 5 TON FOR ELECTRIC HOIST
		I	PRAYAS ENGG (PBL)	V V NAGAR	A	UPTO 10 TON FOR ELECTRIC HOIST ONLY
		I	CRANEX	GHAZIABAD	A	UP TO 35 T CAPACITY EOT CRANE ONLY. GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.
		I	ALPHA SERVICES	ALWAR	A	SINGLE GIRDER EOT CRANE & ELECTRIC HOIST UPTO 15 TON ONLY. GEARBOX FROM NTPC APPROVED SOURCES.
		I	CENTURY CRANE ENGINEERS PVT. LTD	BALLABHGARH	A	GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.
		I	ARMSEL	BANGALORE	A	UPTO 10 TON EOT & UPTO 15 T ELECTRIC HOIST
		I	TRACTEL TIRFOR	PALWAL	A	UPTO 15 TON FOR ELECTRIC HOIST AND UPTO 10 TON FOR EOT
		I	MILLARS INDIA	KARAMSAD	A	
		I	AVON CRANES	GURGAON	A	
		I	GRIP ENGINEERS	HYDERABAD	A	GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.
		I	GRIP ENGINEERS	FARIDABAD	A	UPTO 20 TON ELECTRIC HOIST ONLY
14	ALLOY STEEL/CARBON STEEL FORGINGS	Refer	INDIAN FORGING AND STAMPING	JAMSHEDPUR	A	
		Resp	HINDUSTAN FORGE	MUMBAI	A	
		Eqpt	BAY FORGE	CHENNAI	A	
		QP.	VIKRANT FORGINGS	KOLKATA	A	
			SAIL	DURGAPUR	A	