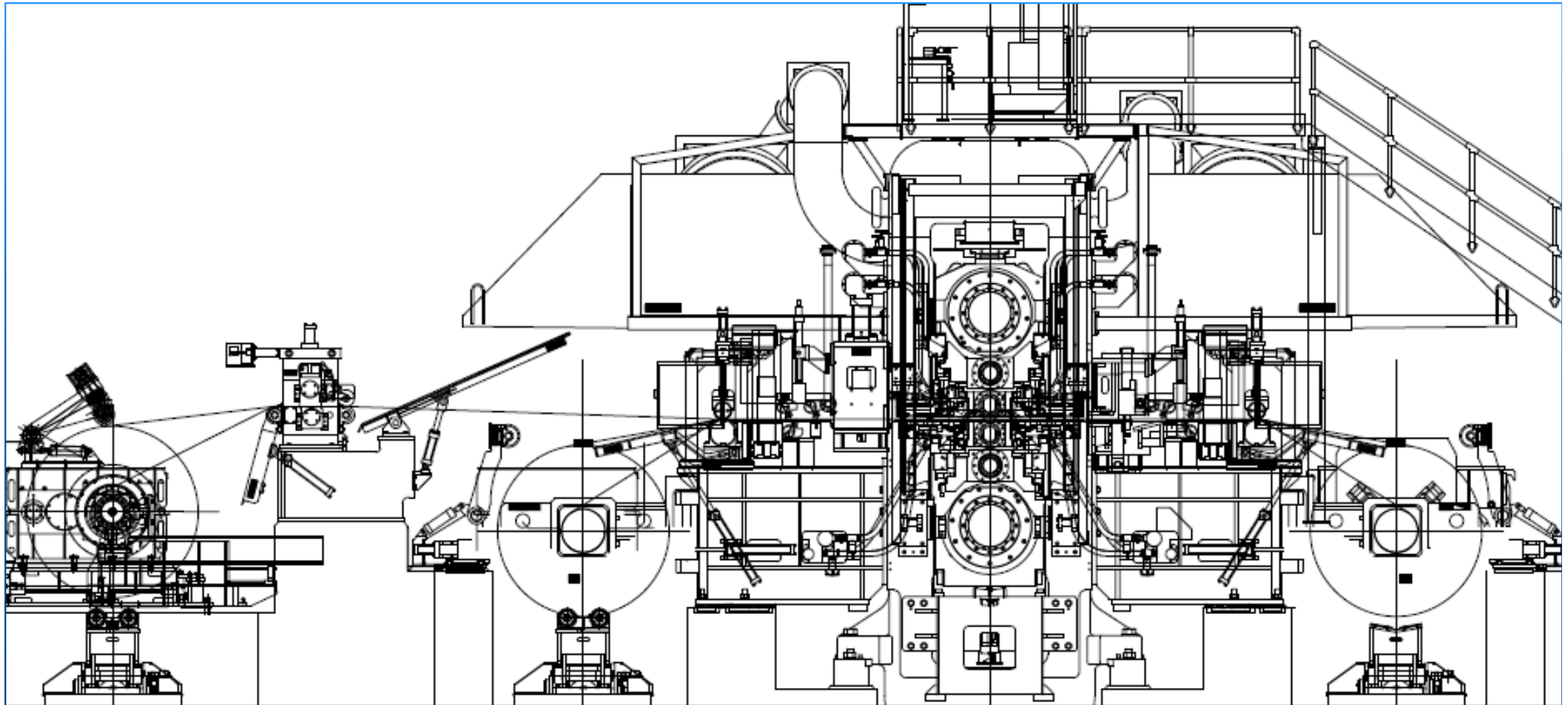




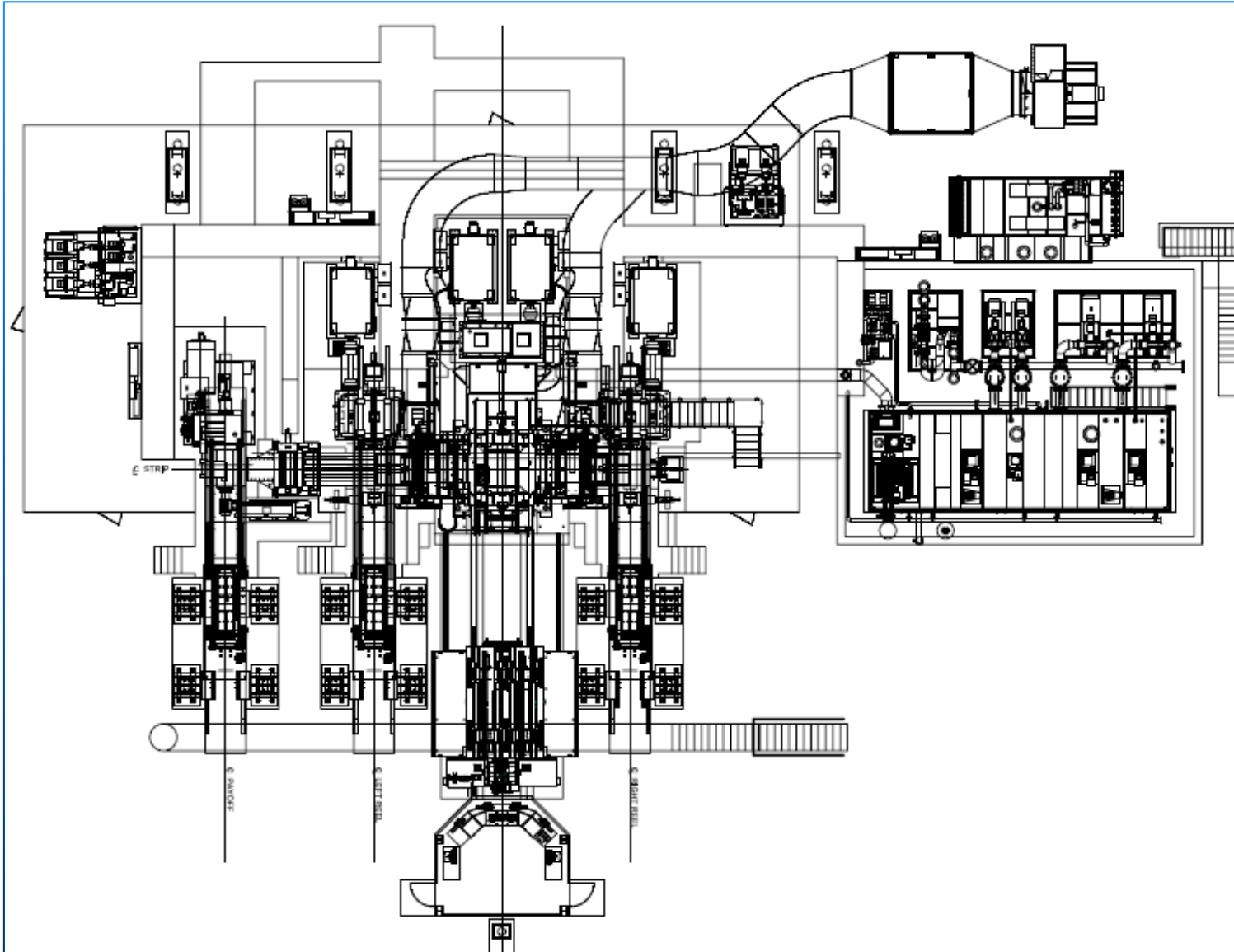
Cold Rolling Mill

Cold Reversing Mill



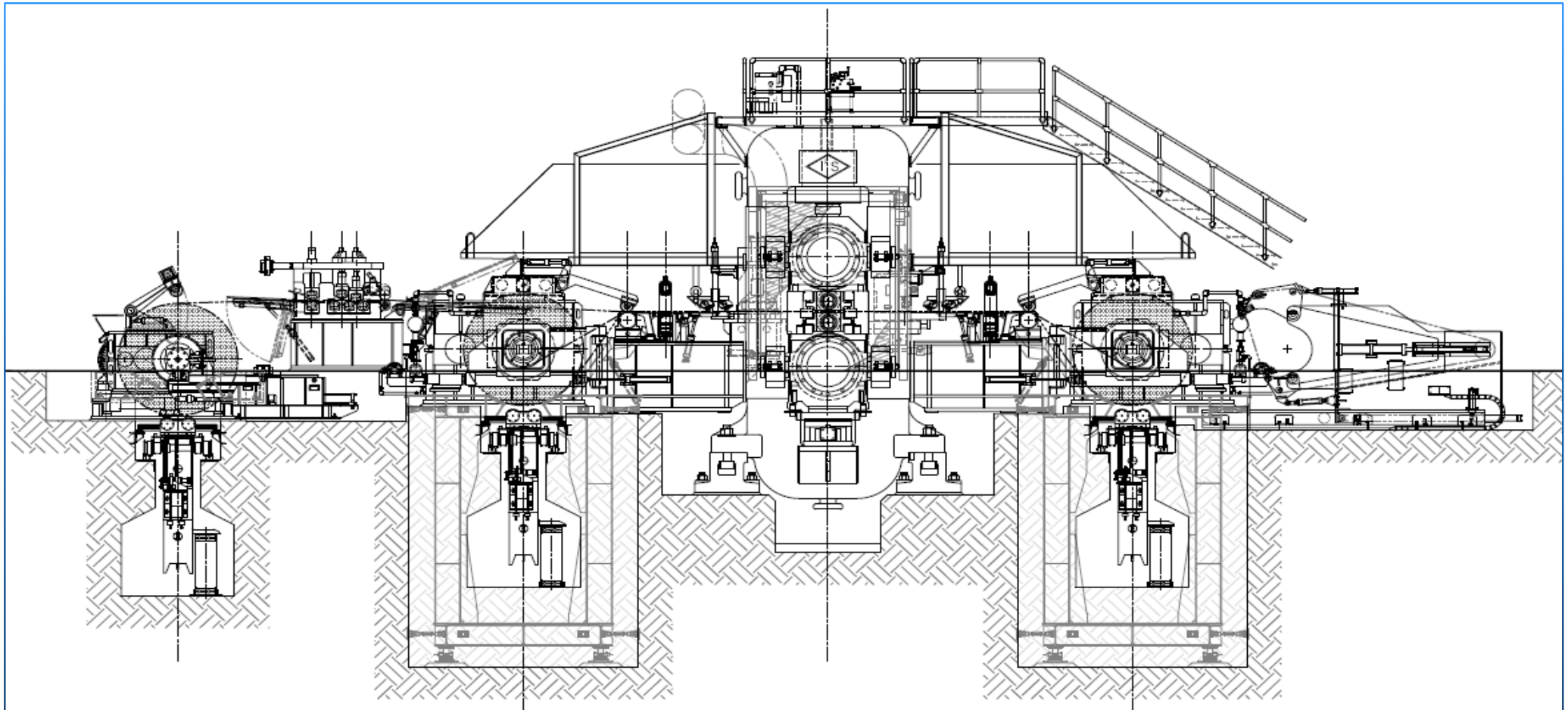
Incoming Coil Thickness range = 3,2 – 1,4 mm
Outgoing Coil Thickness range = 1,8 – 0,14 mm
Yearly Capacity = 180.000 Tons

Cold Reversing Mill



Main Power:
Pay Off = 350 kW
Stand = 2 x 1900 kW
Tension Reel (each)= 1900 kW
Max Speed = 1400 m/min

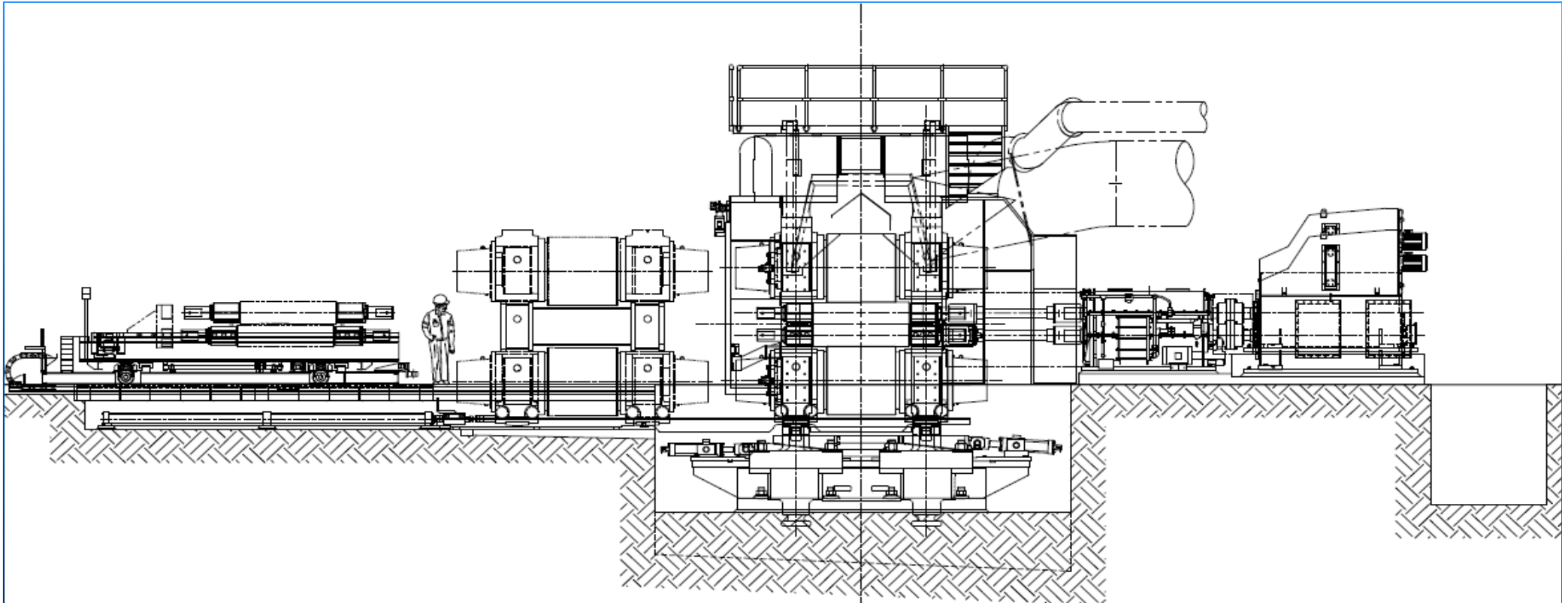
Cold Reversing Mill



Work Roll Size: 400 mm x 1430 mm
Backup Roll Size: 1250 mm x 1430 mm
Separating Force: 1800 Tons
Mill Speed: 1250 m/min

Mill Stand Features: Hydraulic Screw-down, Roll Bending- Mae West, Roll Changer, Pass-Line Wedge Adjustment, Spindle Supports, Side Guides & Pressure Board, USC Zone Controlled Coolant Sprays, Doctor Knife, & Backup Roll Wipers, Upper Work Roll Air Wipers

Cold Reversing Mill

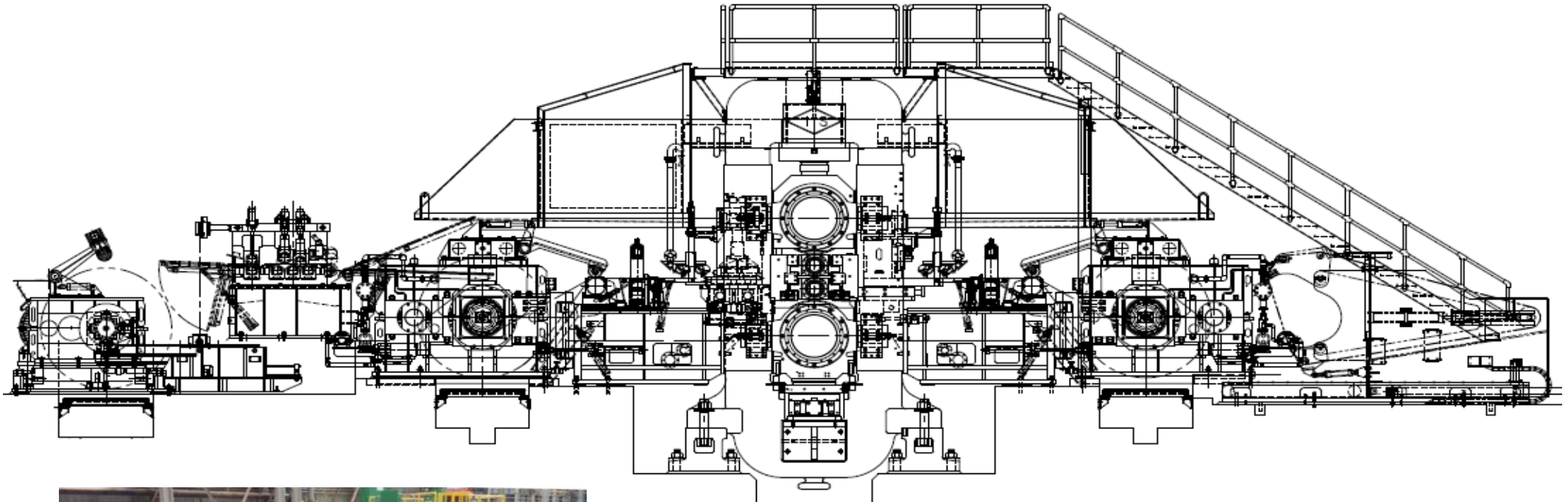


Line Features: Exit Shear, X-Ray Gauges, Air Knives for strip drying, Semi Automatic Coil Banding System, Coil Weighing & Label Printing System, Entry & Exit Flipper Tables, ABB Shape Measurement Rolls, Entry & Exist Load Cell Tensiometers

Cold Reversing Mill

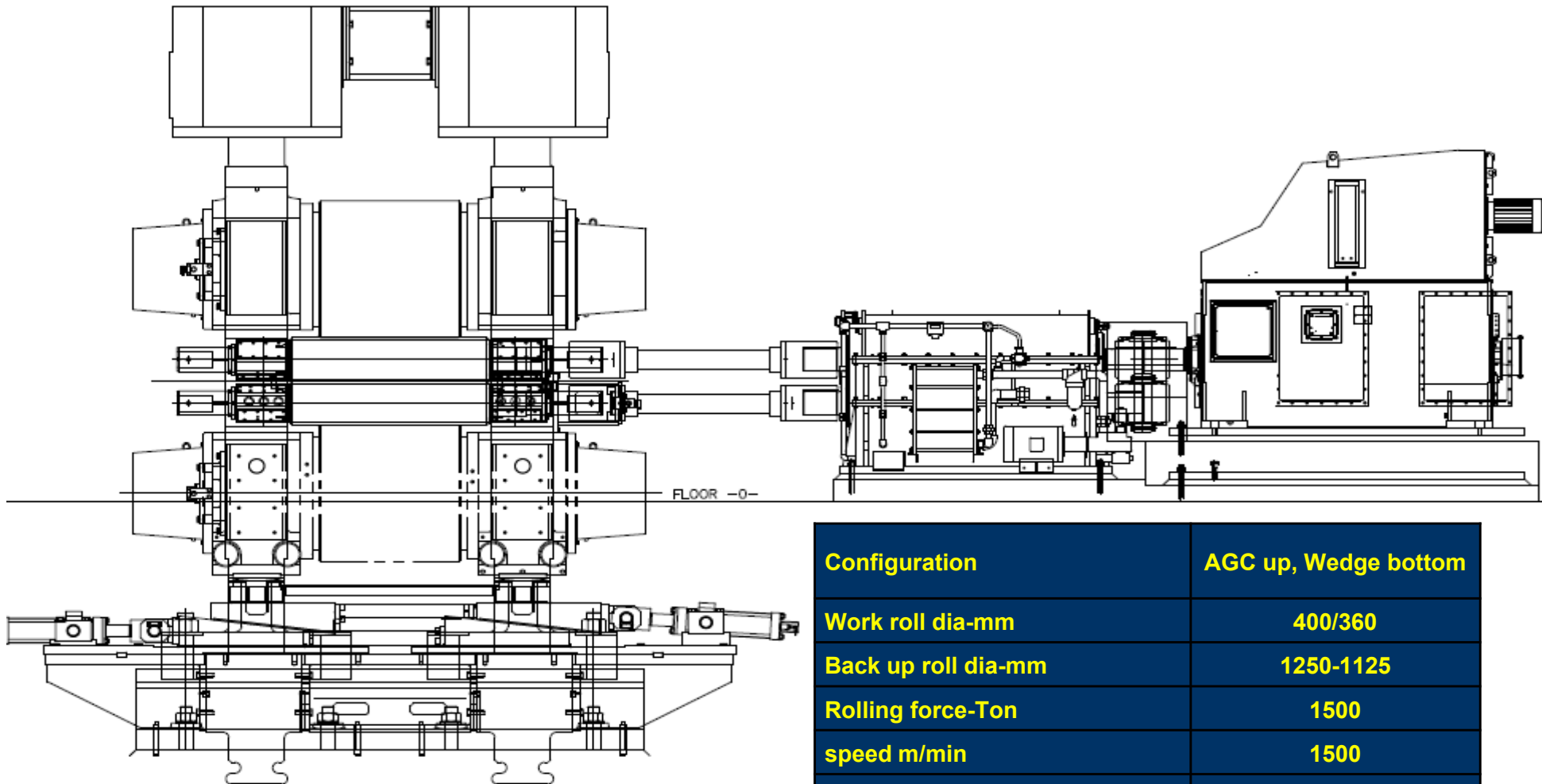


Cold Reversing Mill



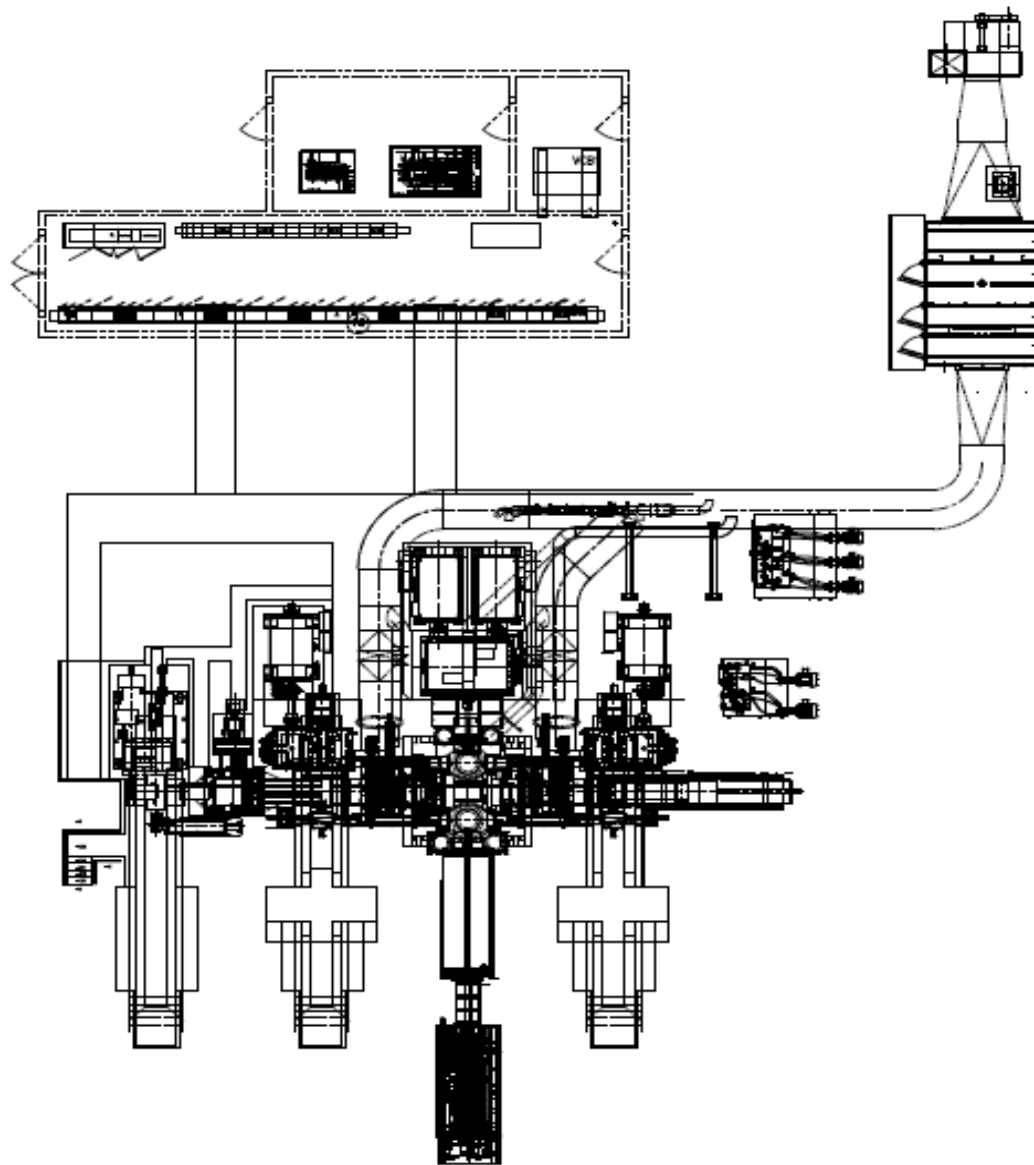
steel grades	CQ-DQ
coil weight ton	25
max entry thk- mm	2,5
min entry thk-mm	0,7
max exit thk-mm	0,5
min exit thk-mm	0,15

Cold Reversing Mill: Main Features



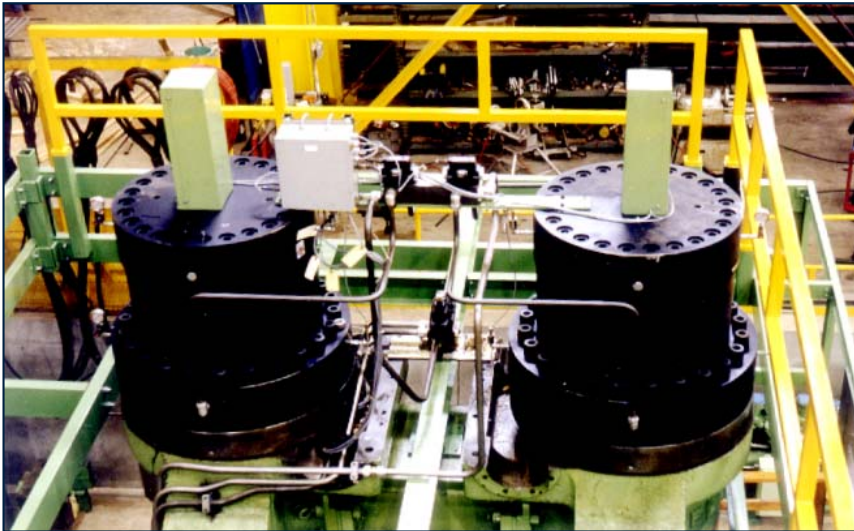
Configuration	AGC up, Wedge bottom
Work roll dia-mm	400/360
Back up roll dia-mm	1250-1125
Rolling force-Ton	1500
speed m/min	1500
coolant lpm	6500
Motor power -kW	2*2100
motor speed-rpm	0-464/1695

Cold Reversing Mill: Main Features



pay off dia.-mm	610
pay-off reel range -mm	575-635
pay off dia.ext-mm	2100
pay-off reel tension Kg	6500 kg @ 420 m/min
Pay-off speed- m/min	420
pay off reel installed power-kW	450
pay-off motor speed-rpm	0-725/2400
gear ratio-i	12,25 :1
tension reel dia ext-mm	2100
tension reel dia int-mm	610
tension reel tension Kg	11866 kg @ 1150
tension reel tension Kg	8561 kg @ 1500
tension reel installed power-kW	2100
tension reel motor speed-rpm	0-464/1695
gear ratio-i	2,354 : 1
tension reel range mm	597-611

Cold Reversing Mill: Main Features



Screwdown hydraulic power unit

Reservoir Capacity	1,135 liter
Supply Pumps Rating	150 lpm - 260 bar
Supply Pump Motors	75 kW @ 1450 rpm
Cooling Loop Pumps	60 lpm - 7 bar

Auxiliary hydraulic power unit

Reservoir Capacity	2,500 liter
Supply Pumps Rating	280 lpm - 100 bar
Supply Pump Motors	50 kW - 1450 rpm
Cooling Loop Pumps	100 lpm - 7 bar

Oil Mist Lubrication System

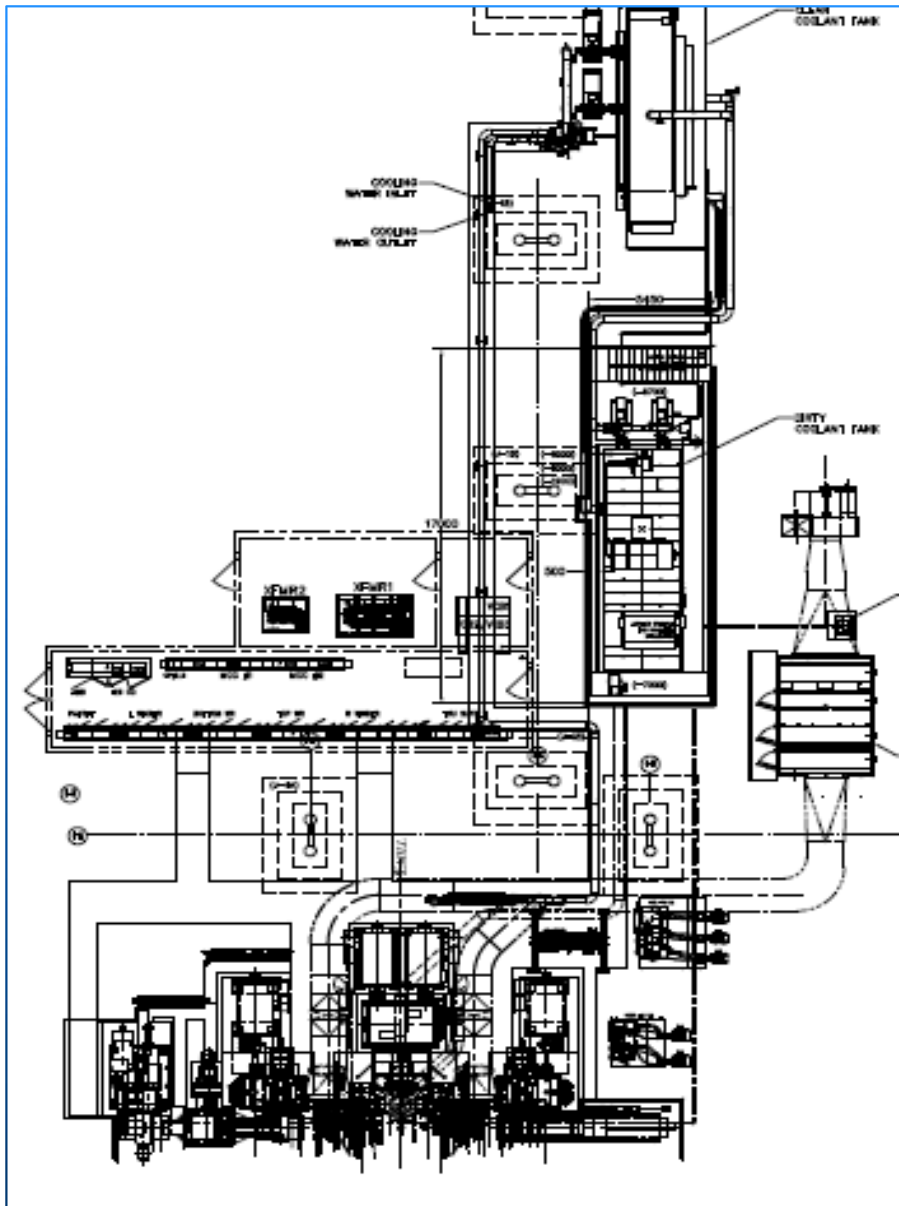
Two oil mist lubrication system for backup rolls.
Each System includes 13.6 liter capacity reservoir

Gear lubrication system

consisting of three individual systems for two winder gear cases and one for the pinion stand directly mounted on gear cases.



Cold Reversing Mill: Cooling System



Roll Cooling System

Type of Oil Emulsion 2% ~ 5% oil

Flow Rate to sprays 6500 lpm

Max pressure at nozzles 5 bar

Max temperature 45°C

Filtration degree 5 ~ 10 micron

Clean Oil Tank Capacity 65000 liters

Dirty Oil Tank Capacity 70000 liters

7,000 lpm filter pumps (1 operating - 1 standby), each driven by a 50 kW @ 1500 rpm AC motor

7,000 lpm Flat Bed Pressure Filter complete with controls and two (2) rolls of filter media

Plate- frame type heat exchanger sized to cool 6500 lpm rolling solution to 38 ~ 40° C

Oil Skimmers Inc. tramp oil skimmer (in dirty oil tank only).

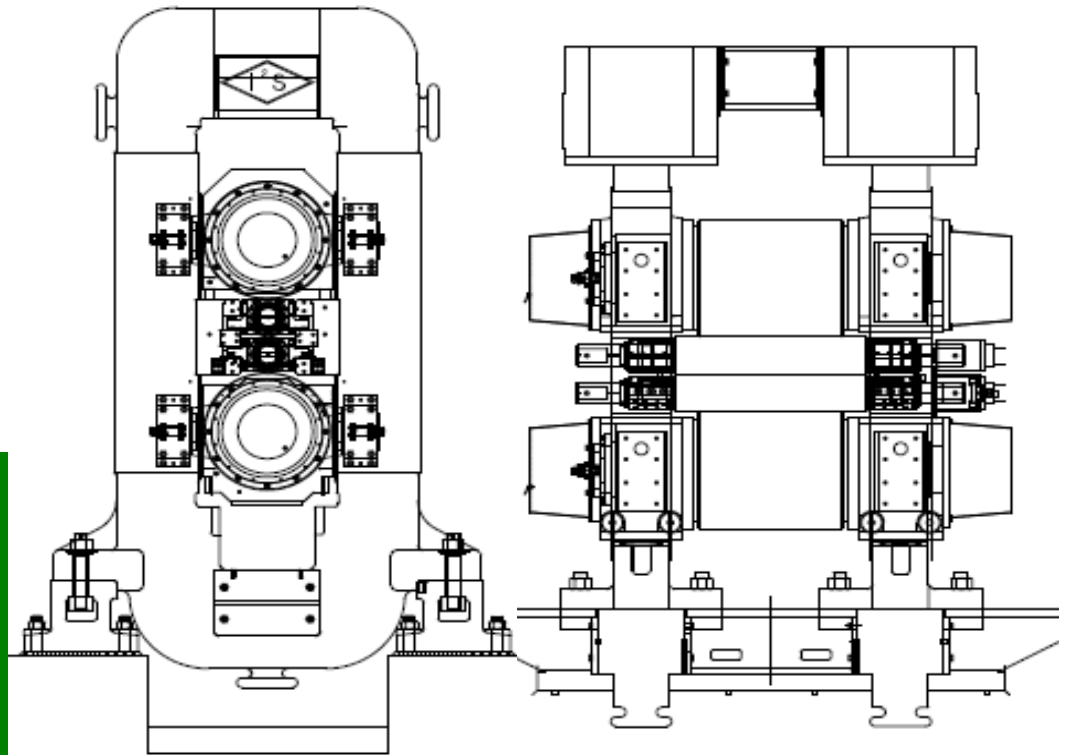
Magnetic separator is located around the dirty oil tank.

Fume Exhaust System

Capacity 70,000 m³/hr at 2.0 kPa (200mm W.C.)

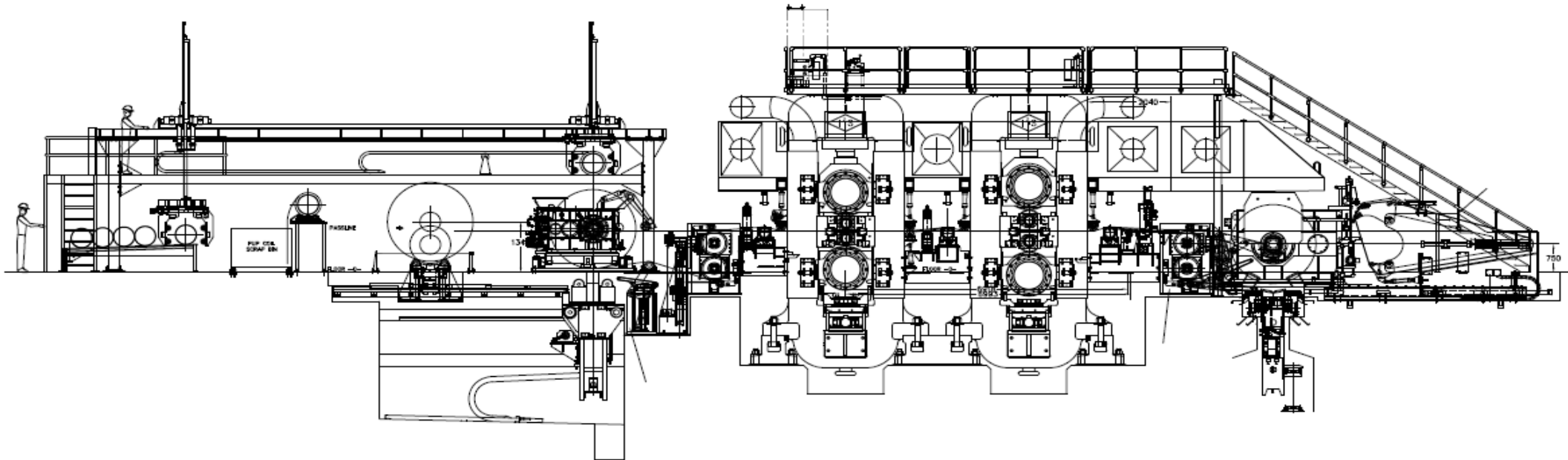
Motor rating 65 kW

Cold Reversing Mill



Housing Material	Cast Steel
Work Rolls	Forged alloy steel, hardened and ground.
Work Roll Bearings	Four row tapered roller type, grease lubricated.
Work Roll Chocks	Forged steel
Work Roll Hardness	Body: 94/98 Shore "C", Necks: 40/45 Shore "C"
Work Roll Bearing Lubrication	Grease
Backup Rolls	Cast alloy steel, hardened and ground
Backup Roll Bearings	Four row tapered roller type, oil mist lubricated.
Backup Roll Chocks	Cast steel machined
Backup Roll Material	Cast Alloy Steel
Backup Roll Hardness	Body: 70/75 Shore "C", Necks: 40/45 Shore "C"

Cold Reversing Mill

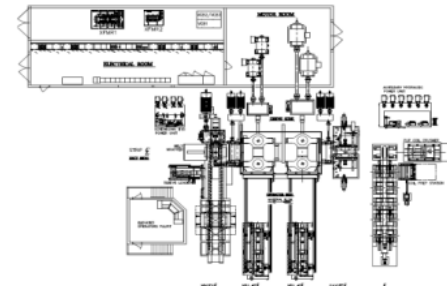
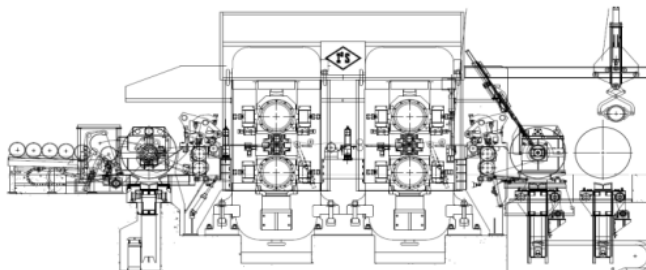


2 Stand Temper Mill DCR – 410 and 560 & 1250, 1200 Ton each, 1500 m/min

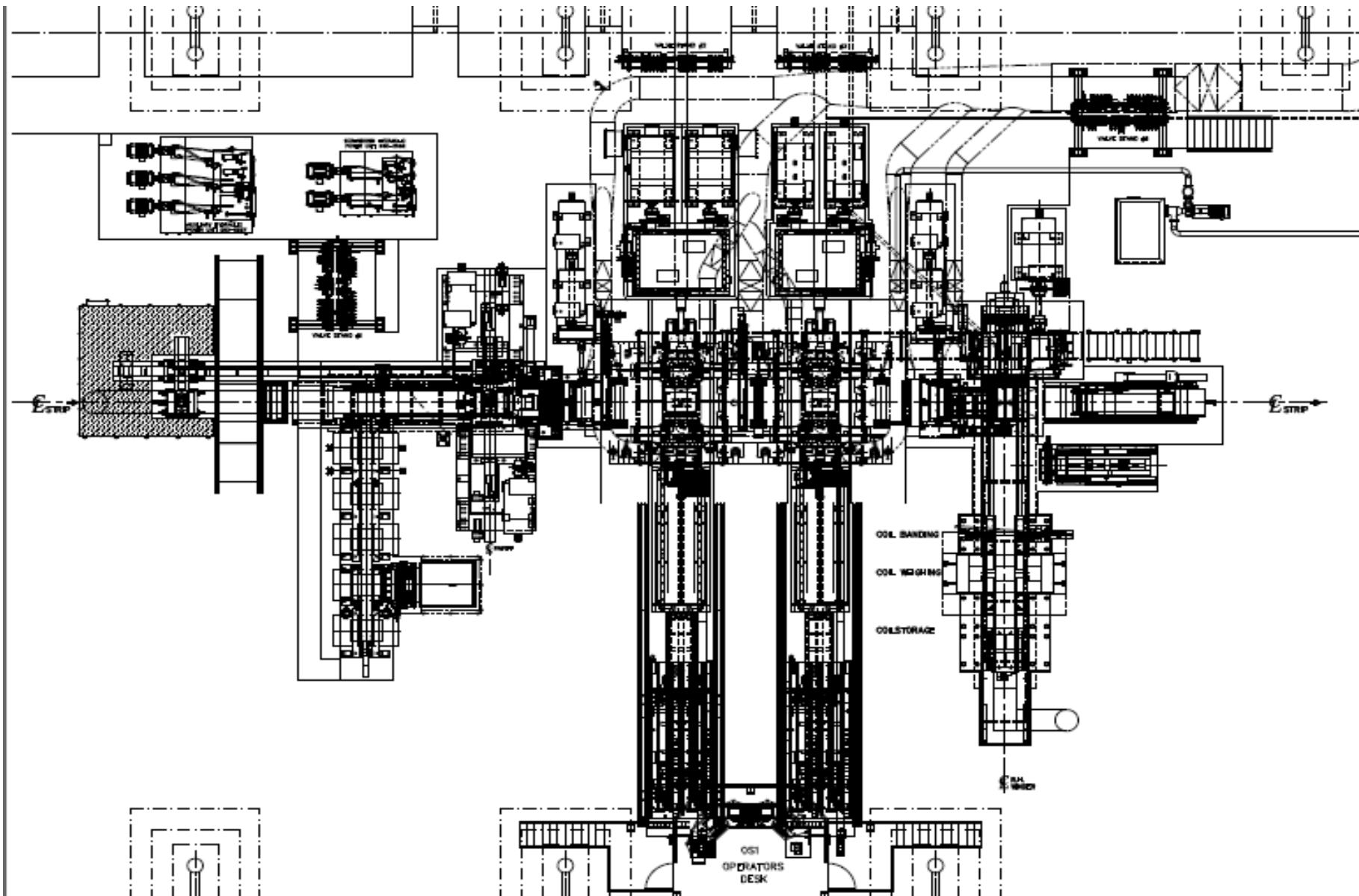
Main motors power (kW)= 2 x 275+300+450+2x1500+2x750+450+300+550= 7100 kW

Cold Reversing Mill

Operation	2-Stand 4-Hi Temper & Double Reduction Mill (CQ, DQ, DDQ)	Entry S-Bridle Rolls (2 rolls)	
Thickness		Roll Diameter	510 mm
Temper Rolling	0.15 mm, min. ~ 1.0 mm, max.	Drive Motor #1	300 kW @ 936 rpm
Double Reduction	0.2 mm, min. ~ 0.75 mm, max. (incoming) 0.15 mm, min. ~ 0.6 mm, max. (outgoing)	Drive Motor #2	450 kW @ 936 rpm
Width	700 mm, min. ~ 1,050 mm, max.	Roll Speed	1,500 mpm max.
Coil Size		Tension (Bridle#2 ~ Mill)	51 kN max. (approx.)
Inside Diameter	508 mm	Mill Stand #1	
Outside Diameter	1,000 ~ 2,100 mm max. (including sleeve)	Drive Motor	2 x 1,500 kW @ 485/1,326 rpm
Maximum Weight	25 ton (including sleeve)	Pinion Stand	1 : 1 (2-inputs, 2-outputs)
Work Roll Diameter:		Mill Speed	0 / 549 / 1500 mpm
Temper Mill (both Stands)	510 mm ~ 560 mm	Mill Stand #2	
Double Red. Mill (Stand #1)	360 mm ~ 400 mm	Drive Motor	2 x 750 kW @ 520/1,400 rpm
(Stand #2)	510 mm ~ 560 mm	Pinion Stand	1.5 : 1 (2-inputs, 2-outputs)
Backup Roll Diameter:		Mill Speed	0 / 557 / 1500 mpm
For both Temper & DR mill	1,140 mm ~ 1250 mm	Exit S-Bridle Rolls (2 rolls)	
Roll Face	1,200 mm (approx.)	Roll Diameter	510 mm
Roll Separating Force	12,000 kN each stand	Drive Motor #1	450 kW @ 936 rpm
Payoff		Drive Motor #2	300 kW @ 936 rpm
Mandrel Diameter	508 mm	Roll Speed	1,500 mpm max.
Drive Motor	2 x 275 kW @ 700 / 2,400 rpm	Tension (Mill ~ Bridle#1)	51 kN max. (approx.)
Gear Reducer	2.89 : 1 (approx.)	Winder	
Tension Max.	22 kN to 1,500 mpm	Mandrel Diameter	508 mm
		Drive Motor	550 kW @ 700 / 2,400 rpm
		Gear Reducer	2.89 : 1 (approx.)
		Tension Max.	22 kN to 1,500 mpm



Cold Rolling Mill



Cold Rolling Mill



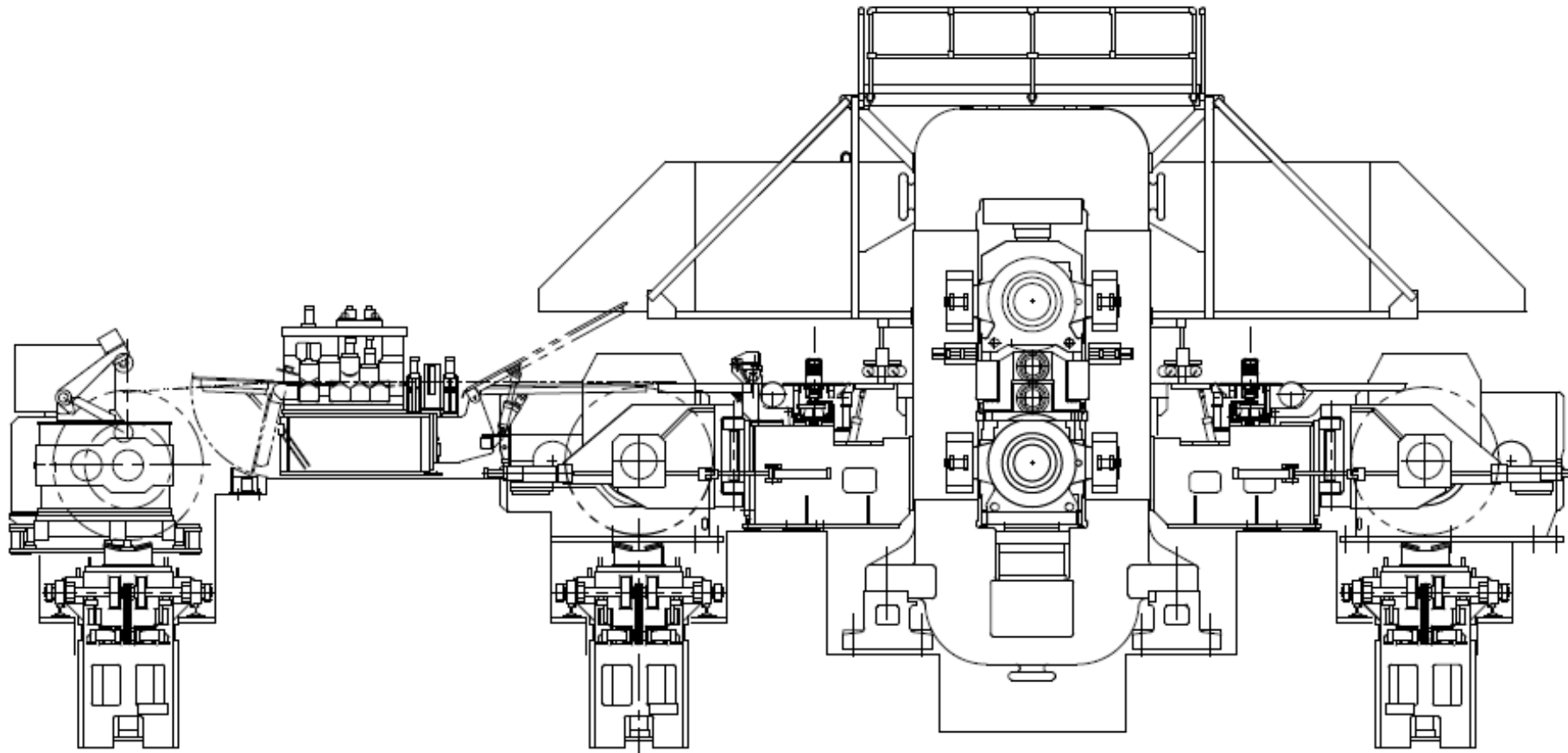
Cold Rolling Mill



Cold Rolling Mill

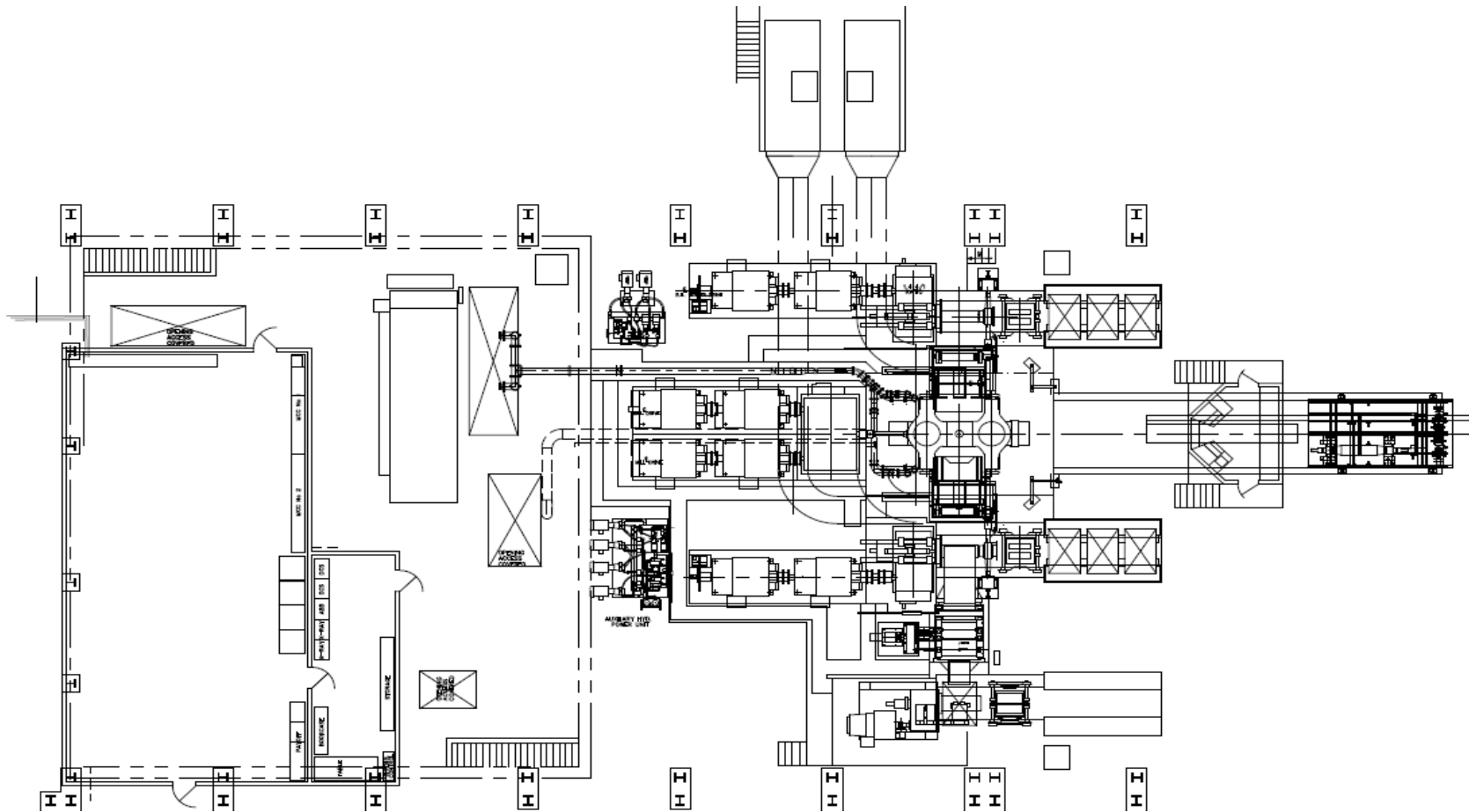


Cold Rolling Mill



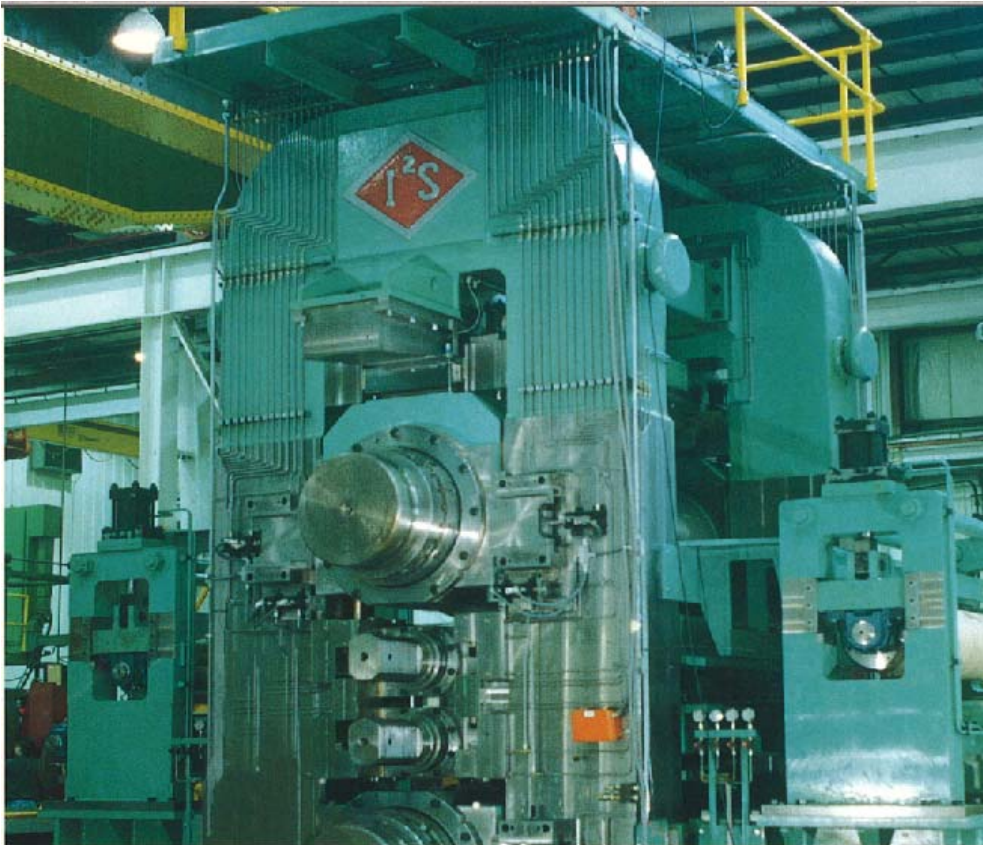
Material: Low Carbon Steel
Strip Width: Max. 1250mm Min. 700mm
Entry Gauge: Max. 3.2mm
Exit Gauge: Min. 1.8mm to 0.18mm x 1220mm
Max Coil Size: 610mm I.D. x 1905mm O.D.
Coil Weight: 25 M Tons Max.

Cold Rolling Mill



Mill Speed: 0 / 417 / 1250 MPM
Mill Drive: 4 x 1750 HP @ 300 / 900 RPM
Winder Drives: 2 x 1750 HP @ 300 / 1080 RPM
Payoff Drive: 500 HP @ 500 / 1500 RPM

Cold Rolling Mill



4-hi Temper Mill –
444 & 1067 X 2133 mm
1 to 10 mm



4 Hi Temper mill – CTL
– 533 & 1245 x 2743 mm -USA

Cold Rolling Mill

WR 340/310mm x 1150 mm
IR 400/360mm x 1310 mm CVC
BU 1000/900mm x 1150 mm
Design Separation Force 1000 tons, actual load is always less than 600 tons
Main Drive Motor 1600 kW *2; Speed: 200 rpm/1200 rpm
Winder Motor 800 kW * 2; Speed: 200 rpm/1200 rpm
Design Separation Force 1000 tons

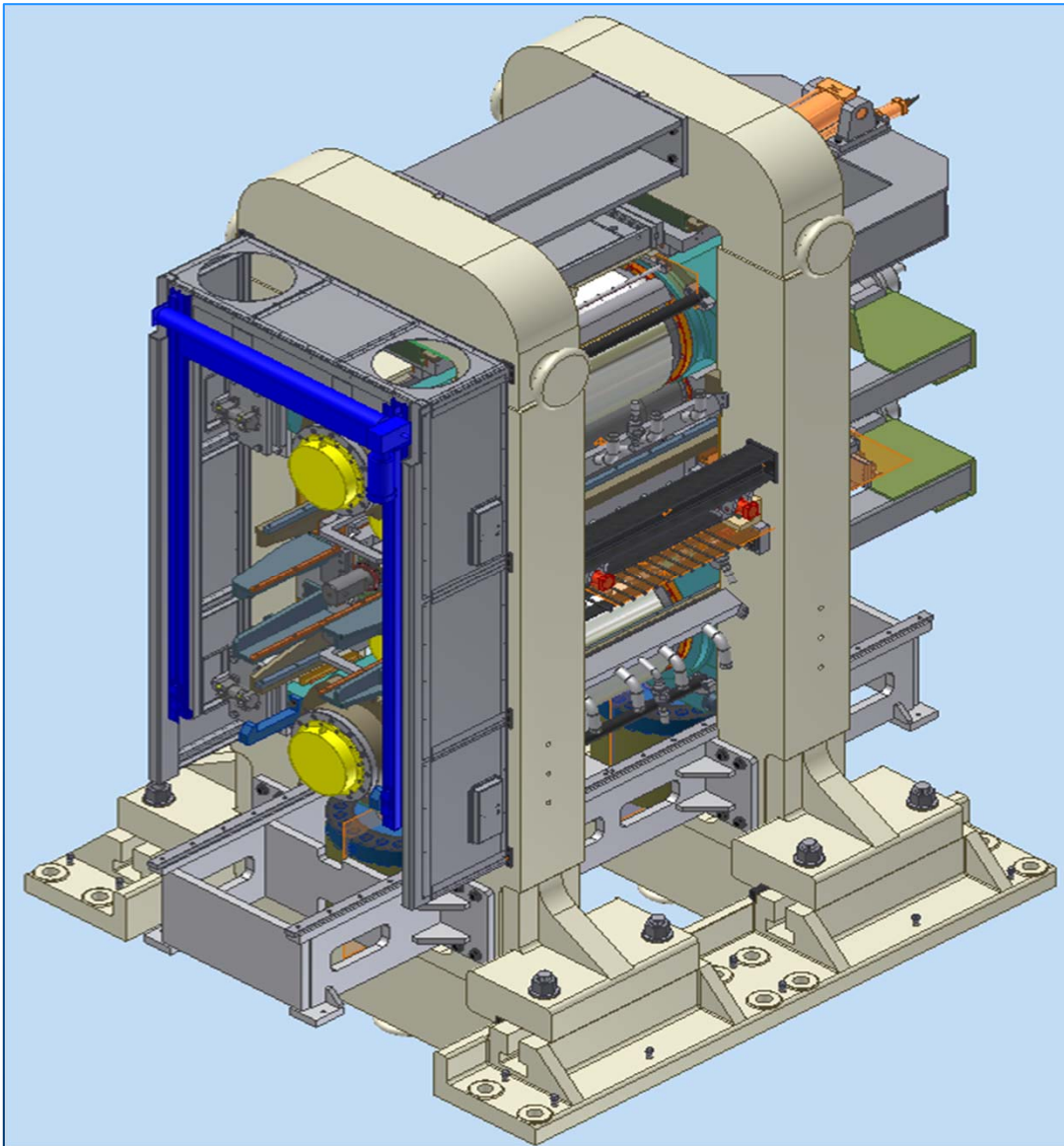


Rolling Schedule

Pass	Entry thickness (mm)	Exit thickness (mm)	%Reduction	Speed(mpm)
1	1,60	0,99	38%	300
2	0,99	0,61	38%	700
3	0,61	0,38	38%	850
4	0,38	0,24	37%	850
5	0,24	0,15	38%	900
6	0,15	0,097	35%	900

The recipe provides a very good set up. Together with quality incoming coils, the mill runs very smoothly and provides good quality on shape (visual observation).





Mill Stand Configuration:

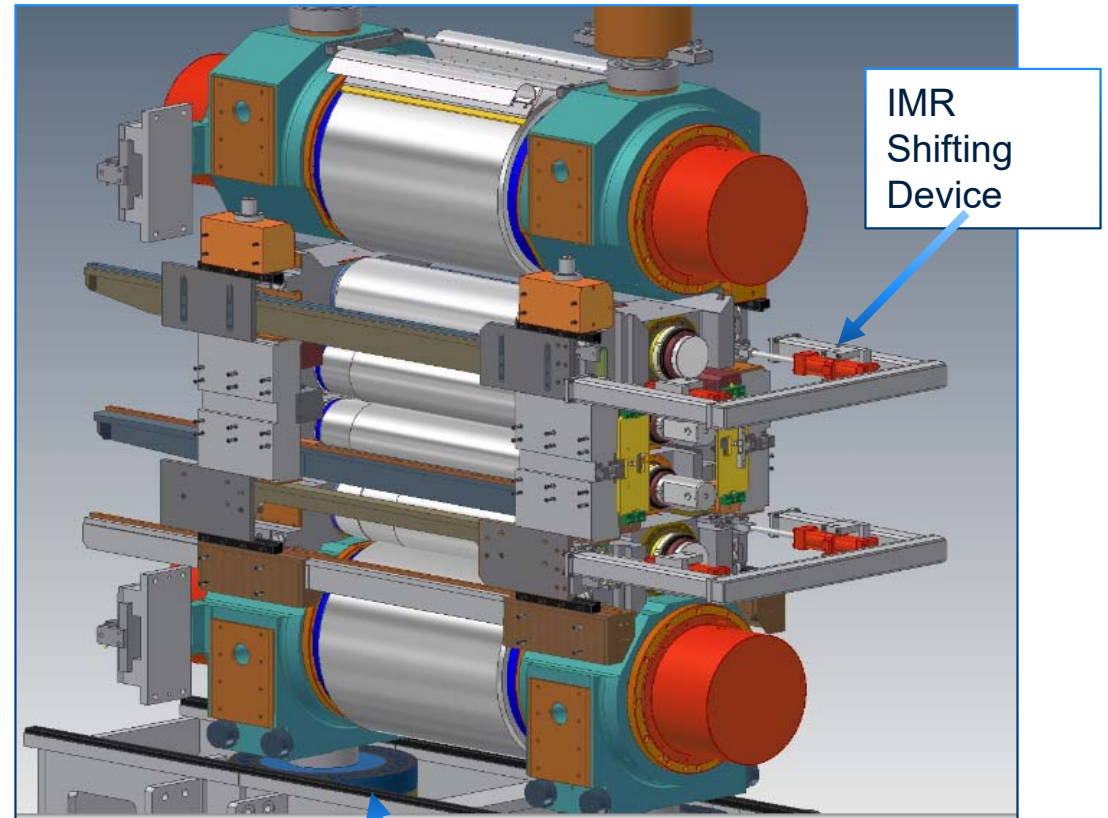
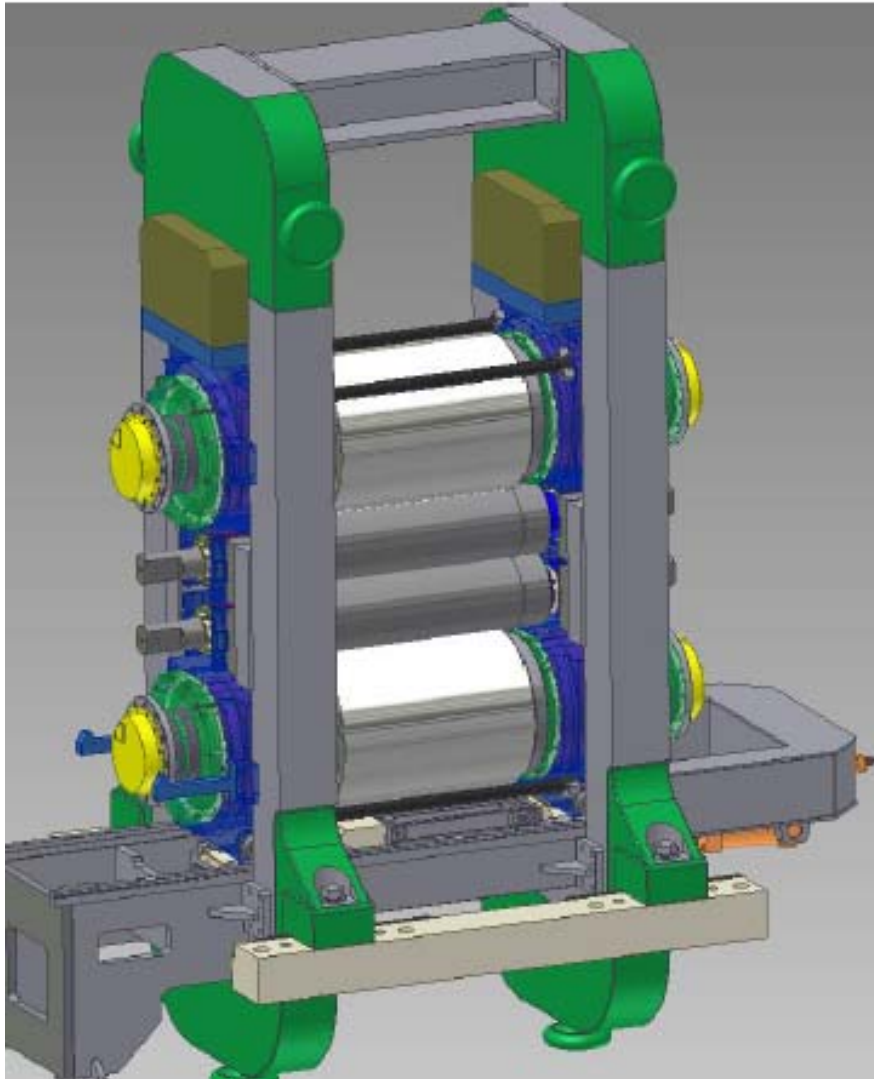
Reversing four or six high mill stand equipped with:

- Bottom mounted hydraulic roll gap cylinders,
- Work & Intermediate roll Bending System,
- Intermediate Roll Lateral Side Shifting,
- Top mounted Pass Line Adjustment Device (wedge and step),
- Side shifting work and intermediate roll changing device.

Housings are made of cast steel, which together with top and bottom spacers, are keyed and bolted together. Columns are machined on sides. Replaceable steel liners are mounted on the four housing column wearing surfaces. Mill stand is mounted on bed rails.

Nominal Rolling Force: 1300 Tons

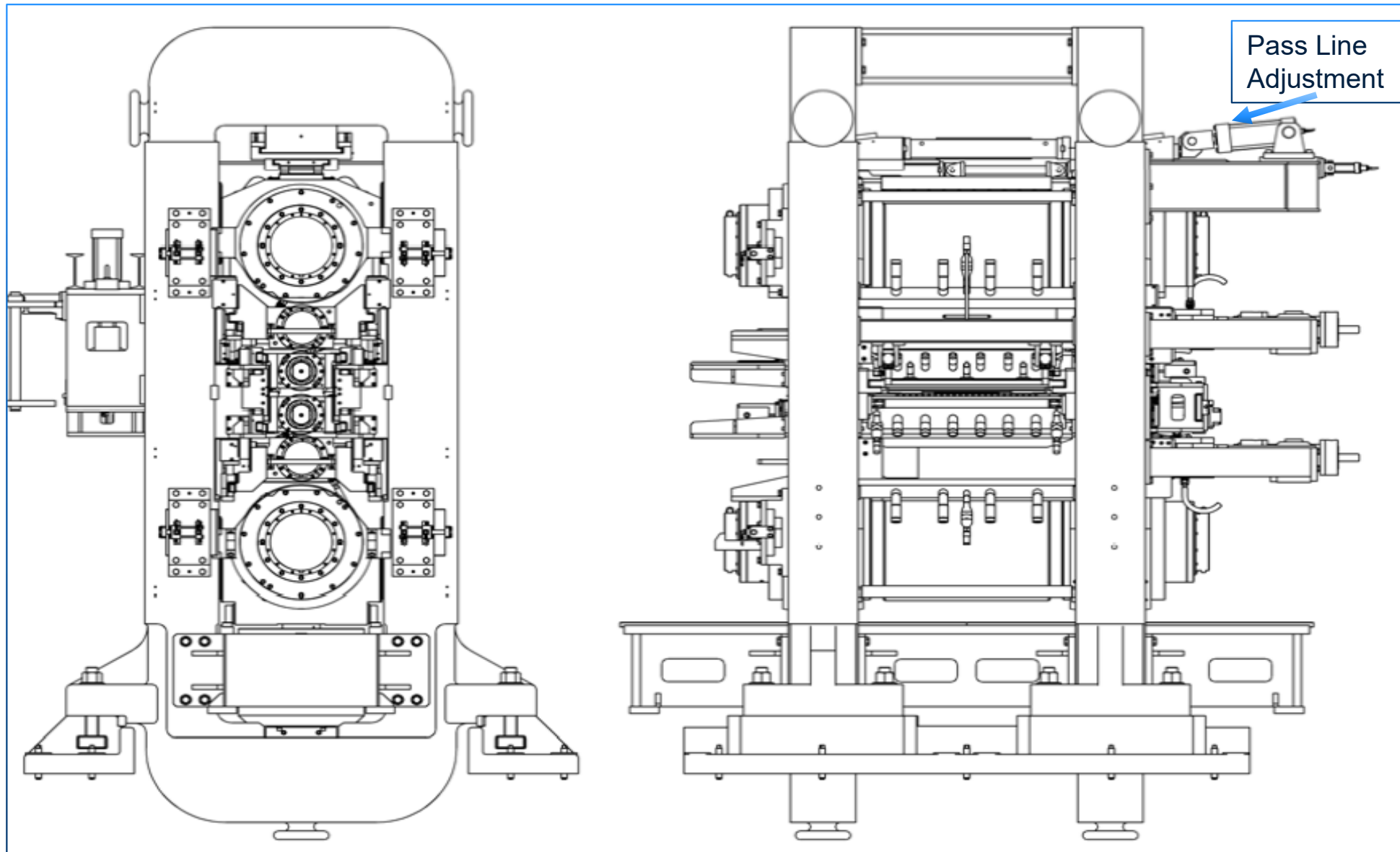
Cold Rolling Mill



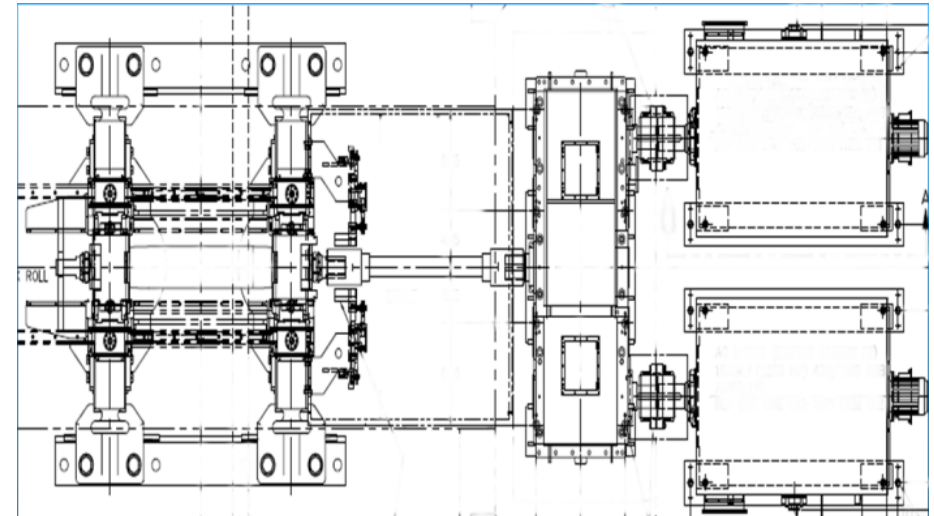
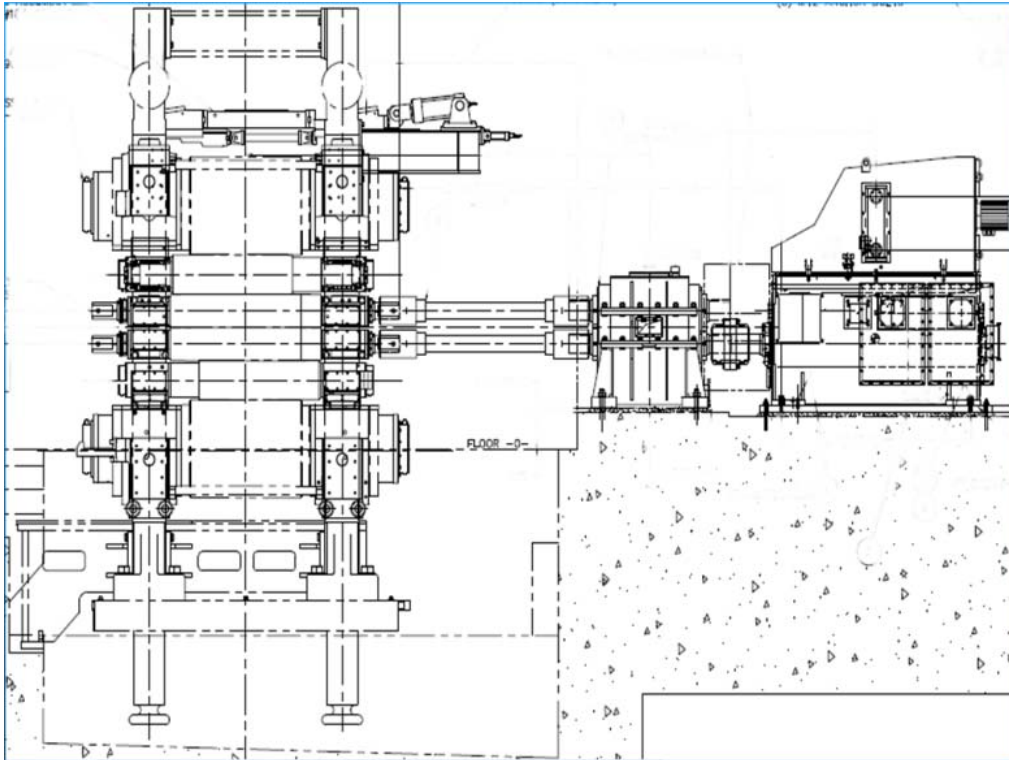
AGC
Cylinders

IMR
Shifting
Device

Reversing Cold Reduction Mill: Mill Stand

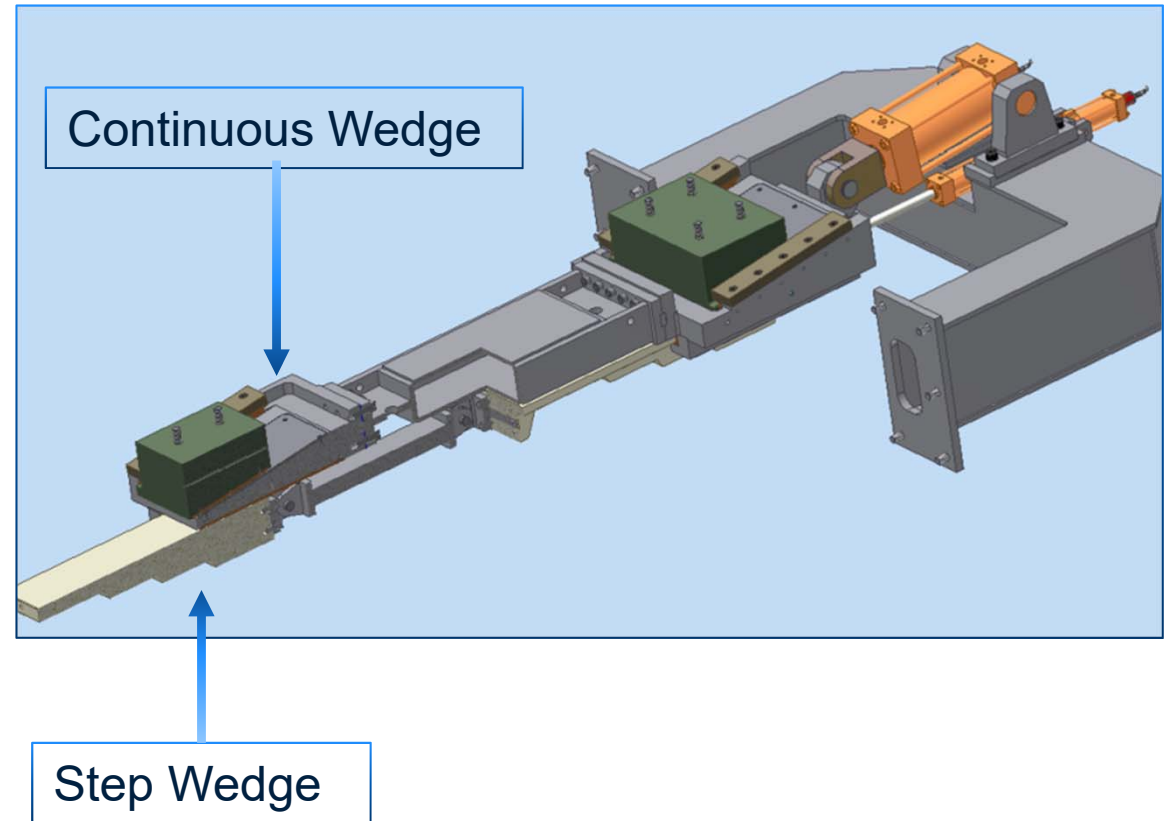
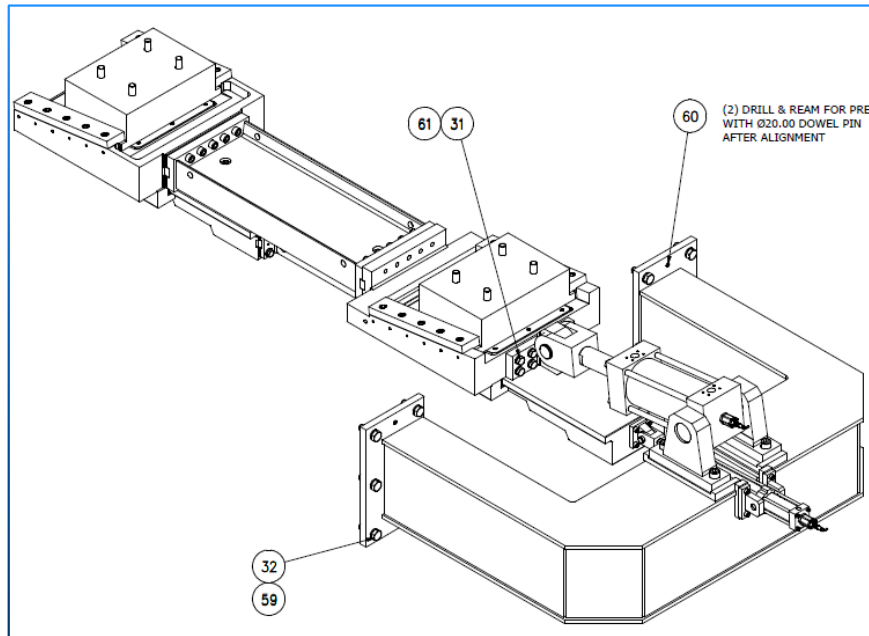


Cold Rolling Mill: Drive System



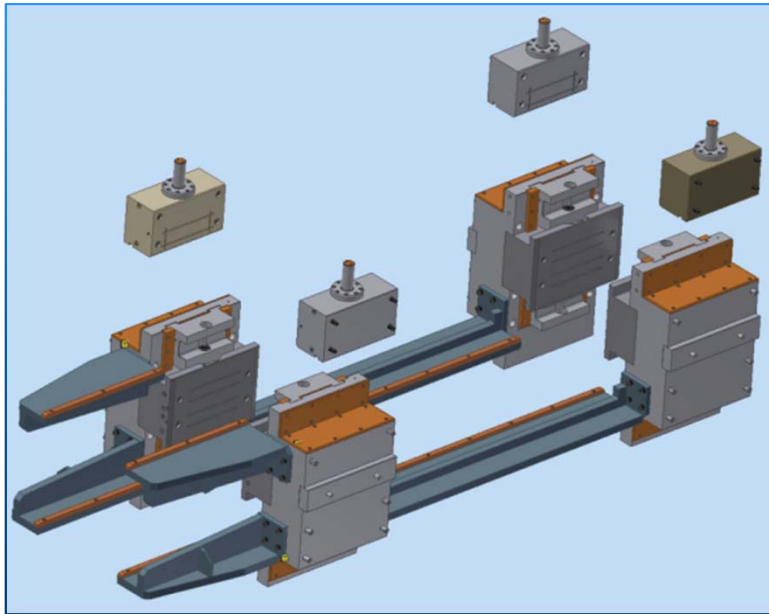
Drive System is made via Work Rolls. Upper and lower Work Roll are both driven by (2) variable speed AC Motors through a gear reducer. All gearing is heat treated alloy steel and rotates in anti-friction bearings.. Drive Spindles are universal type. Spindle support is supplied on the drive side of the Mill for use during roll changing.

Cold Rolling Mill: Pass-Line Control



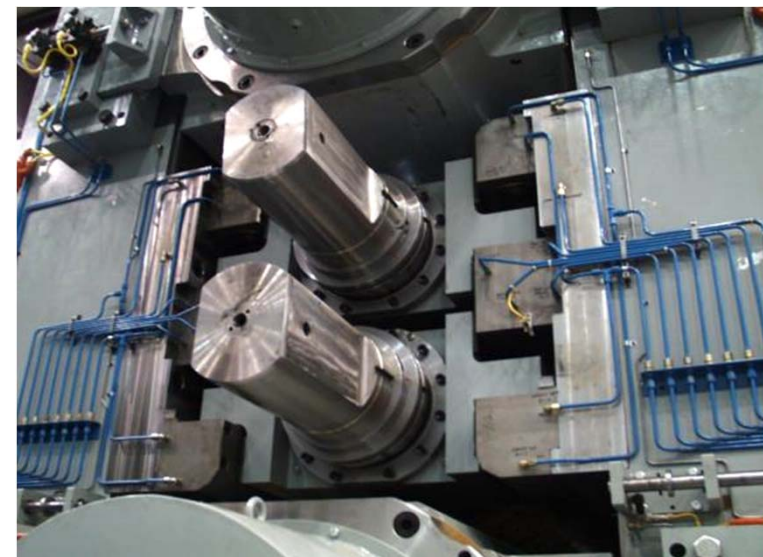
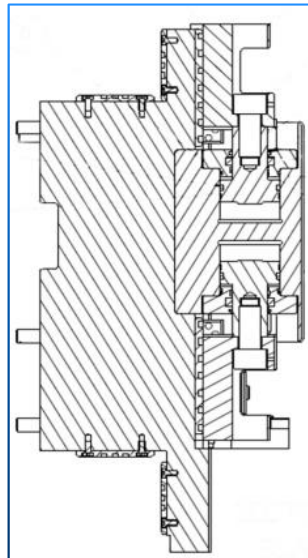
Pass line adjustment is with step & wedge arrangements. Steps provide incremental adjustment and wedges provide fine adjustment within all required range. This type of arrangement permits to minimize space. Pass line adjustment is operated by hydraulic cylinders.

Cold Rolling Mill: Bending Blocks

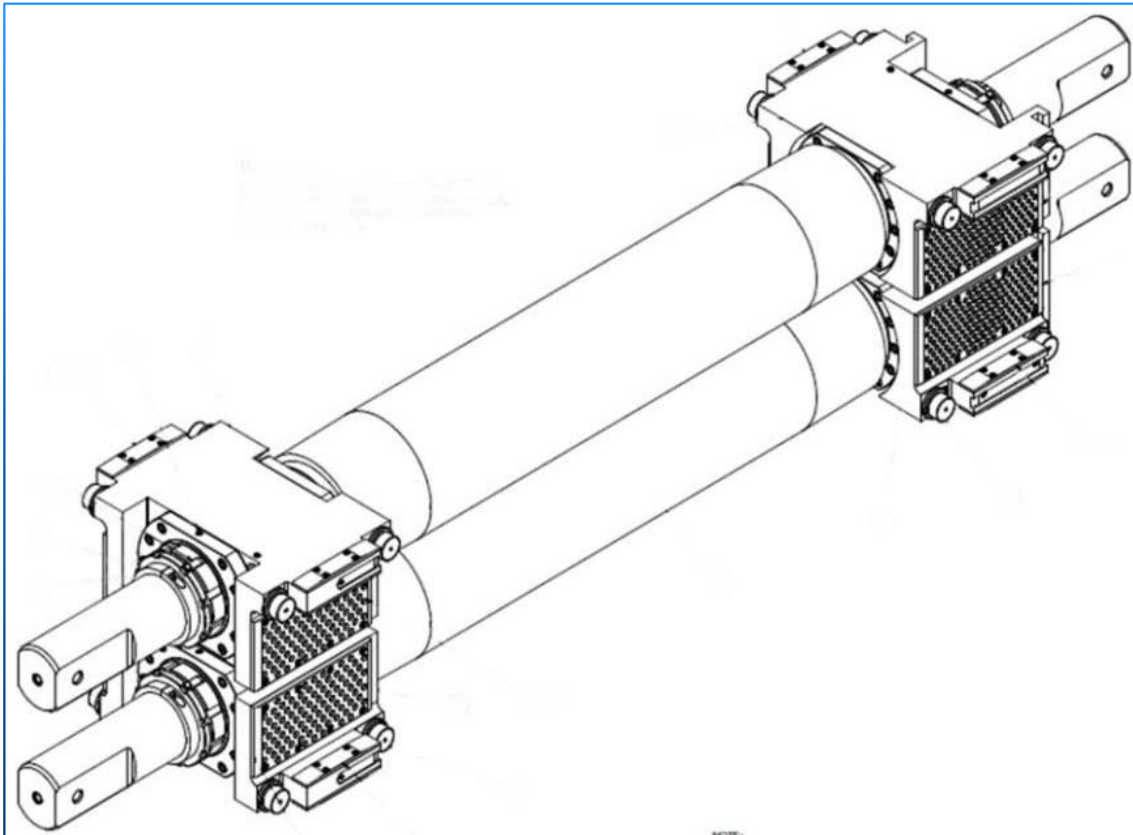


Mae West Blocks allow for quick work roll change
Each assembly includes double acting hydraulic pistons controlled by proportional pressure valve for bending both sets of Work Rolls and Intermediate Rolls (Crown In- Crown Out Bending).

Mae West blocks also include double acting hydraulic pistons for counterbalance of the Upper Backup Roll Assembly.



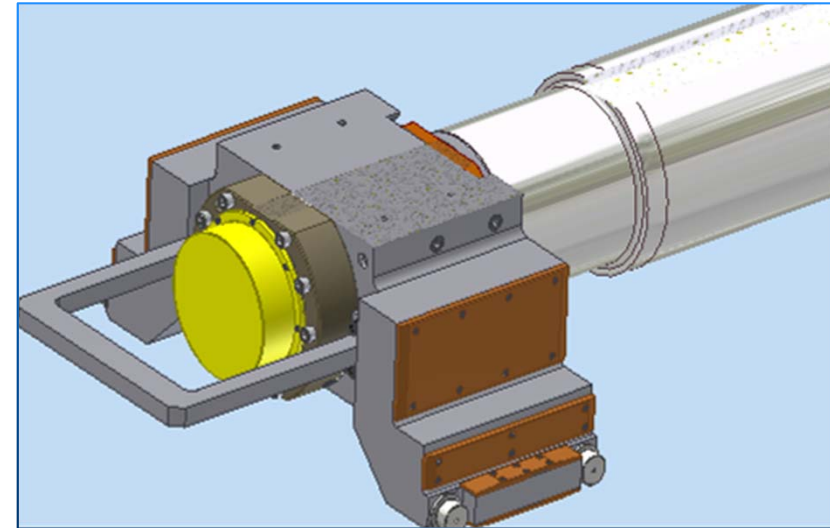
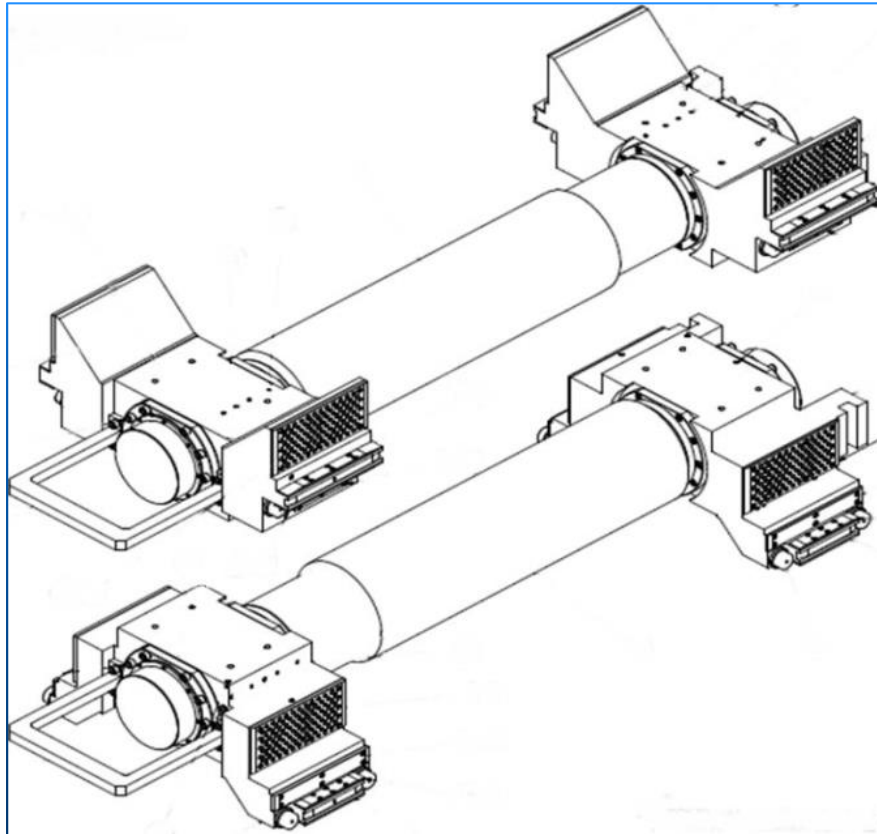
Cold Rolling Mill: Work Rolls



Work Roll (Six high solution)	Maximum Diameter:	340 mm
	Minimum Diameter:	300 mm
	Face:	1310 mm
Work Roll (Four high solution)	Maximum Diameter:	400 mm
	Minimum Diameter:	360 mm
	Face:	1310 mm

Work Rolls are of forged alloy steel, hardened and ground.
Work Roll Bearings are four row cylindrical roller type and thrust bearings for axial load.
Lubrication is by Packed Grease sealed type.
Work Roll Chocks are machined steel and furnished complete with all required seals, caps, gaskets, retainers, and replaceable bronze liners

Cold Rolling Mill: Intermediate Rolls



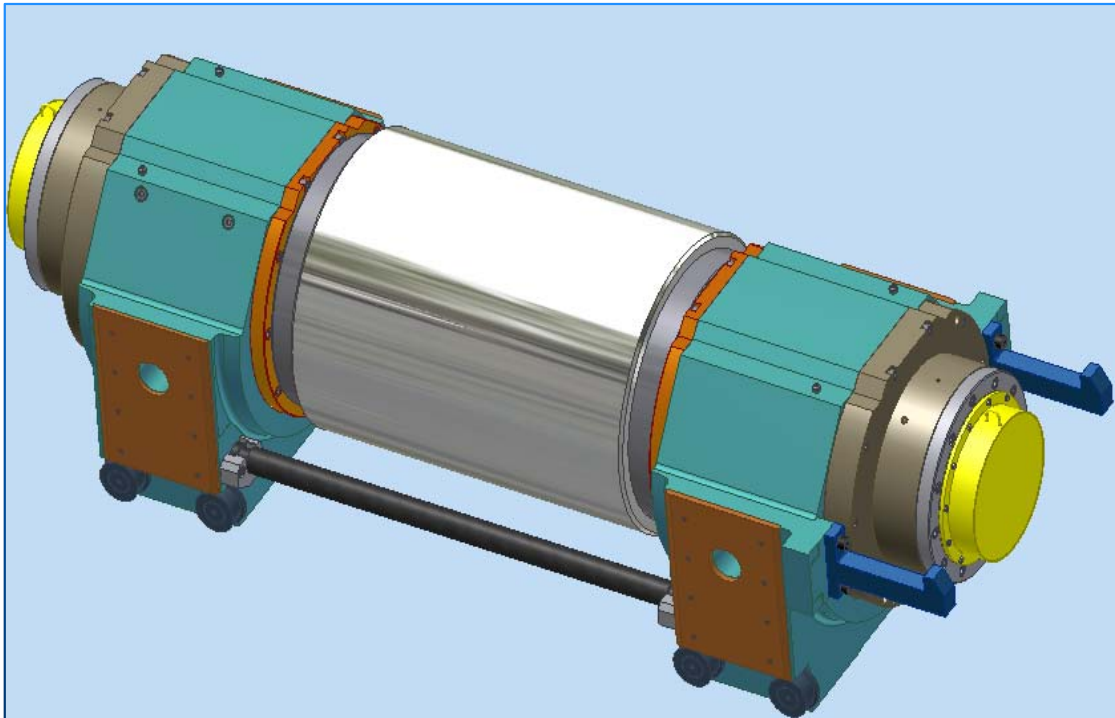
Intermediate Roll	Maximum Diameter:	400 mm
	Minimum Diameter:	360 mm
	Face:	1360 mm

Intermediate Rolls are of forged alloy steel, hardened and ground.

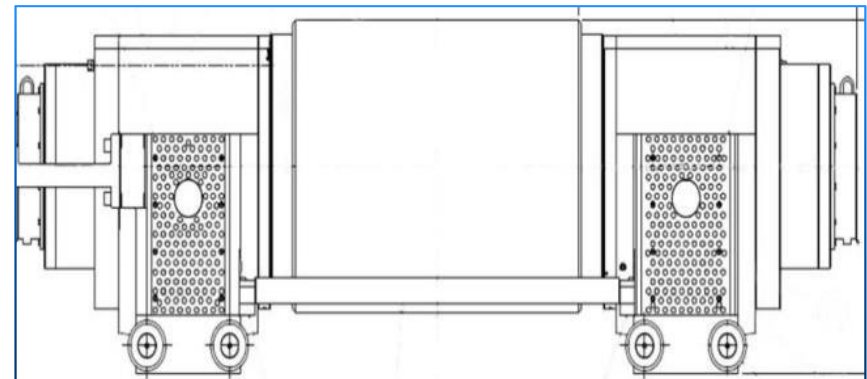
Intermediate Roll Bearings are four row cylindrical roller type with thrust bearings for high axial load associated with roll shifting. Lubrication is by Grease sealed pack type.

Intermediate Roll Chocks are machined steel and furnished complete with all required seals, caps, gaskets, retainers, and replaceable bronze liners.

Cold Rolling Mill: Back Up Rolls



Back-up Roll: (Six high solution)	Maximum Diameter: 1000 mm Minimum Diameter: 900 mm Face: 1300 mm
Back-up Roll: (Four high solution)	Maximum Diameter: 1100 mm Minimum Diameter: 1000 mm Face: 1300 mm

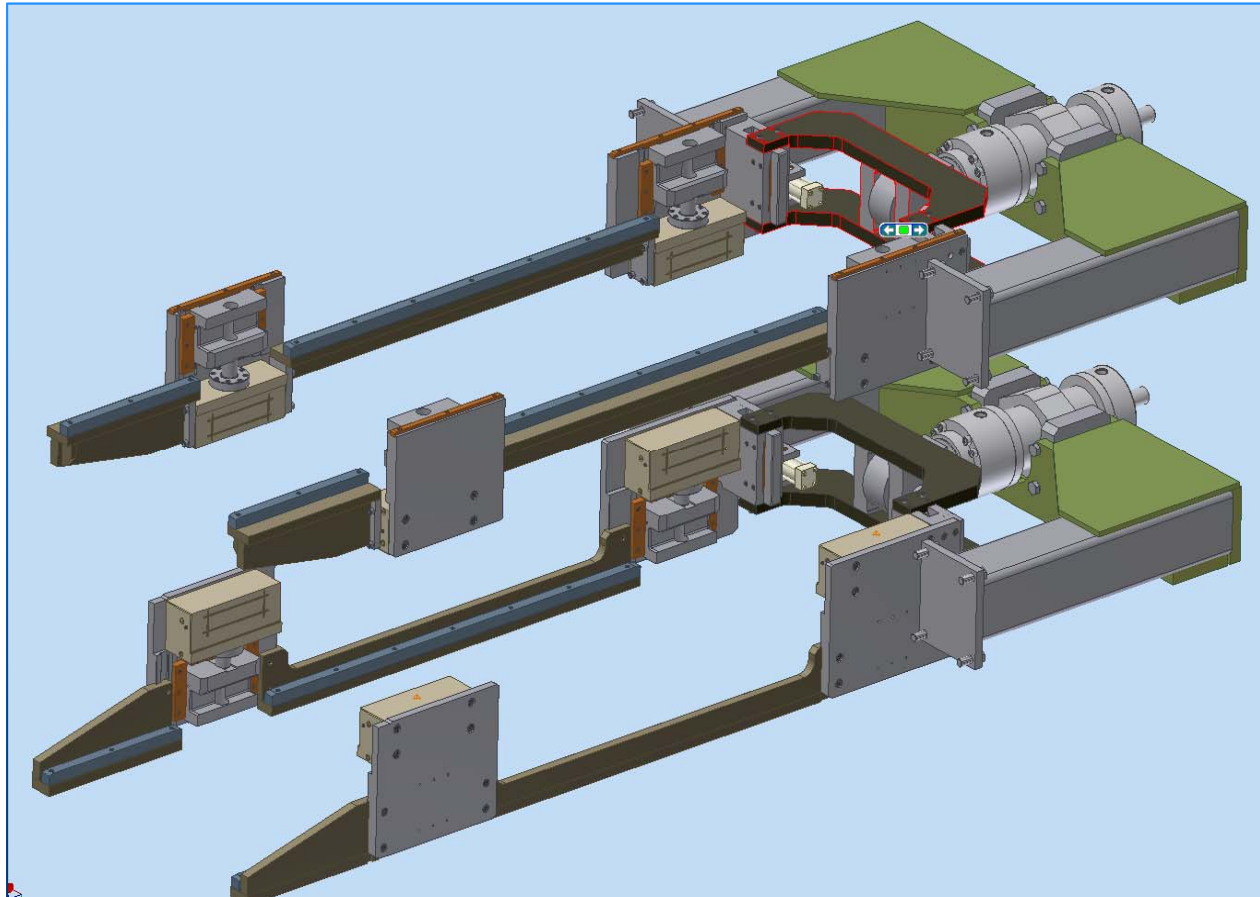


Back-up Rolls are of Forged or Cast alloy steel, hardened and ground. Final grind for finish and crown is by end User.

Back-up Roll Bearings are four row cylindrical roller type with thrust bearings for axial load. Lubrication is by oil mist system.

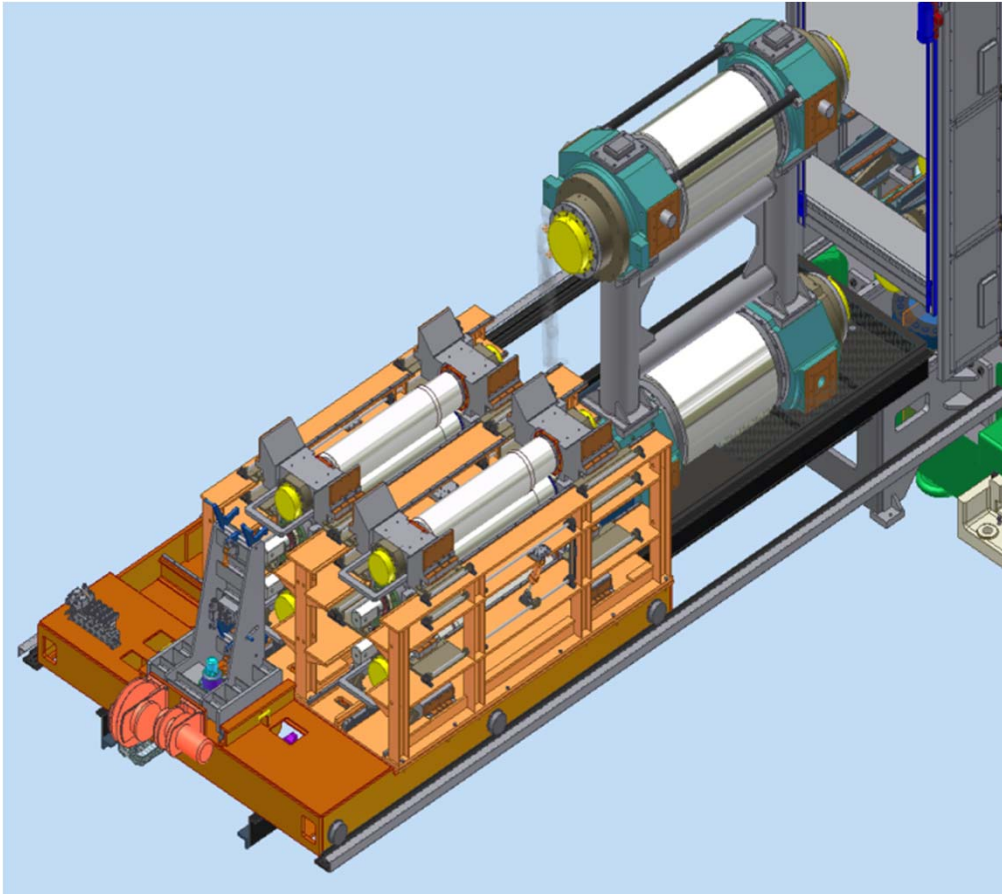
Back-up Roll Chocks are machined steel and furnished complete with all required seals, caps, gaskets, retainers, and replaceable bronze liners.

Reversing Cold Reduction Mill: IMR Side Shifting



It is hydraulically operated. Top and bottom roll chocks are shifted in the Mae West blocks by hydraulic cylinders mounted on the drive side of mill housing. Top and bottom Intermediate Rolls can be shifted in opposite directions to provide compensation for various strip widths and strip shape issues. Hydraulically operated chock keepers are built in to this mechanism.

Cold Rolling Mill: Roll Changing System



This device is for changing the Work Roll Assemblies, the Intermediate Roll Assemblies, or both Work and Intermediate Roll Assemblies at the same time.

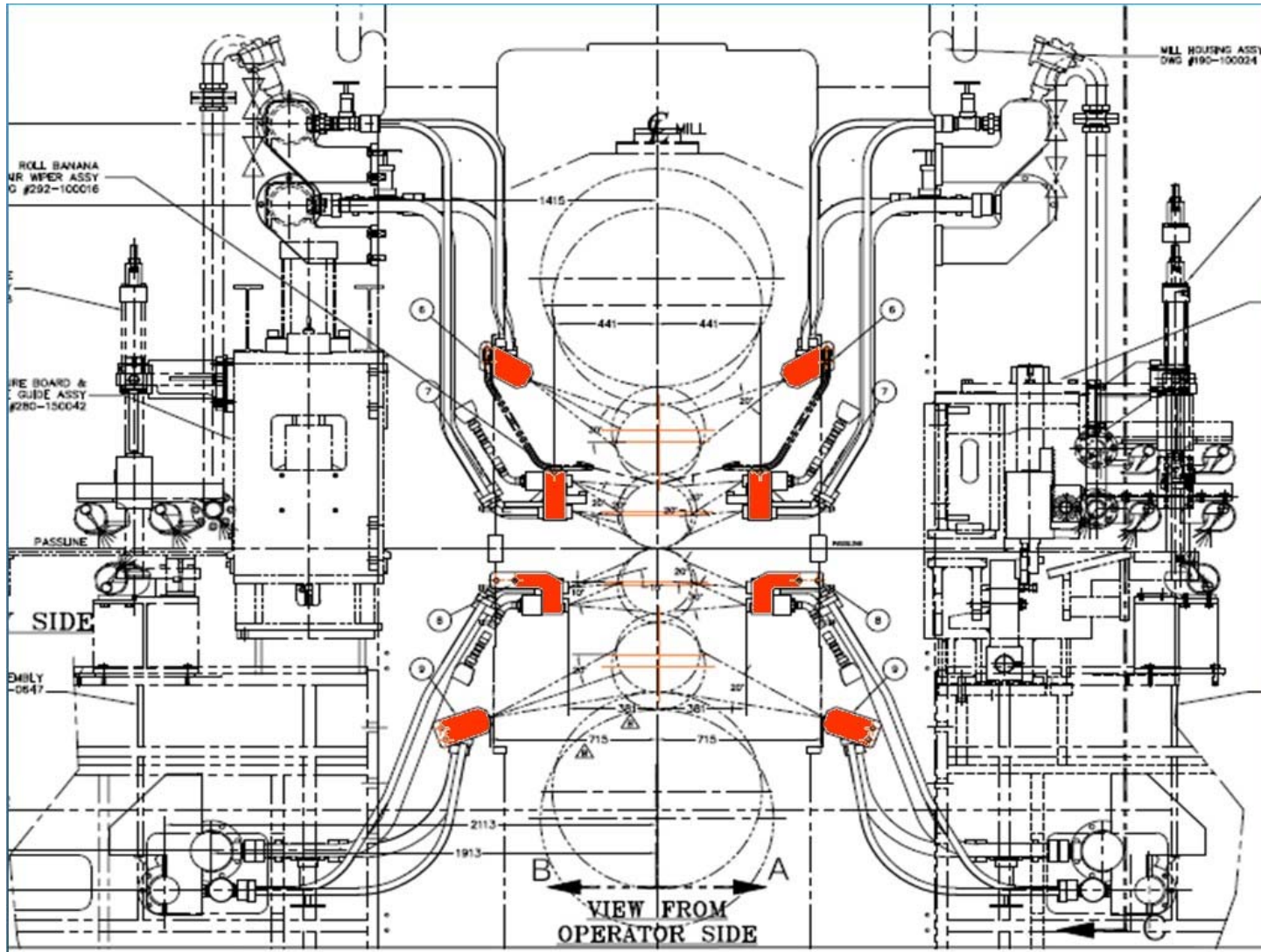
The quick roll changer consists of a lower carriage which runs on rails mounted in the floor and an upper side shift table. Hydraulic/Electrical motors/cylinder drives the changer wheels when moving it to and from the Mill.

A single hydraulic cylinder indexes the side shifting table horizontally between the unload and load positions, and a hydraulic motor traverse a changing head for removal and installation of the Roll

Assemblies.

The side shifting table has two bays, one is loaded with new roll assemblies and the other is empty to receive used rolls from the Mill.

Cold Rolling Mill: Multizone Cooling

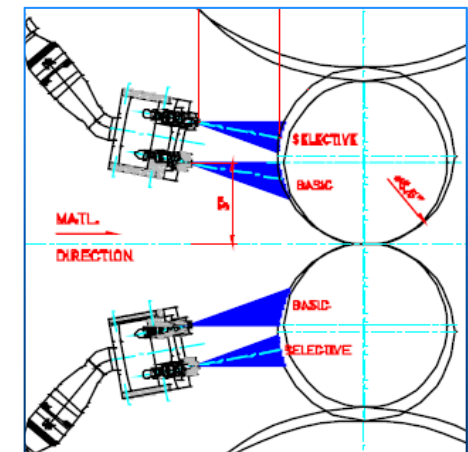


Coolant sprays are used to apply a controlled amount of coolant to nozzles across the width of strip being rolled.

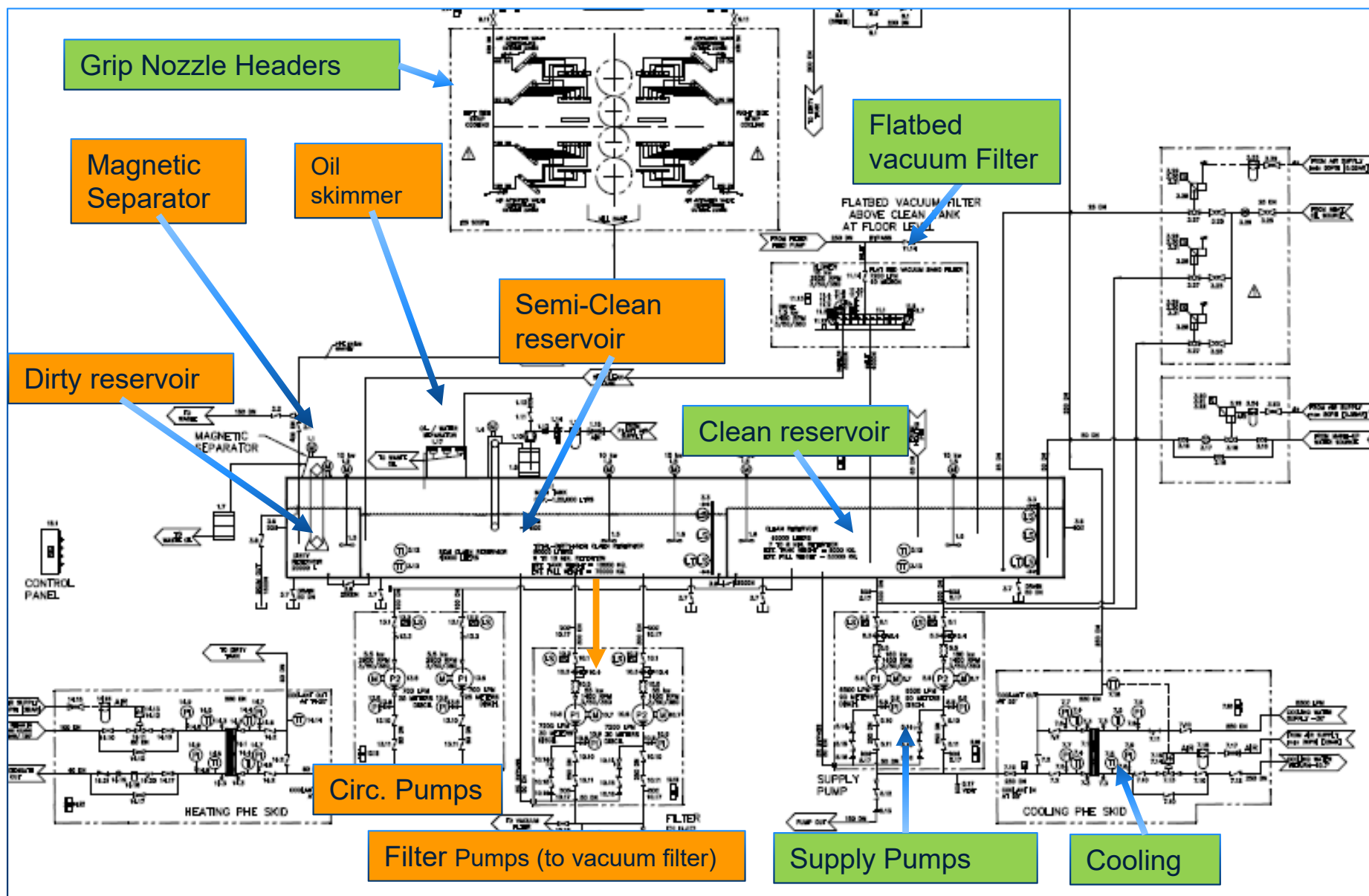
The spraying system will be consisting of four headers:

- one above and one below the strip spraying on work rolls (selective cooling nozzles)
- one spraying on top intermediate roll
- one spraying on bottom intermediate roll.

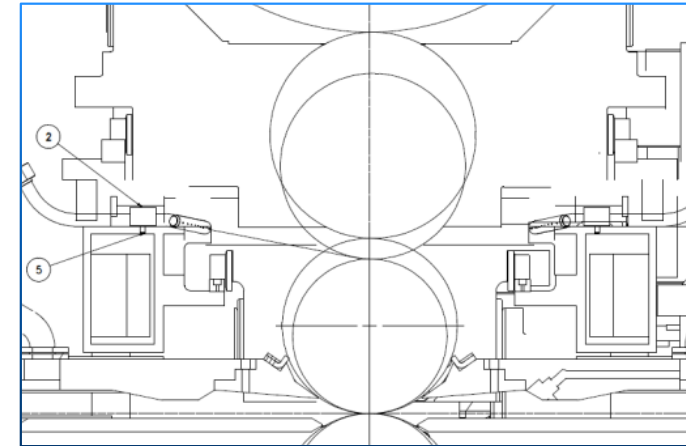
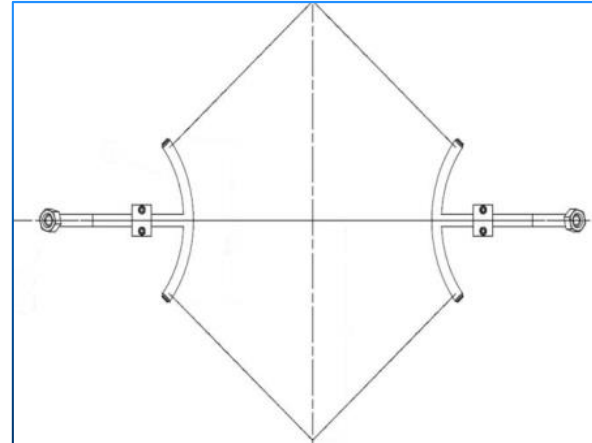
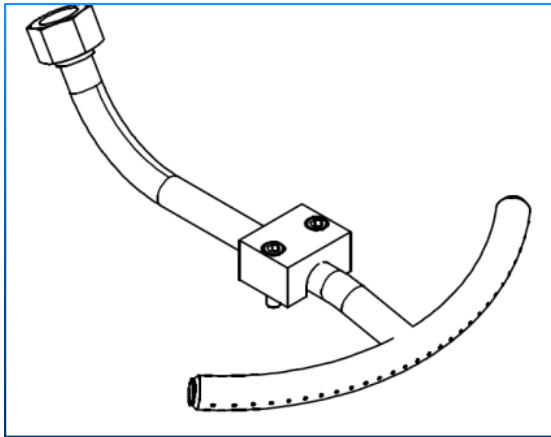
Nozzles will be piped in zones controlled by on-off valves from main desk.



Reversing Cold Reduction Mill: Emulsion Cooling System



Reversing Cold Reduction Mill: Air Wiping System

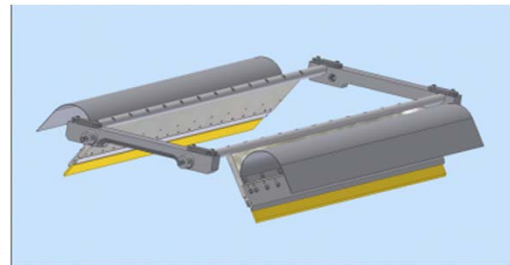
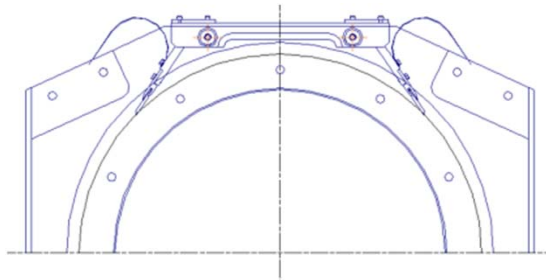


Wiping system to prevent the carryover of coolant on the strip surface consists of Air Knife Headers (Lechler Whisper Blast), Upper BUR Doctor Blade and coolant splash guards.

The Air Knife headers are mounted above and below the strip surfaces at the exit of roll bite.

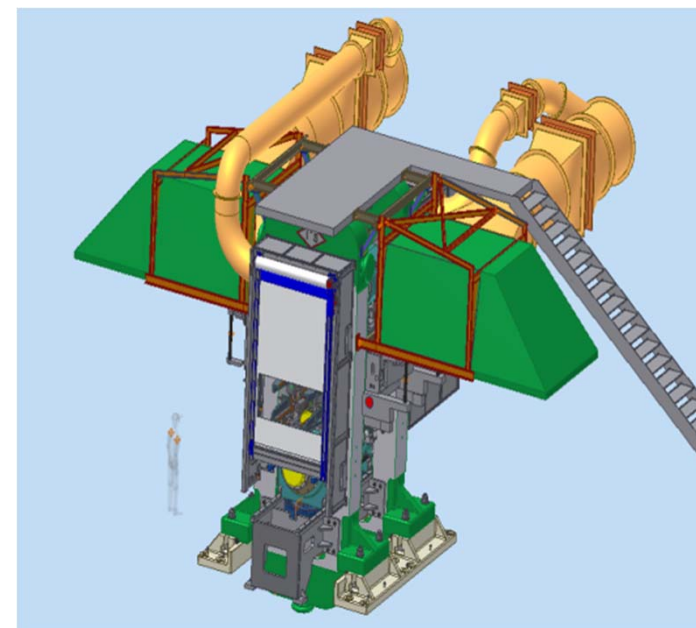
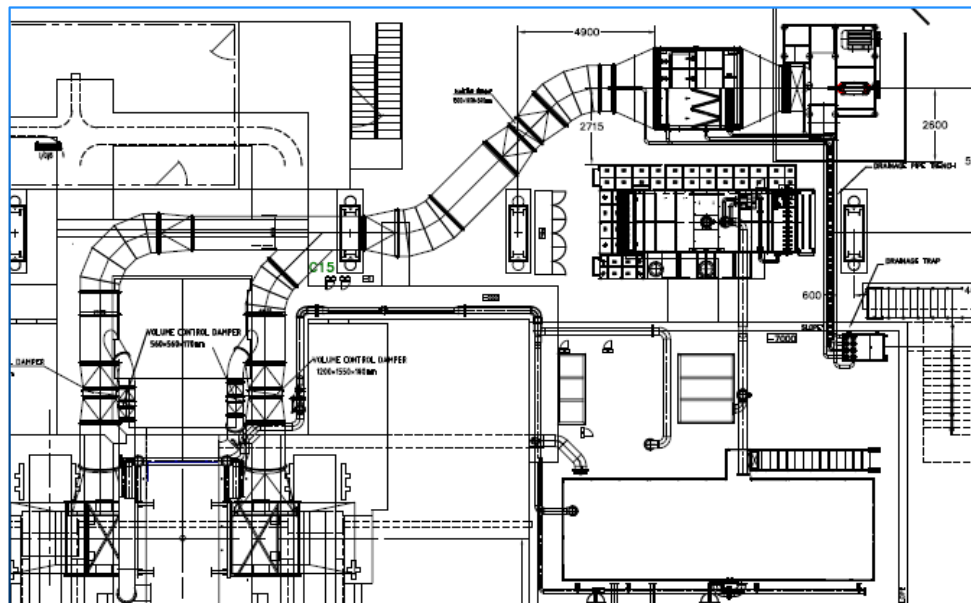
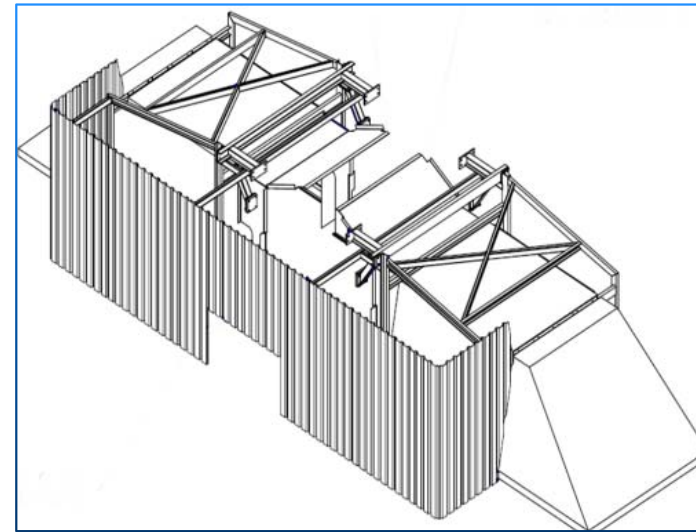
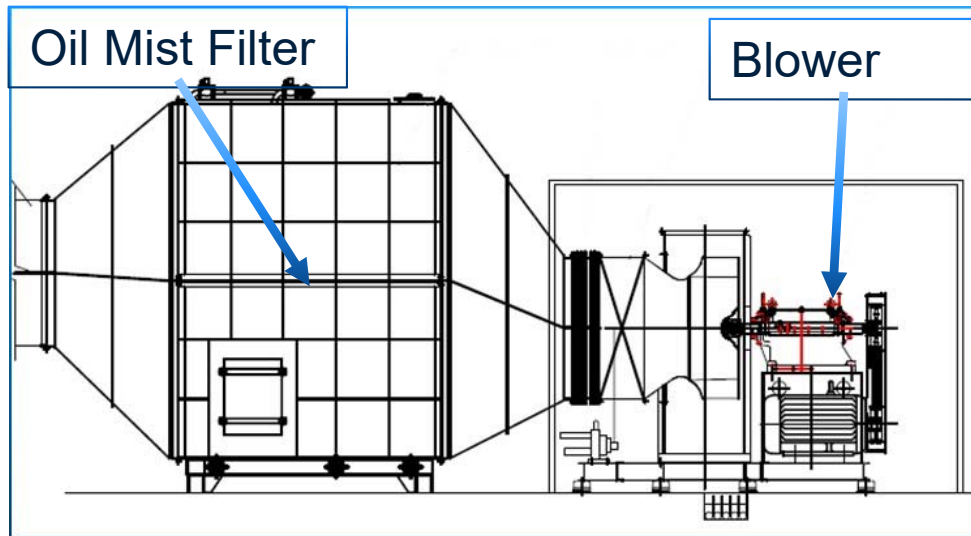
The Doctor Blade is mounted on the upper BUR entry side to prevent coolant carryover.

The Blower blow a stream of high velocity low pressure air aimed to push coolant that migrates up the work roll to this nip point to the outside away from the strip.

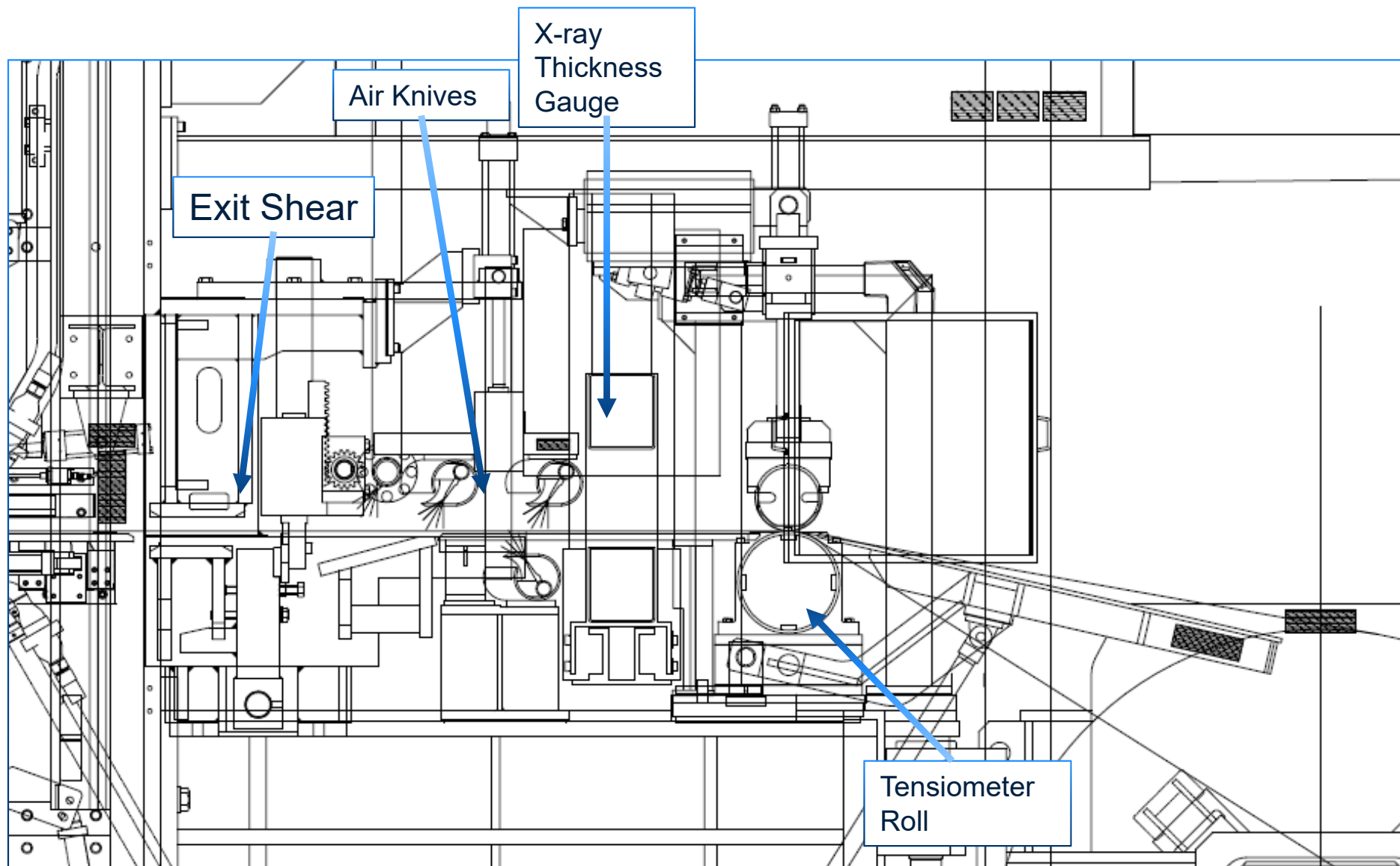


Wipers of doctor blade style are provided on the Top Back Up Roll.

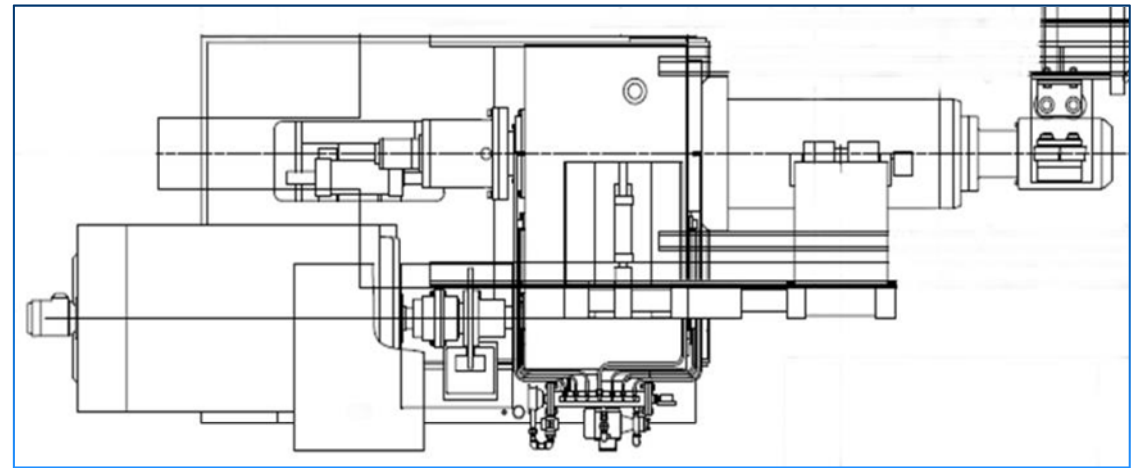
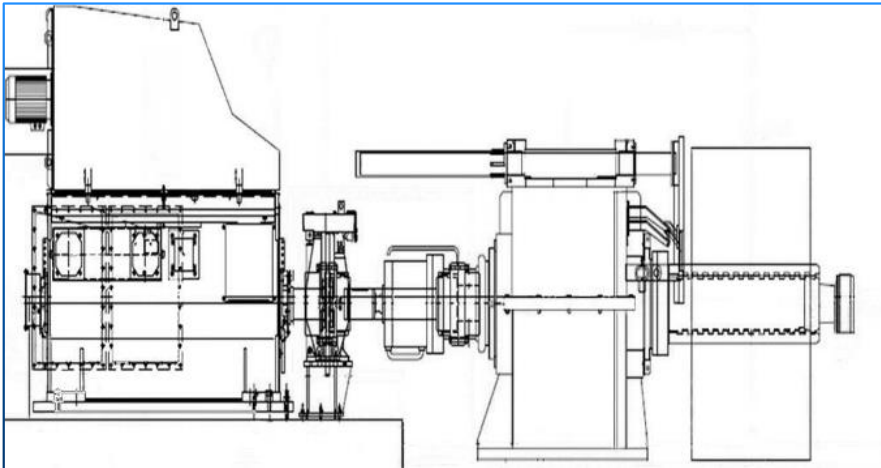
Reversing Cold Reduction Mill: Fume Exhaust System



Reversing Cold Reduction Mill: Exit Group Right Side



Reversing Cold Reduction Mill: Tension Reel



The Tension Reel is an overhung mandrel type. Mandrel consists of four heat treated forged alloy steel segments mounted on a four step pyramid. One of the four segments also includes a strip gripper. Unit is arranged for “overwinding”.

Pyramid and mounting shaft is an integral forged steel, heat treated unit.

The pyramid shaft is mounted in sleeve bearings in the drive sleeve which rotates in anti- friction bearings in the gear case. Pyramids (all surfaces) are lined with bronze alloy and include grease grooves. Strip gripper is hydraulically operated and located in one of the four segments.

An AC Drive motor will be coupled to the input shaft of the gear speed reducer. Housing is of welded steel construction. Sight glass and manual drain valves will be provided for maintenance. Central Lubrication will be provided.

A hydraulically positioned Stripper Plate device is provided to assist in removing a finished coil or empty sleeve from the mandrel.

A pivoted over arm type non driven roll Snubber Roll, connected by hydraulic cylinder is mounted on the reel housing proper to hold the loose end of the coil.

Outboard bearing Support it is supplied to relieve the overhung load on the mandrel. Gate is hydraulically operated.



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