ANNEXURE – D

Details of Work

Tube Guidance system

Tube Guidance system is located at the exit of stretch reducing mill. It is used to guide the tube in straight line at very high speeds of 6m/sec. It consists of two main sections. Depends upon the diameter of the finished tube rolled in SRM, the diameter of Tube Guidance system is adjusted.

First section consists of the roller table with height adjustment mechanism by electrical motor with hydraulic clamping.

The second section consists of the roller table mounted on a pivoting support frame with height adjustment mechanism suitable for different diameter from 26.7mm to 133 mm.

Sl. no	***Description***	***Qty***
1.	Driving Motor Assembly	11 set
2.	Base Supporting structure	5 set
3.	Adjustable Bed assembly	2 set
4.	Roller assembly	3 set
5.	Guide roller assembly	3 set

Activities to be done during erection of tube guidance system

1. **Assembly of base frame on foundation**
2. **Assembly of Adjustable bed including Hydro/Pneumatic Cylinders**
3. **Positioning and alignment of Drive motors with necessary accessories**
4. **Positioning of Guide rollers with support structure, arms etc.**
5. **Positioning of Measuring devices and aligning.**
6. **Any other activity for installation of the system as per drawing and erection instructions given.**
7. **Any minor fabrication / rectification work on the system to suit site conditions must be carried out.**

Rotary saw

Behind the Tube guidance system, a rotary saw has to be installed. The task of the rotary saw is to divide the outgoing tube strand at very high speeds into multiple lengths. The minimum tube length cut is 10 m. The rotary saw is equipped with a tube supporting wheel. A blade is mounted in the crank shaft and used to cut the tubes

The rotary saw consists of a Base frame for motor and gear box. The Gear box is used for driving the saw arms. A carrying device is fitted in the saw arm for mounting the blade with Saw blade drive unit. A Mechanical safety device is used to hold the saw arms while changing the saw blade. Pneumatic holding brake is used to stop the rotary saw. Oil circulation is used to lubricate the gear unit. Tube supporting wheel and pneumatic valves are provided for cutting the tubes to the required length.

Sl. no	***Description***	***Qty***
1	Support Roller of Tube	1
2.	Bearing Pedestal of support Roller	1set
3.	Support Roller Coupling	1
4.	Saw Blade	1
5.	Saw Blade Drive	1
6.	Cross Beam	1.
7.	Hand Wheel	1
8.	Saw Lever	1 set
9.	Locking Mechanism	1
10.	Main Gear Unit	1
11.	Saw Lever Drive	1
12.	Base Frame	1
13.	Coupling	1
14.	Bevel Gear Unit	1

Activities to be done during erection of Rotary Saw:

1. **Positioning of base frame of main gear unit on foundation.**
2. **Assembly of saw lever drive on the base frame.**

3. **Assembly of main gear unit of saw lever drive.**
4. **Assembly of locking mechanism of saw lever.**
5. **Assembly of saw lever.**
6. **Assembly of coupling and bevel gear unit,**
7. **Positioning of bearing pedestal of support roller,**
8. **Assembly of support roller coupling,**
9. **Assembly of support roller,**
10. **Assembly of cross beam,**
11. **Assembly of saw blade drive and Saw**
12. **Assembly of hand wheel,**
13. **Any other activity for installation of the system as per drawing and erection instructions given,**
14. **Any minor fabrication / rectification work on the system to suit site conditions must be carried out.**
15. **All items are to be aligned and leveled for smooth running**

Roller conveyor to cooling bed

The roller conveyor after rotary saw is used to transport the tubes. The tubes are then transferred to the cooling bed by means of the pusher. The roller conveyer is made of Welded steel construction with Tube support plate between rollers .The Rollers are supported with axles and bearings. The driving system consists of seven movable retainer plates, one shunt of cast iron with Mechanical drive unit for the shunt. One braking trough of cast iron and pneumatic cylinders are provided for handling the tubes. The roller table consists of 3 flat and 61 oblique conveyor rolls which are individually driven by an electric motor. The total length of the conveyor is 79m.The conveyor rollers are positioned with a pitch distance of 1.25m.

Sl. no	***Description***	***Qty***
1.	Base Frame for Rollers	11
2.	Stopper with Buffer	1
3.	Flat Roller	3
4.	Oblique Roller	61
5.	Shunt Device with Motor	2 set
6.	Conveyor Motor	64
7.	Pneumatic / Hydraulic Tie rod, Adjustment mechanism	1 set

Activities to be done during erection of roller conveyor to cooling bed:

1. **Positioning of base frame of conveyor roller on foundation and leveling.**
2. **Assembly of roller conveyor with drive .Leveling and aligning the roller conveyor**
3. **Assembly of end stopper of conveyor rolls.**
4. **Assembly of shunt mechanism and leveling.**
5. **Positioning and alignment of guide blades.**
6. **Positioning of crank shaft for pusher level adjustment.**
7. **Assembly of gear unit and servo motor for crank.**
8. **Positioning of Measuring devices and aligning**
9. **Any other activity for installation of the system as per drawing and erection instructions given.**
10. **Any minor fabrication / rectification work on the system to suit site conditions must be carried out.**

Cooling Bed

Cooling bed is a 65 m length walking beam type. The main purpose of cooling bed is for the cooling of hot rolled tubes at the exit of SRM approximately from a temperature of 800^0C to a 100^0C.

Cooling bed consists of the following seven major sub-assemblies

Sl. no	Description	Qty
6.	Driving device	2 set
7.	Supporting device	20 set
8.	Moving rack assembly	1 set
9.	Fixed rack assembly	1 set
10.	Layer transfer device	23 set
11.	Discharging device no.1	2 set
12.	Discharging device no.2	1 set

1. Driving device (2 sets)

Sl. No	Description	Qty.	Remarks
1.	Assembly shaft No.1	2	
2.	Assembly shaft No.2	6	
3.	Assembly shaft No.3	2	
4.	Main gear box	3	
5.	Base	3	
6.	450sHCI brake	3	
7.	Motor Assembly	3	
8.	Pads	6	

2. Supporting Device (20 sets)

Sl. No	Description	Qty.	Remarks
1.	Base no.1	2	Supporting the swing bar assembly
2.	Swing bar assembly No.1	1	Supporting the swing bar assembly
3.	Swing bar assembly No.2	1	Supporting the swing bar assembly

3. Moving Rack assembly (1set)

Sl. No	Description	Qty.	Remarks
1.	X-supporting assembly No.1	1	Supporting pipe
2.	X-supporting assembly No.2	1	Supporting pipe
3.	X-supporting assembly No.3	1	Supporting pipe
4.	Base No.1	20	Supporting the X-supporting Assembly

5.	Base No.2	20	Supporting the X-supporting Assembly
6.	X-supporting Assembly No.4	1	Supporting pipe
7.	X-supporting Assembly No.5	1	Supporting pipe
8.	X-supporting Assembly No.6	1	Supporting pipe
9.	X-supporting Assembly No.7	1	Supporting pipe
10.	X-supporting Assembly No.8	1	Supporting pipe
11.	X-supporting Assembly No.9	1	Supporting pipe
12.	X-supporting Assembly No.10	1	Supporting pipe
13.	X-supporting Assembly No.11	5	Supporting pipe
14.	X-supporting Assembly No.12	3	Supporting pipe
15.	X-supporting Assembly No.13	2	Supporting pipe

4. Fixed rack assembly (1 set)

Sl. No	**Description**	**Qty.**	**Remarks**
1.	Beam no.1	3	Base Installation
2.	Beam no.2	3	Base Installation
3.	Beam no.3	3	Base Installation
4.	Beam no.4	3	Base Installation
5.	Beam no.5	3	Base Installation
6.	Beam no.6	3	Base Installation
7.	Beam no.7	3	Base Installation
8.	Beam no.8	3	Base Installation
9.	Beam no.9	3	Base Installation
10.	Beam no.10	3	Base Installation
11.	Beam no.11	2	Base Installation
12.	Beam no.12	2	Base Installation

13.	Beam no.13	2	Base Installation
14.	Beam no.14	2	Base Installation
15.	Beam no.15	2	Base Installation
16.	Beam no.16	2	Base Installation
17.	Beam no.17	2	Base Installation
18.	Beam no.18	2	Base Installation
19.	Beam no.19	2	Base Installation
20.	Beam no.20	2	Base Installation
21.	Base no.1	150	Beam Erection
22.	Base no.2	360	Grid installation
23.	pads	360	For Adjusting
24.	Fasten plate	90	Supporting pipe
25.	Grid no.1	90	Supporting pipe
26.	Grid no.2	135	Supporting pipe
27.	Grid no.3	45	Supporting pipe
28.	Stop block	720	10X15-80

5. Layer Transfer assembly (1 set)

Sl. No	**Description**	**Qty.**	**Remarks**
1.	Transfer Arm Assembly No.1	1	
2.	Clamp coupling	14	
3.	Transfer Arm Assembly No.2	11	
4.	Transfer Arm Assembly No.3	1	
5.	Transfer Arm Assembly No.4	2	
6.	Transfer Arm Assembly No.5	1	
7.	Transfer Arm Assembly No.6	1	
8.	Motor assembly	2	

9.	Coupling	2	
10.	Gear box assembly	2	

6. Discharging device No.1 (23 sets)

Sl. No	Description	Qty.	Remarks
1	Discharging Device No.1	23	

7.Discharging device No.2 (3 sets)

Sl. No	Description	Qty.	Remarks
1	Discharging Device No.2	3	

Installation & Inspection Procedure

Cooling bed has to be installed as per the relevant technical descriptions.

1. The installation of driving device

The Driving device consists of three sub assemblies

1.1 The main gear box

1.2 The assembly shafts

1.3 The motor assembly

1.1 Installation of Main Gear Box

While installing and positioning of main gear box, the following points are to be taken care of:

a. The distance between output shaft centre line (of inlet section gear box) and charging device centre line should be 2605 ≤ ±1 mm. In case of any deviation, the distance has to be corrected by adjusting the Gear box position.
b. The distance between inlet section and outlet section of gear box output shaft should be 8100 ≤ ±1 mm. In case of any deviation, the distance has to be corrected by adjusting the Gear box position.
c. The distance between gear box and cooling bed positioning point should be 12850 ≤ ± 2 mm. In case of any deviation, the distance has to be corrected by adjusting the Gear box position.
d. The distance between two gear boxes should be 19500 ≤± 2 mm. In case of any deviation, the distance has to be corrected by adjusting the Gear box position.

e. The output shaft centre elevation should be 898 ≤± 0.2 mm. In case of any deviation, the distance has to be corrected by adjusting the pad for Gear box base.

1.2 Installation of assembly shafts

While installing and positioning of assembly shafts, following points are to be taken care of:

a. The concentricity of assembly shaft and gear box output shaft should be with an accuracy of ≤± 0.1 mm.
b. The concentricity among assembly shafts should be with an accuracy of ≤±0.1 mm.

In case of any deviation in the 1.2.a and 1.2.b, the distance has to be corrected by adjusting the pad for bearing base.

1.3 Installation of motor assembly

While installing and positioning of motor assembly, following points are to be taken care of:

a. The concentricity between motor output shaft and gear box input shaft should be with an accuracy of ≤±0.1 mm. In case of any deviation, the distance has to be corrected by adjusting the pads.

2. The installation of supporting device

The supporting device consists of two sub assemblies

2.1 The Base

2.2 The Swing Assembly

2.1 Installation of Base

While installing and positioning of the base, following points are to be taken care of:

a. The elevation of the upper side of the base should be 1283 ≤ ± 0.2 mm. In case of any deviation, the distance has to be corrected by adjusting the pad.
b. The Interval between 40 groups of the base should be with an accuracy of ≤±1 mm. In case of any deviation, the distance has to be corrected by adjusting the position of the base.

2.2 Installation of swinging bar assembly

While installing and positioning of swinging bar assembly, following points are to be taken care of:

a. Adjusting the rotating shaft centre line of the swing bar assembly to the same line with accuracy of ≤±0.2 mm. In case of any deviation, the distance has to be corrected by adjusting the base.

3. The installation of moving rack assembly

After installation of the driving device and supporting device, the installing and positioning of the moving rack assembly has to be carried out with the following procedures.

a. Assemble each x- supporting and supporting base no1 & 2.
b. Install the x-supporting on the driving device and supporting device (ensure correct position according to requirement)
c. Adjust the height of the supporting base with pads. Adjust grid working side to the same height with an accuracy of ≤±2 mm. In case of any deviation, the distance has to be corrected by adding pads.

4. The installation of fixed rack assembly

While installing and positioning of the fixed rack assembly, the following points are to be taken care of:

4.1 Install and Adjust Base

4.2 Put all beams on the base.

4.3 The supporting base should be installed on the beams.

4.4 The grid on the supporting base should be installed.

4.5 Adjust the height of supporting base with pads.

4.6 Adjust the grid-working-surface to the same surface.

4.1 Installation of base

While positioning the base, the following points are to be taken care of:

a. The elevation of the base up surface should be +152mm with an accuracy of ≤±0.2 mm. In case of any deviation, the distance has to be corrected by adjusting the pad.
b. 150 sets of base interval should be installed with an accuracy of ≤±2 mm. In case of any deviation, the distance has to be corrected by adjusting the position of base.

5. The Installation of Layer Transfer Device

The layer transfer device consists of the following subassemblies

5.1 The gear box Assembly

5.2 The transfer arm assembly

5.3 The motor assembly

5.1 The Installation of gear box Assembly

While installing the gear box assembly, the following points to be taken care of:

a. Distance between the output shaft centre line of gear box and outlet roller centre line should be 880mm with an accuracy of ≤±0.5 mm. In case of any deviation, the distance has to be corrected by adjusting the position of gear-box

b. Gear-box from the cooling bed positioning point should be 17575mm with an accuracy of ≤±2 mm. In case of any deviation, the distance has to be corrected by adjusting the elevation of base.
c. Distance between two gear box should be 32000mm with an accuracy of ≤ ±2 mm. In case of any deviation, the distance has to be corrected by adjusting the elevation of base.
d. Elevation of output shaft centre should be +350 with an accuracy of ±0.2mm. In case of any deviation, the distance has to be corrected by adjusting the base.

5.2 The Installation of transfer arm assembly

While installing the transfer arm assembly, the following points are to be taken care of:

a. Concentricity of two shafts in transfer arm assembly should be with an accuracy of ≤±0.1mm. In case of any deviation, the distance has to be corrected by adjusting the pad of bearing base.
b. Concentricity between shaft and gear-box in the transfer-arm-assembly should be with an accuracy of ≤±0.3mm. In case of any deviation, the distance has to be corrected by adjusting the pad of bearing base.
c. Level of supporting upper surface of the transfer arm (when the support is in the same angle) with an accuracy of ≤±0.3 mm. In case of any deviation, the distance has to be corrected by adjusting draw bar of transfer arm.

5.3 The Installation of motor assembly

While installing the motor assembly, the following points are to be taken care of;

a. Concentricity between motor-output-shaft and gear box input shaft should be with an accuracy of ≤ ±0.1 mm. In case of any deviation, the distance has to be corrected by adjusting the pad for motor base.

6. The Installation Of Discharging Device Nos 1&2

The discharging device installation consists of the following process,

6.1 Install the discharging device 2 nos as per the requirement.

a. Assemble all working slope of First discharging device to the same surface with an accuracy of ≤±1 mm. In case of any deviation, the distance has to be corrected by adjusting the pad.

b. Assemble all working slope of Second discharging device to the same surface with an accuracy of ≤±1 mm. In case of any deviation, the distance has to be corrected by adjusting the pad.

7. The Installation of Pipelines

The Pipeline installation consists of the following process,

7.1 Install pipeline on the device as per the requirement.

7.2 Ensure the device moving freely

8. The Installation of Cooling Water Pipeline

While installingThe cooling water pipeline, consists the following steps,

8.1Locate gear box water position

8.2 Install the cooling water pipe line at site

8.3 Ensure that pipeline does not disturb the flexible moving of device

9. Fixing arrangement of electrical detecting element and accessories

Based on the actual site situation, arrangement has to be made for fixing electrical detecting element and accessories.

10. The Final Inspection of Installed Devices

The final inspection has to be carried out as per requirements given above and during inspection,

10.1 Cross check installation of layer transfer device, supporting device.

10.2 Inspect the complete device

10.3 Ensure that

a. Installations are correct
b. Bolts are fixed
c. Power supply is OK
d. Device can move freely
e. All obstacles are cleaned /cleared

10.4 Carry out final inspection

11. Trial Run of Installed Devices

While Trial run, following procedure has taken care of:

11.1 Ensure everything is OK as above

11.2 Start manual trial of each device individually

11. Trial Run of Installed Devices

While Trial run, following procedure has taken care of:

11.1 Ensure everything is OK as above

11.2 Start manual trial of each device individually

Activities during Commissioning for all equipments:

1. The commissioning will be carried out by BHEL and/or SMS Engineers.

2. Necessary alignment readjustment must be carried out as instructed

3. Any disassembly and reassembly with any minor rectification must be carried out.

Tools and Tackles:

All necessary tools and tackles like spanners, hydraulic jack, pipe wrench, chain pulley block, leveling instrument, measuring instruments, handling rope, chain, welding, gas cutting, drilling equipments are to be brought by the vendor.

Consumables like oxygen, acetylene gas, welding electrodes, power, cotton waste, compressed air, kerosene will be provided by us.

Drawings

Interested vendors who are capable of meeting BHEL requirement are requested to contact SSTP Purchase department for drawings on free of cost, if required for further details.

Safety

The vendor has to take care of safety of the equipment erected and the personal working. Personal protective equipments are to be provided by the vendor. This includes safety shoe, safety goggles, hearing protection, protective gloves, safety helmet etc.

DRAWING NO. SSTP:PD:2012-014-001

ALL DIMENSIONS ARE IN MILLIMETERS

N

EDGE OF SRM

C11 C10 C9 C8

feeding direction

Stopper

walking direction

front end cooling bed

walking line

Lubrication system gearbox

d rotary saw

Grease

(-4000)

Stopper

B11 B10 B9

11 10 9 8 7 6 5 4

EQPT:	COOLING BED				
BHEL	Bharat Heavy Electricals Ltd SEAMLESS STEEL TUBE PLANT TIRUCHIRAPALLI – 620014	DRN	SSN.KUMAR	SSN.Kumar	03.02.12
		CHD	G.LOGANATHAN	G.Loganathan	03.02.12
		APPD	S.MOHAN	S.Mohan	03.02.12
DEPT: PLANT DESIGNS	GRADE OF UNTOL. DIM: f/M/f IS:2102	SCALE	WEIGHT (Kg)	REF TO ASSY DWG NO	ITEM NO
				REF TO OLD DWG NO	
TITLE: GA FOR SRM TUBE GUIDENCE TO COLDSAW CONVEYOR				DRAWING NO: SSTP:PD:2012-014-001	REV: 00

A0–SIZE