₫	पचई पले
	11
	7?77
	77

COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of Bharat Heavy Electricals Ltd.
It must not be used directly or indirectly in anyway detrimental to the interest of the company

PURCHASE SPECIFICATION

Department: ASSCP Unit : Corporate R & D

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	1 of 16

ITEM: Wet chemical bench

S. No.	TECHNICAL SPECIFICATION	VENDOR'S CONFIRMATION
1.	SCOPE	
	Design, fabrication, supply, installation and commissioning of wet chemical	
	bench for processing of 125x125 mm2 and 156 x156 mm2 size wafers with	
	thickness of 180 ±20 micron. The solution temperature in some of the	
	tanks may go up to 85°C. The handling of the wafers should be through a	
	Teflon carrier of 25 wafers capacity. The particulate impurity should be <	
	0.2 microns on the outgoing wafers.	
	The system should consist of three separate units. (1) manual unit for	
	ultrasonic cleaning and alkali treatment, (2) automated unit for alkali	
	treatment, acid treatment and spin drying, and (3) one water polisher unit	
	for 18MOhm DM water. The total available space and approximate system	
	dimensions are shown in Figure 1. The manual and automated units should	
	be housed in chemical ventilation hoods. The DM water unit may be housed	
	separately to convert 5-10 M Ω water to 18 M Ω water.	
	The manual unit will have the facility for manual transfer of wafer carrier	
	from one solution tank to another. The automated unit should have	
	automatic PLC controlled transport for motion from tank A1 to A12 (Figure	
	2a). The loading/unloading from spin dryer will be manual. The wafer	
	carrier used for chemical treatment should fit into the spin dryer.	

	REVISION (01)	APPROVED BY		
		Dr. S. P. Singh		
		PREPARED	ISSUED	DATE
		S. Chandril		

(बी एच ई एल
	11
	mim
•	

Department: ASSCP

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	2 of 16

			Unit : Corporate R & D	Page	2 of 16				
			Oint : corporate it & b	rage	2 01 10				
	S.No		ICAL SPECIFICATION			VENDOR'S CONFIRMATION			
	2	DETAIL	S OF EQUIPMENT						
	2 A								
		1 Encl	osure						
		The total footprint for the enclosure should be 2100 ± 100 mm x 1000							
the		± 10	00 mm. The height should be less than 30	00 mm.					
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in anyway detrimental to the interest of the company			 Laminar Flow Hood with HEPA Filter hood with Class 100 HEPA Filter should Fan filter units should cover the entire equipped with differential pressure in laminar flow. The Hood material should retardant polypropylene of thickness room grade and acid resistant electrifittings should be provided. The fan tup of SS 304 and max noise permissible working distance. Base Frame: The complete line should polypropylene of thickness 10mm or height of the tanks should be around ground. All the control should be moomm from the ground. The total height without fume suction should be around ground. Working platform and storage 15mm thick natural polypropylene. Side& Front covers, Storage Cabinet polypropylene front cover & Side covers in the storage shelf should be provided with sliding Polypropylene Doors wherean be stored during process. Fume Suction Hood: Natural Polypropylene should be provided from the batable. 	E: Vertical laminal ld be provided to le length of the undicator for effectuld be stress relication and illuminal filter unit should be should be 65 do be made up of more. The operation of the Chemical and 2.4 meter from the company of the chemical and 2.4 meter from the company of the chemical and 2.4 meter from the company of the chemical and 2.4 meter from the company of the chemical and 2.4 meter from the company of the chemical and 2.4 meter from the company of	o the line. unit and ctive ved, fire . Clean tion I be made db at the f natural ating the t of 1800 al station m the uld be of atural rovided. e tanks y items				
			Doors: Vertically moving clear acrylic	doors be provid	led.				



Spec. No	ASP/DST1/E-01
Rev. No	01
Page	3 of 16

		Department: ASSCP	ev. No	v. No 01						
				_	rporate R 8		F	age	3 of 16	
	S. No.	TE	CHNIC	CAL SPECIF	ICATION					VENDOR'S CONFIRMATION
	2.	DETAILS OF EQUIPMENT								
	2 A	Manual unit								
		2	Ultra	asonic unit	:					
0	-		125	kHz/600 w	atts ultraso	nic assem	nbly should be p	rovided fo	r tanks	
of the							e independent			
rest							A selector swi	ch should	connect	
Is Ltd inte			the	tank, one	at a time to	the gene	erator.			
oerty of Bharat Heavy Electricals Ltd. in anyway detrimental to the interest of		3	Solu	tion and r	inse tanks (M1 to M5	5)			
/ Elec ntal to			The	tank refere	ences are fr	om Figure	e 2a.			
Yeav) rimer				• Inner v	vorking dim	ension (m	nm.): 200(L) x 30	0(W) x 30	0(H)	
arat I 7 det			•			d: PID co	ntrolled 1.2 kW	Teflon co	ated	
of Bh nywa)			heatersLids: Appropriate lids with inner projection for all tanks with							
oerty in ai			hinged handles and matching material							
prop ectly			Drain valves: Electrically operated							
is the indire			Specific requirements for Tanks M1 to M5							
on this document is the property of Bharat Heavy Electricals Ltd. used directly or indirectly in anyway detrimental to the inter			S. No	Tank referenc e	Material	Heating	Construction	Drain		
ion on this a			1	M1, M2 (Solvents)	SS 316 Thickness: 14 gauge	No	1 ultrasonic assembly @ 125 kHz (single unit)	1	disconnect of 20 ltr. ty.	
The information of the informati	-		2	M3 (rinse)	Natural PP Thickness: 10 mm	No	Double walled overflow structu (Flow rate ~ 15 litre/min.). Spray nozzles and nitrogen bubble arrangement.	re and fill min.	dumping ling in < 1	
			3	M4(alkali	10 111111	85° C				#
	_		4	M5(HCl)		No	Acid resistant welding and connectors etc.	carbo	disconnect by of 20 ltr. apacity.	

		ਧਵੀਂ ਹਾਲ //		Spec. No	ASP/DST	1/E-01
		HE	Department: ASSCP	Rev. No	01	
			Unit : Corporate R & D	Page	4 of 16	
	S.	TEC	HNICAL SPECIFICATION			VENDOR'S
	No. 2.	DET	AILS OF EQUIPMENT			CONFIRMATION
	2 A		nual unit			
		3	Control panel			
directly or indirectly in anyway detrimental to the interest of the			Control panel should be provided for contro and outlet valves for rinse tank and outlet v temperature controller.	-		
r detrim	2 B	Auto				
		1				
II ai			The total footprint for the enclosure should	d be 6000+/- 200	mm x 1000	
			+/- 100 mm. The height should be less than	3000 mm.		
Canding			Laminar Flow Hood with HEPA Filter hood with Class 100 HEPA Filter show Fan filter units should cover the entequipped with differential pressure laminar flow. The Hood material show retardant polypropylene of thickness room grade electrical and illuminating provided. The fan filter unit should	ould be provided t tire length of the u indicator for effe ould be stress reli ss 10mm or more. ion fittings should	o the line. unit and ctive ved, fire Clean be	



Department: ASSCP Unit : Corporate R & D

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	5 of 16

SI.	TECHNICAL SPECIFICATION	VENDOR'S CONFIRMATION
2	DETAILS OF EQUIPMENT	
2B	Automated unit	
	1 Enclosure	
It must not be used directly or indirectly in anyway detrimental to the interest of the company	Base Frame: The complete line should be made of natural polypropylene of thickness 10mm. The operating height of the tanks should be around 1000mm from the ground. All the control should be mounted at a height of 1800 mm from the ground. The total height of the Chemical station without fume suction should be around 2.4 meter from the ground. Working platform and storage rack base should be of 15mm thick imported natural polypropylene. Side& Front covers, Storage Cabinet: 10 mm thick natural polypropylene front cover & Side covers should be provided. Inside storage shelf should be provided just below the tanks with sliding Polypropylene Doors where the necessary items can be stored during process. Fume Suction Hood: Natural Polypropylene fume exhaust hood should be provided from the back side over the entir table. Doors: Vertically moving clear acrylic doors be provided. Automated transport Side arm type servomechanism based auto transporter for wafer basket movement from tank A1 to tank A12 (see Fig. 6). Spin dryer Should accommodate a basket of lot 25 at a time and spin dry within 30 S.	



Department: ASSCP Unit : Corporate R & D

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	6 of 16

			l	Jnit : Corpo	orate R 8	k D		Page	6 of 16
s Ltd. interest of the	SI. No. 2 2B	DETA Auto	AILS OF omated Soluti	on and ring ank referen Inner wo Heaters, heaters Lids: Ap matching	se tanks ces are forking din if require propriate g materia	rom Figur nension (i ed: PID co e lids for a	e 2a. mm.): 200(L) x i ontrolled 1.2 k\	N Teflon coa	ted
ricals the			•	Drain val	lves: Elec	ctrically o	perated by tou	ch screen	
Elect			S _F	pecific requ	irements Materi	for tanks Heating	construction	Drain	
leavy iment			No.	reference	al				
Bharat h way detr			1	A1 (Alkali)	, 10 mm	85 C		Quick discon carboy of 20 Capacity.	ltr.
The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in anyway detrimental to the interest of the company			2	A2 , A4, A9 (DI)	Natural PP,	No	Double walled overflow structure (Flow rate ~ 15 litre/min.). Spray nozzles and nitrogen bubbler arrangement.	Quick dumpi and filling in min.	
n on this e used d			3	A3, A5, A7 (Acid)	PVDF, 10 mm	No	A sid us siste at		
ormation : not be ny			4	A6 (Acid)	PVDF, 10 mm	80 C	Acid resistant welding and connectors etc.	Quick discor carboy of 2 Capacity	0 ltr.
The infe			5	A8,A10(R CA1&2), A11 (HF)	Teflon, 10 mm	75 C		Capacit	
			6	A12 (DI)	Teflo	No	Double walled overflow structure (Flow rate ~ 15 litre/min.). Spray nozzles and nitrogen bubbler arrangement.	Quick dumpi and filling in min.	



PURCHASE SPECIFICATION Department: ASSCP

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	7 of 16

-		Unit : Corporate R & D	Page	7 of 1	.0		
S	I. TECHNI	CAL SPECIFICATION			VENDOR'S CONFIRMATION		
2		DETAILS OF EQUIPMENT					
2	B Autom	ated unit					
2		 The control parameter for temperatransport wherever is required sho Different programs should be made using or using one or more of the process recipe. polisher/ 18 MΩ DM water unit 	uld be through PL e available in PLC	for not			
	water	Water polisher should be provided to co into 18 M.ohm water. Approximate dimensions for water polismm x 1200 mm. The unit should have a minimum flow ra Conductivity meters for input and output provided. The outlet should be fitted with a 0.2 minimum flow range.	ther are 1500 mm te of 2 liter per m It flows should be	x 1500 ninute			
3	D Wafer •	Four standard PVDF carriers for a batch and 156 mm each. The carrier should be provided with wafers during aggressive reactions and the transport arm and in the spin dryer.	of wafer of size i	to hold			
3	Service	es required					
	which by the	quirement of services like compressed a are required for commissioning of the sy vendor. These services will be provided b	stem are to be in				
5	Syster	n acceptance criteria					
	•	The material used should be of ISI mark The structure should conform to all so fume hoods.	-	hemical			



PURCHASE SPECIFICATION Department: ASSCP

Unit : Corporate R & D

Spec. No	ASP/DST1/E-01
Rev. No	01
Page	8 of 16

SI. No.	TECHNICAL SPECIFICATION	VENDOR'S CONFIRMATION	
5	System acceptance criteria		
	 Safety alarms for exhaust failure, water level in the heated solution tanks and other relevant hazards should be included. All joints should be strong and leak proof. All pipe connections for inlet and outlet including quick dump valve should be leak proof. Provision for drain spill collection should be provided. Material used should not release particulates during chemical processing. 		
6	Warranty		
	One year after installation and commissioning of the system.		
7	Delivery		
	The system has to be delivered and commissioned at Amorphous Silicon		
	Solar Cell Plant, BHEL Gurgaon.		

Note:

COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of Bharat Heavy Electricals Ltd.
It must not be used directly or indirectly in anyway detrimental to the interest of the company

- (1) Supplier shall confirm adequacy of the items offered for above processing. Any other items required for the purpose shall be brought out clearly.
- (2) Any deviation from the above spec. shall be clearly brought out by the supplier in their offer. For all the items, vendor's confirmation shall be filled up in the space provided.

		बी एच ई एल)	DUDGUAGE CDECUEICATION	Spec. No	ASP/DST1/E-01
		HĤEL	PURCHASE SPECIFICATION Department: ASSCP	Rev. No	01
			Unit : Corporate R & D	Page	9 of 16
				-	
	GEI	NERAL COND	ITIONS:		
	01.	Three sets of	operation and maintenance manual in Eng	lish shall be supplied	along with the equipment.
		The manual s	hall include circuit diagram, component lay	out, PCB art work, tr	ouble shooting chart indicating
		symptoms, ch	necks and preventive maintenance schedul	e to be carried out, so	uggested remedy for all items
		including the	bought out items. This shall also include al	l mechanical /pneum	atic /hydraulic diagrams for
		the compone	nts /systems used in the equipment.		
.he	02.	The equipme	nt shall be designed taking into account all	safety and OHSAS re	quirements. Hazards
of 1		connected wi	th operation & maintenance of the equipn	nent shall be brought	out explicitly and instructions
d. erest		for minimisin	g the hazards (environmental / safety) to b	e indicated.	
als Lt e int	03.	The equipme	nt shall be aesthetically fabricated.		
ctrice o th	04.	List of spares	part numbers, and address of original sup	pliers of spares/subsy	ystems shall be provided.
y Ele ıtal t	05.	Service facilit	ies required, Environmental requirements	and their tolerance li	mits may be furnished as per
leav) rimer		the format er	nclosed.		
ent is the property of Bharat Heavy Electricals Ltd. or indirectly in anyway detrimental to the interest of the	06.	The offer sha	II include adequate training on operation 8	maintenance of the	equipment to BHEL personnel
of Bha yway		and Inspectio	n of the Equipment at supplier's works / B	HEL's works. Offer sha	all also include satisfactory
erty o		installation, c	ommissioning and performance trials of th	e equipment at BHEL	works by the supplier.
orope tly i	07.	Final clearand	e will be given after satisfactory trial runs	at BHEL for a period o	of two weeks.
the I	08.	The supplier	shall submit test and guarantee certificates	a. Calibration certifica	tes for all the instruments /
ent is or in		gauges / indic	cators shall be provided. Calibration proced	dures are also to be in	dicated in detail. The
ctly		equipment sh	nall be guaranteed for trouble-free operation	on and against manuf	acturing defects for a
is do dire		minimum per	iod of 1- year from date of commissioning.		
used	09.	Equipment sh	nall be rated for 415 V $/$ 3 phase $/$ 50 Hz $/$ 5	wire or 230 V / 1 pha	se / 50 Hz/ 3 wire system only.
tion o	10.	Service Engir	neers deputed by the supplier for installation	on of the equipment a	at BHEL works shall comply
orma not ny		with safety re	egulations and precautions, and have had a	dequate training in E	nvironmental / Health / Safety
The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in anyway detrimental to the inter company		hazards assoc	ciated with the installation and operation o	f the equipment.	
4 ± 00	11.	The vendor m	nust have supplied in the past similar equip	ment to customers. 1	The details pertaining to such
		customers m	ust be provided to BHEL. The equipment in	stalled must be work	ing satisfactorily for one year

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Ltd. t not be used directly or indirectly in anyway detrimental to the interest of the company		



Department: ASSCP Unit: Corporate R & D

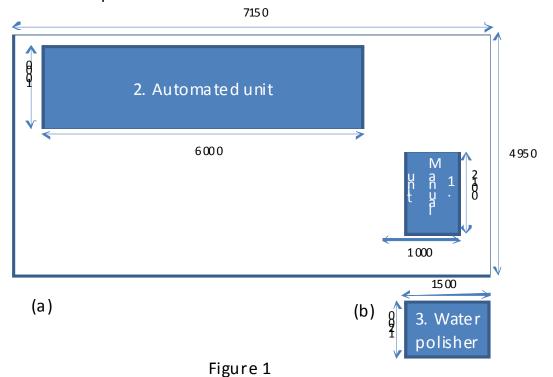
Spec. No	ASP/DST1/E-01
Rev. No	01
Page	10 of 16

FORMAT FOR SERVICE FACILITIES

Sl. No.	SERVICE	DETAILS (To be furnished by vendor)
01	ELECTRICAL	by vendory
O1	THREE PHASE	
	KVA RATING	
	NO. OF SERVICE POINTS	
	SINGLE PHASE	
	KVA RATING	
	NO. OF SERVICE POINTS	
02	10 MΩ DI WATER	
02	FLOW (LPM)	
	1	
	PRESSURE (PSI)	
	PORT SIZE(INCHES)	
	NO. OF SERVICE POINTS	
	TEMPERATURE (Deg C)	
03	RAW WATER	
	FLOW (LPM)	
	PRESSURE (PSI)	
	PORT SIZE (INCHES)	
	NO. OF SERVICE POINTS	
04	COMPRESSED AIR	
	FLOW (LPM)	
	PRESSURE (PSI)	
	PORT SIZE (INCHES)	
	NO. OF SERVICE POINTS	
05	DRAIN	
	PORT SIZE (INCHES)	
	NO. OF SERVICE POINTS	
07	EXHAUST	
	FLOW (CFM)	
	PORT SIZE (INCHES)	
	NO. OF SERVICE POINTS	
08	CLASS OF CLEAN ROOM FOR PROCESS AREA	
09	OTHER SERVICES	
-	(Inclusive of Process Gases)	
10	ENVIRONMENT	
	TEMPERATURE (DEG C)	
	HUMIDITY (%)	

Automatic wet chemical station for processing a batch of 25 Si wafers of size 125x125/156x156 mm²

Approximate permissible dimensions for the various units and their positioning with respect to each other. All dimensions are in millimeters.



1. Manual unit

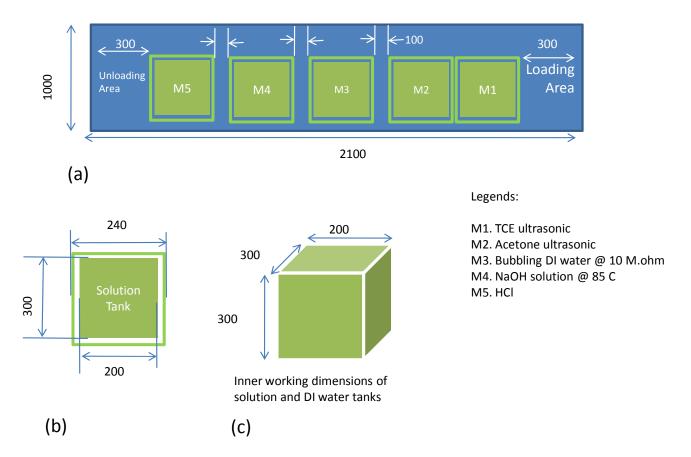


Figure 2

2. Automated unit

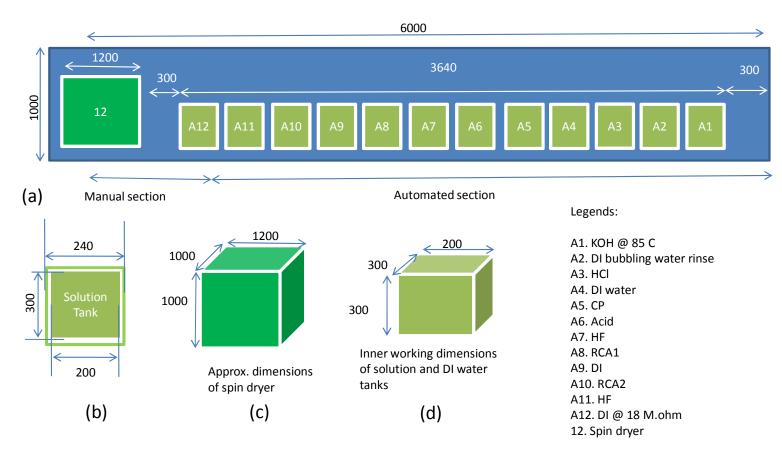
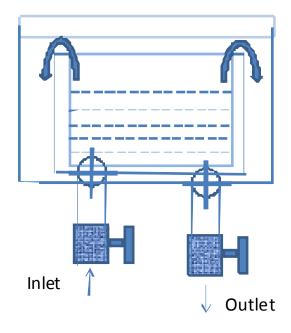
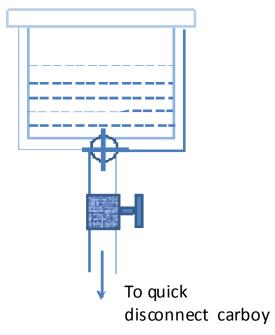


Figure 3

Disposal and drainage system for the manual and automatic line



(a) Double walled rinse tank structure



(b) Solution tank

Figure 4

Fume hood and support structure for the automated line

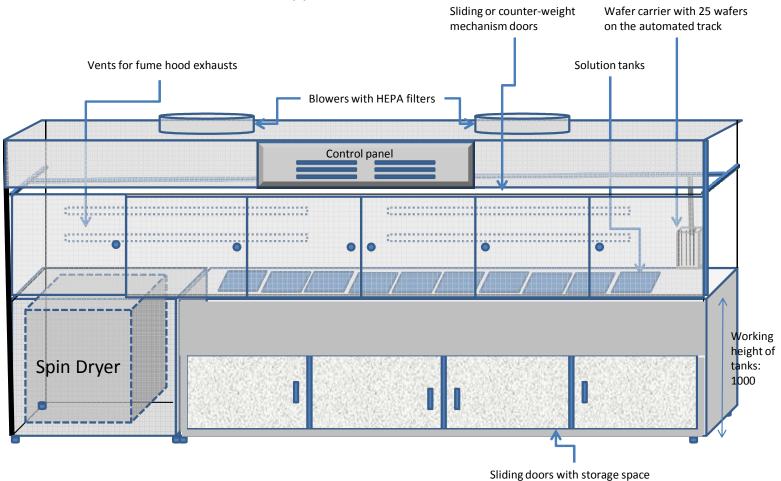


Figure 5

Fume hood and support structure for the manual line

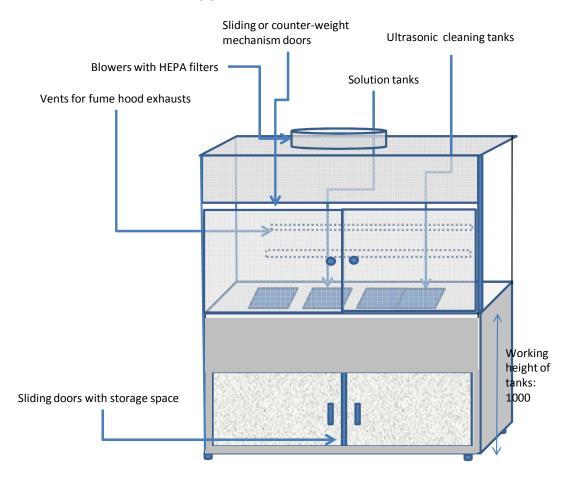


Figure 6