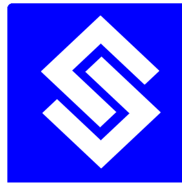
Request for Proposal (RFP)- Technical Part

for Augmentation of

Existing 8-inch CMOS Wafer Fab-line of

Semi-Conductor Laboratory (SCL), India



SEMI-CONDUCTOR LABORATORY

(Government of India, MEITY)

Sector-72, S.A.S NAGAR, PUNJAB, INDIA

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List of abbreviation:

AA - Active Area

ADR- Automatic Defect Review

AEX - Acid Exhaust

AFC - Approved For Construction

AMAT - Applied Material

APC - Advanced process control

ARC - Anti-Reflective Coating

ASIC - Application Specific Integrated Circuit

ASP - Advanced Strip Passivation

ASTM - American Society for testing of materials

BARC - Bottom Anti-Reflective Coating

BE/FE - Backend/Frontend

BHF - Buffered Hydrofluoric Acid

BIS - Bureau of Indian Standards

BKM - Best Known Method

BOE - Buffered Oxide Etchant

BPSG - BoroPhosphoSilicateGlass

CD - Centrifugal Dryer

CD SEM - Critical Dimension Scanning Electronic Microscope

CDA - Compressed Dry Air

CDS - Chemical Delivery System

CDU - Chemical Delivery Unit

CIM - Computer Integrated Manufacturing

CL - Control Limit

CLC - Closed Loop Control

CMOS - Complementary Metal Oxide Semiconductor Field Effect Transistor

CMP - Chemical Mechanical Polishing

CP - Contaminating Particles

CPRI - Central Power Research Institute

CPU - Central Processing Unit

CPVC - Chlorinated Poly Vinyl Chloride

CR - Cleanroom

CT - Current transformer

CV Plotter - Capacitance to Voltage Plotter

CVD - Chemical Vapour Deposition

DBs - Distribution Board

DC - Data Collection

DI Water - De-Ionized Water

DICD - Desired Critical Dimension

DIW - De-Ionized Water

DMR - Discrepancy Material Report

DOE - Design of Experiment

DPS - Decoupled Plasma chamber

DR - Design Rule

DRC - Design Rule Checking

DSW - Defect Sensitive Wafer

DTCU - Dome Temp. Control Unit

DUT - Device Under Test

ECC - Error Correction Code

EDA - Exploratory Data Analysis

EDC - Engineering Data Collection

EDX - Energy Dispersive Xray Spectroscopy

EMO - Emergency Off

EP - End Point

EPD - End Point Detection

EPDM - Ethylene Propylene Diene Monomer

EQP - Equipment

ER - Etch Rate

ERDA - Electrical Research and Development Association

ERP - Enterprise Resource Planning

ERT - Emergency Response Team

ESD - Electro-Static Discharge

ET - Electric Testing

FAB - Fabrication

FAT - Factory Acceptance Tests

FCMS - Facility Control Management System

FFU - Filter Fan Unit

FICD - Final Critical Dimension

FRLS - Flame Retardant and Low Smoke

FRP - Fibre Reinforced Plastic

FSD - Fire and Safety Division

GDS - Graphic Design/Data System

GEM - Generic Equipment Model

GEX - General Exhaust

GI - Galvanized Iron

GN2 - General Nitrogen

GUI - Graphical User Interface

HDD - Hard Disk Drive

HDIS - High dose implant strip

HDP - High density Plasma

HF - Hydrofluoric Acid

HHP - Hot plates

IC - Integrated Circuit

ICP - Inductively Coupled Plasma

ICPMS - Inductively Coupled Plasma-Mass-Spectrometry

IP - Intellectual Property

IPA - Iso-Propyl Alcohol

JEDEC - Joint Electron Device Engineering Council

KLARF - KLA Reference File

LAN - Local Area network

LDS - Liquid Delivery System

LEF - Library Exchange Format

LFC - Liquid Flow Controller

LFM - Liquid Flow Meter

LLA - Load lock A

LLB - Load Lock B

LLD - Liquid Leak Detection

LPM - Liter per Minute

LSS - Life safety system

LVS - Layout Vs Schematic

MCB - Miniature Circuit breaker

MCCB - Moulded Case Circuit Breaker

MEITY - Ministry of Electronics And Information Technology

MEMS - Micro-electro Mechanical systems

MES - Manufacturing execution System

MFC - Mass Flow Controller

MIM - Metal Insulator Metal

MLC - Magnetically Levitated centrifugal Pump

MOC - Material of Construction

MOSFET - Metal Oxide Semiconductor Field Effect Transistor

MOU - Memorandum of Understanding

NVM - Non-Volatile Memory

MVDBs - Medium Voltage Vertical Distribution Board

NBC - National Building Code of India

NLDM - Non-Linear Delay Model

NLPM - Non-Linear Power Model

NOX1000 - 1000 A Silicon Oxide Wafer

NPW - Non Product Wafer

NS-TEOS - Non-Silicide TEOS

NW - N-Well

OCAP - Out of Control Action Plan

OD - Outer Diameter

OEE - Overall Equipment Effectiveness

OEM - Original Equipment manufacturer

OOC - Out of Control

OOS - Out of Specification

P/E cycles - Program/Erase Cycle

PCC - Power Control Centre

PCM - Process Control Monitor

PCW - Process Cooling Water

PDK - Process Design Kit

PECVD - Plasma Enhanced Chemical Vapour Deposition

Photo - Photolithography

PLC - Programmable Logic Control

PM - Preventive Maintenance

PMA - Process Module A

PMB - Process Module B

PN2 - Processed Nitrogen

POC - Point of Connection

POR - Process-of-Record

POU - Point of Use

PPE - Personal Protective equipment

PR - Photo Resist

psi - Pound per Square Inch

PSL - poly styrene latex

PV - Process Vacuum

PVAC - Poly-Vinyl Acetate

PVC-U - Poly Vinyl Chloride

PVDF - Poly Vinylidene fluoride

PW - P-Well

QC - Quality Check

QPC - Quartz Part Cleaner

QTC - Quartz Tube Cleaner

R&D - Research and development

R2R - Run to Run

RAA - Reverse Active area

RAID - Redundancy Array of Independent Disks

RF - Radio Frequency

RF generator - Radio frequency Generator

RFP - Request for Proposal

RNQA - Reliability and Quality Assurance

RPM - Real-Time Production Monitor

RPS - Remote Plasma Source

RQT - Remaining Queue Time

RRC - Recovery Run Card

RRNU - Removal Rate Non-Uniformity

SACVD - Semi Atmospheric Chemical Vapour Deposition

SC1 - Standard Clean 1

SC2 - Standard Clean 2

SCADA - Supervisory Control and Data Acquisition

sccm - Standard Cubic Centimetre

SECS - Semiconductor Equipment Communication Standards

SEM - Scanning Electron Microscope

SEMI - SEMI Standard

SEX - Solvent Exhaust

SIS - Slurry Injection System

SITC - Supply Installation Testing and Commissioning

SLD - single Line Diagram

SLE - Short Loop Experiment

SMIF - Standard Mechanical Interface

SOW - Scope of Work

SPC - Statistical Process Control

SPD - Surge Protection Device

SPM - Sulphuric acid Per Oxide Mix

SQL - Structures Query Language

SRC - Split Run Card

SRS - Scanning Electron Microscope Review Station

SS - Stainless Steel

SSD - Solid State Device

STI - Shallow Trench Isolation

TBI - Triple Beam Illumination

TEB - Tri Ethyl Borate

TEOS - Tetra-Ethyl Ortho Silicate

TEOS-CS - TEOS Contact

TEPO - Tri Ethyl Phosphate

TF - Thin Film

TGM - Toxic Gas Monitor

TMP - Turbo Molecular pump

UHP - Ultra High Purity

ULPA - Ultra Low Particulate Air

UPA - Upper Pneumatic Assembly

UPS - Uninterrupted Power Supply

UPW - Ultra Pure Water

US - Unit Step

USB - Universal Serial Bus

USL - Upper Specification Limit

UV - Ultra Violet

VCR - Vacuum Coupling Radiation

VDD - Drain Voltage

Vds - Drain Source Voltage

Vgs - Gate Source Voltage

VLSI - Very large Scale Integration

VMB - Valve Manifold Box

WIP - Work In Progress

XLPE - Cross Linked Polyethylene

XRF - X-Ray Fluorescence

X-SEM - Cross section Scanning Elecrton Microscopy

YMS - Yield Management system

Preamble

Semi-Conductor Laboratory (SCL), S.A.S. Nagar (Near Chandigarh) is engaged in the design, development and manufacture of Very Large Scale Integrated Circuits (VLSIs) since 1983. Presently, SCL manufactures Digital, Analog & Mixed Signal domains VLSI Semiconductor products, including ASICs (Application Specific ICs) in 0.18µm (180 nm) CMOS technology in its 8-inch wafer fabrication facility. SCL also has a 6-inch wafer fab-line, for MEMS (Micro-electro Mechanical systems) fabrication. Both the 8-inch and 6-inch fab lines co-exist in the same building and share common infrastructure for utilities.

The 8-inch fab-line, comprising of refurbished process tools (70 nos.) with 180 nm CMOS technology was established in 2011-12, primarily for R & D activities. The fab-line has one of the kind refurbished equipment for each process. Process Equipment Line, In-line Inspection & Metrology Equipment and Support Utilities are as per international standards for semiconductor fabrication. The Wafer fabrication process has been qualified as per JEDEC JEP-001A guidelines.

Augmentation of the 8-inch line has been sought under the RFP to facilitate low volume fabrication with committed cycle time. Also, technology IP acquisition for NVM (Non-volatile Memory) shall facilitate product development in demand segments at 180 nm CMOS technology node. Augmentation of 8-inch fab-line is envisaged to be achieved, with minimal disruption of its existing operations, by:

- Supply of 08 nos. equipment with higher capacity and better performance.
- Upgrading the existing equipment / tools (25 nos.) for enhanced overall equipment effectiveness (OEE), including increased equipment availability, better equipment performance, etc.

- Addition of key software / Manufacturing execution system (MES) for productivity enhancement for smooth and efficient utilization of the fab-line .
- Porting NVM IP technology (single poly) on the existing process for 8-inch fab-line, concurrently.

SCL intends to engage an experienced contractor for supply, installation, commissioning & qualification of New / OEM refurbished equipment, upgradation & post upgrade qualification of identified existing 8-inch equipment, supply and porting of NVM (single poly) technology in 8-inch process at SCL, removal & crating of old equipment and equipment move-in, etc. The contractor shall also be responsible for detailed engineering and execution of modification in Cleanrooms & utilities distribution and equipment hook-up, as per Scope of Work. Bidders are required to submit their offers as per the scope of work detailed in this document.

With the above background, the eligibility criteria for participation in the tender, detailed scope of RFP, details of the existing fab-lines / infrastructure at SCL, etc. are given below:

I. Eligibility Criteria

Only those Bidders who meet the following eligibility criteria will be considered for evaluation of their proposals:

- Bidders should have successfully completed at least two similar contract (s) / Project (s) i.e. involving the following, during the last 15 years:
  - Supplying, Installation & Commissioning of semiconductor equipment and integrating the same with baseline process, 180 nm technology node or better.
  - Replacement of process equipment in fab-lines (180 nm or better), qualification and process development on the replaced equipment.

- Experience of fab upgradation activities in a running fab, with minimum line disruption.
- Experience in process module integration and qualification in the baseline process
- Experience in implementing MES software for enhancing fab productivity and semiconductor information management in a running fab-line.
- De-hooking & Roll-out of tools and tool move-in & tool hooking in running Clean-room(s).
- Clean room and Utilities modification/ including tool hookup for supplied/replacement tools, etc.

- The Contractor (prime bidder) may associate with other firms having experience in similar work(s) and in such cases the combined experience of the consortium members shall be taken into consideration for determining the eligibility. However, fulfillment of all the contractual obligations for successful execution of the project shall be the sole responsibility of the Contractor (prime bidder). Prime Bidder will provide Copy of Memorandum of Understanding (MOU) undertaken with all consortium partners, indicating their roles and responsibilities under this consortium for execution of scope of work as per RFP. If the Prime Bidder is bidding on behalf of any OEM, the Prime Bidder shall provide authorization from OEM for submitting the bid against this tender.

- The key personnel identified for execution of the project should have relevant experience in the similar/respective fields. The resume of the key persons should be enclosed with the bid.

- The Contractor (Prime bidder) should be a profit making firm/company and having a turnover of more than 45 Million USD per year during the last three years.

Contractors shall furnish complete details of the contracts executed by them, clearly mentioning the value of contracts, scope of work, date of start & completion, client details, completion certificate from clients etc. and the same shall be supported with relevant documents.

II. Pre-Bid Conference

A pre-bid meeting will be organized to answer any queries or clarify doubts of the prospective vendors regarding RFP specification and terms. The Bidder or his authorized representative is requested to attend.

Any queries/clarifications to this RFP may be sent to this office by email to fab_pm@scl.gov.in or by post so as to reach the under mentioned address well in advance i.e. before the stipulated date:-

Project Manager - Fab Augmentation
Semiconductor Laboratory (SCL), Sector-72,
SAS Nagar, Mohali Punjab 160071

(a) All prospective bidders shall attend pre-bid conference on scheduled date and time. Any request pertaining to change of date, time and venue of pre-bid conference will not be entertained.

(b) All enquiries / clarifications from the bidders, related to this RFP, must be directed in writing exclusively to the contact person notified in this RFP document. Please refer to *Annexure A : Pre Bid Queries Format* “Request for Clarifications” for pre-bid queries format.

(c) The preferred mode of delivering written questions to the aforementioned contact person would be through post or email. Telephone calls will not be accepted. In no event will the SCL be responsible for ensuring that bidders' inquiries have been received by SCL. The queries by the bidders will be provided in the format mentioned in *Annexure A : Pre Bid Queries Format*.

(d) After issuance of the RFP, the contact person notified by SCL will begin accepting written questions from the bidders. SCL will make efforts to provide a full, complete, accurate, and timely response to all questions. However, SCL

makes no representation or warranty as to the completeness or accuracy of any response, nor does SCL undertake to answer all the queries that have been posed by the bidders.

(e) All the interested vendors/ authorized representative (with authorization letters from their respective companies) to attend Pre-bid conference at scheduled date, time and place.

III. SCOPE OF RFP

Scope of this RFP includes the following:

1. Relocation of 10 nos. of existing 8-inch line equipment in cleanrooms to create space for supplied equipment.

2. Supply, Installation, Commissioning and Qualification of 08 equipment.

3. Supply, Installation, Testing and Commissioning/ Qualification of tool upgrades for existing 8-inch process tools (25 nos.).

4. Supply, Installation and Customization of Manufacturing execution system (MES) - A key software for productivity enhancement for smooth and efficient operations of 8-inch fab-line.

5. Supply and porting of NVM technology (single poly) on the existing process for 8-inch fab-line.

6. De-hooking & relocation of existing tools (10 nos.) including pedestal and Tool move-in & tool-hooking for the supplied equipment, in running Clean-room(s) with minimal disruption of operations of 8-inch fab-line.

7. Assess the requirements and carryout the Detailed Engineering and necessary modifications of existing Clean rooms and utilities distribution for installing supplied equipment (8 nos.), relocated equipment (10 nos.) and upgradation of existing 8-inch process tools (25 nos.) as detailed in this

document. The approved detailed engineering drawings will be followed for execution of the work by the selected Contractor (Prime Bidder).

Augmentation of the Generations (Sources) for the utilities is not included in the scope.

Time for completion of the entire work covered under this RFP is 20 months to be reckoned from the date of contract signing with the Contractor. NVM technology shall, however, be ported concurrently in the existing 8-inch line and shall be ready for process in 12 months from the date of contract signing. Accordingly, the bidder shall give the schedule / milestones for execution of the work and detailed timeline plan for execution of these activities with minimum disruption of the operation in the running fab line.

The specification given in this RFP gives only the broad requirements. Contractor shall ascertain total requirements based on the nature of work, existing facilities available at SCL, site conditions etc. and shall be deemed to be aware of and have understood all the requirements regarding the statutory rules, regulations, provisions, codes / standards / norms, as per industry standards and site conditions, existing equipment, material specification, installation, testing, commissioning and functioning requirement's with reference to various systems mentioned in this RFP.

Detailed scope of work is given under the succeeding sections.

Section 1 : Equipment Relocation

Following equipment of the 8” Wafer Fab need to be fingerprinted before de-hooking, de-hooked/de-installed, Roll out of the clean-room from the current location, re-installation in another location (upon necessary clean-room & Utilities augmentation/ modification), as per Table-1 and crating of equipment as per Table-2 :

Table 1 : Equipment Relocation/Re-installation as per Layout and Acceptance

SN	Equipment Description	Make, Model	Acceptance parameters
1	ICPMS (Inductively Coupled Plasma-Mass-Spectrometry)	Agilent ICPMS 7900	Calibration with standard tuning solution.
2	Ellipsometer	RUDOLPH FE-VIID	1. 200 wafer Handling check 2. CP check 3. QC with standard golden wafers
3	Sheet Resistance measurement	RS75	1. 200 wafer Handling check 2. CP check 3. QC with standard golden wafers
4	CV Plotter	MDC 490B-8NI-D3	1. 200 wafer Handling check 2. QC with standard golden wafers
5	Quartz Cleaner	Falcon 328D	1. Chemical transfer through automatic chemical delivery system with canister filled with DI water. 2. Leak check integrity from the jig for holding thermocouple during cleaning, Doors (QTC & QPC) and bottom of Quartz cleaner. 3. Pneumatic Valve operation for drain and purge. 4. Visual analysis of Nozzle spray pattern. 5. Acid leak check from the tanks. 6. Operation of wash cycle and purge cycle. 7. Acidic residue check after Boat cleaning of Nitride furnace
6	XRF- Ti/Tin, P, B. concentration	RIGAKU 3640	1. 200 wafer Handling check 2. Metal thickness (Co, Ti, TiN, W and Al-Cu) B and P concentration measurement matching with golden wafers
7	Film Stress Measurement	KLA, FLX-5400	1. 200 wafer Handling check 2. Stress measurement on Golden wafer
8	Wafer Laser Marker	GSI Lumonics - WMSCDPL	1. 200 wafer Handling check 2. CP check 3. QC check

SN	Equipment Description	Make, Model	Acceptance parameters
9	Implant Damage	KLA TP500	1. 200 wafer Handling check 2. CP Check 3. QC Verification with golden wafers
10	Wafer Sorter - Wafer Start	Brooks PRI SCS 3000	1. 200 wafer Handling check 2. CP check 3. Notch alignment and Laser Mark reading 4. Additional acceptance procedure post upgradation as per *Annexure E : Equipment Upgradation and acceptance procedure SN #18*

The scope of work for the relocation of the equipment/tools includes:

1. Based on the equipment plan given in the RFP (*Table 3 : Equipment and Configuration* Vendor shall make detailed plan for equipment relocation and submit for approval of SCL before commencing the execution.
2. Before de-hook, de-install and relocation of equipment to be relocated, vendor shall make fingerprint of the tool as per the acceptance parameters in Table-1.
3. Vendor shall match fingerprint parameters and acceptance parameter as per Table 1 : Equipment Relocation/Re-installation as per Layout and Acceptance after relocation / recommission of the tool at new location.
4. Vendor shall make site preparation, utility modification, re-installation, commissioning, acceptance and qualification of the relocated equipment.
5. The fingerprinting of the equipment shall include electrical test, EMO, safety test, handling check, particle contamination, process QC and golden wafer mapping etc.
6. All the materials like Raw wafers, Golden Wafers and other materials for Fingerprinting & acceptance of the equipment will be provided by SCL.

Table 2 : Equipment for De-install and Crating

SN	Equipment Description	Make, Model	De-installation plan
1	Asher	Gasonics, AURA 2000	To be moved out of the Fab & Crated
2	BPSG Deposition Equipment	Canon, CVD APT-4800	To be Crated (To be moved out of FAB once additional SACVD chamber is qualified)

The scope of work for the crating of the equipment/tools includes:

1. Before de-hook, de-install and rollout of equipment to be crated, vendor shall make fingerprint of the tool.
2. Vendor shall carry out proper crating (including vacuum packing) of de-installed equipment (02 nos., as given in *Table 2 : Equipment for De-install and Crating*).

Section 2 : Supply, Installation and Commissioning of Equipment

Vendor shall Supply, Install, Commission and Qualify the following equipment in the existing wafer Fab:

Table 3 : Equipment and Configuration

SN.	Equipment description	Required Make, Model	Equipment condition	Equipment Configuration	Installation in Clean room
1	Bright Field Inspection equipment	KLA, KLA2367 PRO	New/OEM Refurbished	Bright field	Class 1000
2	Surfscan	KLA, SP1	New/OEM Refurbished	Triple Beam Illumination	Class 1000
3	Dark Field Inspection Equipment	KLA, PUMA 9150	New/OEM Refurbished	Dark field	Class 1000
4	Metal Sputter	AMAT, Endura	New/OEM Refurbished	6 Chambers (Al-1, TiN-2, Co-1, Pre-clean -1, SIP Ti- 1), 2 Chambers - Degas	Class 10 (wafer loading)
5	Plasma Asher	Matson ASPEN II	New/OEM Refurbished	2 Chambers: ICP and DIODE	Class 1000
6	Oxide Di-electric Etcher	TEL UNT ME / LAM Exalen 2300	New/OEM Refurbished / Third Party	4 Chambers	Class 1000

SN.	Equipment description	Required Make, Model	Equipment condition	Equipment Configuration	Installation in Clean room
7	Back-end Polymer Stripper for Post Metal and VIA etch Clean	LAM, DVI (DV24)	New/ OEM Refurbished	1. Minimum 4 nos chamber -2 in each side 2. Separate chemical tank for each side, 3. Chemical Blend Module, 4. ATMI analyzer for monitoring low level fluoride concentration and the total acid concentration. 5. Chemical delivery system (CDS) should have capacity for minimum 2 drum of 200 Ltr per chemical and provision for automatic as well as manual switching from one Drum to another once Drum getting empty	Class 10
8	Photo-resist Stripper and Pre-diffusion Clean	TEL, ZETA VIPER	New/OEM Refurbished / Third Party	1. Single chamber, 4 batch, can cater process (in any combination) - Diluted HF, SC2, SPM & SC1. 2. Chemical delivery system (CDS) should have capacity for minimum 2 drum of 200 Ltr per chemical and provision for automatic as well as manual switching from one Drum to another once Drum getting empty	Class 10 (wafer loading)

The Scope of work shall include:

1. Vendor shall supply either NEW or OEM Refurbished equipment (as listed in *Table-3: Equipment & configuration* with all necessary licenses / ownership in name of Semi-Conductor Laboratory (SCL), India. For Sno. 6 & Sno. 8; 3rd party refurbished equipment are also acceptable.

2. All Equipment should be as per details listed in *Table 3 : Equipment and Configuration* with all necessary software licenses alongwith License key/password.

3. Vendor shall supply and install all necessary accessories, sub-modules, support tools viz. Chiller units, Chemical Delivery System, Liquid Delivery system, Vacuum pumps, etc. along with the equipment.

4. All the auxiliary items like interconnect matching cables for electrical connections; interconnect fittings, vacuum line etc. for support tool installations; Foundation Pads/bolts, Clamps, etc. as may be required to complete the installation and commissioning of the tool, shall also be supplied along with the equipment.

5. Vendor shall also supply the installation drawings giving detailed information regarding the port size & type for the utility connections.

6. Any item(s), not specifically mentioned in the specifications but required for safe and efficient operations of the system shall deemed to be included in the scope of supply of the vendor unless explicitly indicated in the bid by the vendor.

7. Vendor shall provide Plan for preparation of installation site for the supplied equipment. Schematic of the floor plan (Level-1, Level-2) is attached as *Annexure D : Schematic layout.*

8. Vendor shall uncrate the tools, move the same to the respective area (s) and install the tool on foundations, etc. & will provide utilities hook-up upto the tool. Pedestal, anti-vibration pads, etc. if required for the tool shall be in the scope of the vendor.

9. It will be the responsibility of the vendor to ensure proper installation, tool hook-up and commissioning of the tool at SCL.

10. Vendor shall Commission the equipment with the required process gases (to be supplied by SCL) and demonstrate the functionality of the tool supplied, at SCL site.

11. Vendor shall bring all necessary tools/instruments/jigs & fixtures, special tools etc. that may be required for successful installation/commissioning/ verification of the equipment and sub-modules of the equipment.

12. Vendor shall demonstrate, at site, the functionality as per the tool acceptance procedure specified at *Annexure F : Equipment Acceptance Procedure*. Vendor shall provide best known baseline process recipes and Unit step recipes for 180nm process requirements (refer *Annexure F : Equipment Acceptance Procedure*), for validating the process parameters for supplied equipment and Equipment upgrades with New Chambers.

13. SCL shall have the option for Pre-shipment inspection at vendor's premises. Final acceptance, however, will be done after installation and demonstration of the functionality of the tool, as per the acceptance procedure at SCL.

14. The supplier shall submit records and test method for all the FAT (Factory Acceptance Tests) prior to shipment, as given in *Annexure F : Equipment Acceptance Procedure* and submit the detailed report for the same. These tests should include functioning of all critical modules of the equipment including in the assembled condition and submit test results of all the process trials carried out at OEM/Suppliers site.

15. Technical Documentation: Vendor to supply two sets of technical documentation (in English language) containing, but not limited to, the following:

i. System user manuals (two sets of clean room and two sets for grey rooms).

ii. System Hardware, Software manuals and SECS/GEM.

iii. Maintenance /Diagnostic / Trouble shooting manuals including schematics, Circuit diagram - Schematics(Electrical & Plumbing) along with Parts identifier for all spares.

iv. OEM system/subsystem/accessories manuals
v. Vendor to recommend/ specify type of consumable required for pump and accessories.
vi. Vendor shall supply all additional information such as application development notes, paper published/process information etc. related to the system.

16. General Specifications:

a. The vendor shall submit detailed Technical specifications of the supplied equipment including modules, sub-modules, accessories for the Make & Model specified in *Table 3 : Equipment and Configuration* The vendor must also provide the configuration of the Equipment being offered and make and model of all the support equipment/ sub modules.

b. All the equipment to be supplied shall have to be compatible to Cleanroom Class in which these are to be installed.

c. All the equipment and Equipment Software upgrade should be provided with latest Hardware (Controls system) and latest Software versions.

d. All the equipment have to be with SMIF Loaders (preferably Brooks make), compatible with Entegris POD & cassettes.

   Model No. of POD: M200-ET046-0110 AMBSHL G3WR EURO TR30 MOD E200 DOOR, TAN

   Model of Cassette: CKA19880MNHK-47C02 CARR - WFR 200MM NO HDL SHORT TRACK CLND

e. All the equipment should have in-situ Class-1 mini-environment.

f. Vendor needs to provide all Special Tools required for operation & maintenance of the equipment.

g. All metrology equipment need to be supplied with Golden Wafers and NIST Traceable Standard wafers for equipment qualification.

h. All the equipment should be SEMI Standard compliant.

i. Vendor has to provide clause by clause compliance for all specifications and other clauses of this RFP. The statements in the compliance sheet should be supported by relevant documents/brochures.

j. Vendor to provide specification of all the raw materials to be used in all these 08 supplied equipment and upgrades.

k. Vendor shall comply the acceptance procedure , as mentioned in *Annexure F : Equipment Acceptance Procedure* and Table-6: Module acceptance criteria for Supplied Equipment.

Section 3 : Supply, Installation and Commissioning of Equipment upgrades

Vendor shall carry out upgradation of existing 8-inch equipment (25 nos.) as detailed in *Annexure E : Equipment Upgradation and acceptance procedure*.

Scope of work shall include:

1. Vendor shall supply and install chambers, modules, sub-modules, units, parts, power modules, software upgrade, etc. as may be required to upgrade the existing equipment at its current location in the cleanrooms. Special tools with all necessary software/licenses as per upgrade requirements enlisted in *Annexure E : Equipment Upgradation and acceptance procedure* shall also be supplied. Quote for two major equipment upgrades namely (a) Metal etch and ASP chamber in Metal Etcher (Sno. 4 of Annexure-E) and (b) SACVD BPSG Deposition chamber in TEOS Equipment (Sno. 12 of Annexure-E) are MUST.

2. Vendor shall supply all the auxiliary items like interconnect matching cables for electrical connections; interconnect fittings, vacuum line etc. for support tool installations; Foundation Pads/bolts, Clamps, etc. as may be required to complete the installation and commissioning of the upgrades.

3. Any items not specifically mentioned in the specifications but required for safe upgrade and efficient operations of the equipment shall be deemed to be included in the scope of supply of the vendor unless explicitly indicated in the bid by the vendor.

4. Vendor shall provide BKM (Best Known Method) for process acceptance for unit step, modules and shall comply the acceptance procedure for all upgrades as mentioned in *Annexure E : Equipment Upgradation and acceptance procedure* and Table-5: Module acceptance criteria for upgrades.

5. All Equipment upgrades should be as per *Annexure E : Equipment Upgradation and acceptance procedure* details listed in with all necessary software licenses.

6. All necessary Utilities modifications should be done with recommended makes of parts.

7. Vendor shall provide Plan for preparation of installation site. Schematic of the floor plan (Level-2) is per *Annexure D : Schematic layout*.

8. Vendor shall also supply the installation drawings giving detailed information regarding the port size & type for the utility connections.

9. Vendor shall uncrate the chambers/modules/sub-modules/systems/special tools/pumps/RF generator/Chillers, move the same to the respective area (s), install in respective equipment (s) & will provide utilities hook-up upto the tool.

10. Vendor shall Commission the upgraded equipment with the required process gases, chemicals, coolants etc. (to be supplied by SCL) and demonstrate the functionality at SCL site.

11. Vendor shall bring all necessary tools/instruments etc. that may be required for successful commissioning/ installation/ verification of the tool and sub tools.

12. Vendor shall be solely responsible for ensuring proper installation and commissioning of the equipment upgrades at SCL, in a time bound staggered manner preferably within 5 weeks of handing over the equipment for upgradation and with minimal disruption to the current 8-inch fab-line.

Section 4 : Embedded Single-Poly MTP-NVM IP Acquisition

General

Single-Poly MTP Non-Volatile Memory (NVM) IP is required to be embedded in SCL 1.8V/5V (Dual Gate Oxide) 180nm Technology Platform without any additional masks & processing steps. The scope of vendor includes porting of MTP-NVM IP technology in SCL 180nm Technology Platform based on Specification, Feature and Deliverable of the IP listed in **Table 4 : MTP-NVM IP** below along with those written in Sections C to F. Scope (of vendor) also includes development, GDS (test chip, process control monitors and memory-macro) delivery, characterization and qualification (as per applicable standard) of memory macro of 256 Kb or higher.

For this IP porting, the PDK delivery (SCL's 1.8V/5V PDK), mask tape-out and wafer fabrication as per mutually agreed work plan, will be responsibility of SCL.

The target timeline for the scope of work shall be 12 months from the date of acceptance of Purchase Order (PO).

4A. Specifications

Table 4 : MTP-NVM IP

S.N.	Item	Specification / Feature / Deliverable
1.	IP to be embedded in	SCL 1.8V/5V (Dual Gate Oxide) 180nm Technology Platform without any additional masks & processing steps
2.	Devices used in IP	1.8V and 5V devices (both)
3.	Qualification Status	Qualified in 180 CMOS Process in Wafer Foundry(ies) *Vendor to provide list of foundry(ies).*
4.	Memory Macro for IP Qualification	256Kb or higher
5.	Supply Voltage	Dual Supply Voltage. VDD1: 1.62V to 1.98V (1.8V ±10%). VDD2: 3.0V (or lower) to 5.5V. Maximum Supply voltage will always be lesser than 5.5V.

S.N.	Item	Specification / Feature / Deliverable
6.	Memory cuts Data Width i.e. I/O Channels (w/o ECC)	8, 16, 32
7.	Memory cut size	64b to 256Kb (or higher)
8.	ECC Function	Required, 1-bit correction
9.	Special device requirement, if any e.g. MOSFET with (|Vgs| & |Vds| > VDD2	None. Requirement, if any, of high-voltage generation shall be available within embedded NVM IP.
10.	Program & Erase Scheme	multi-bit (4-bit or higher) Program; Sector (8K x 8) / Chip Erase
11.	Access Time*	75ns (max) without ECC 85ns (max) with ECC
12.	Program Time*	150us (typ) for multi-bit (4-bit or higher) Program
13.	Erase Time*	400ms (typ) for Sector (8K x 8) / Chip Erase
14.	Standby Current (typ)*	Vendor to specify for both supplies, namely, VDD1 and VDD2
15.	Read Current (typ)*	IVDD1: 6.5mA; IVDD2: 10.0mA
16.	Program Current*	Vendor to specify for both supplies, namely, VDD1 and VDD2
17.	Erase Current*	Vendor to specify for both supplies, namely, VDD1 and VDD2
18.	Endurance (P/E cycles)	≥ 1,000
19.	Retention	≥ 10yrs at 125 ºC
20.	Operation Temperature (Junction)	-40ºC to 125 ºC (For both Read and Write)
21.	Interface Compatibility	Embedded NVM IP must interface with 1.8V supply digital block placed on same die. It is required to have all digital interfacing signals between embedded memory and digital block to transition between 0V and 1.8V. This is to be ensured by embedded NVM IP. If level translators are required then they must be part of NVM IP.

S.N.	Item	Specification / Feature / Deliverable
22.	Memory Cuts	20 memory cuts of varying density between 64b and 256Kb (or higher) based on the list to be shared by SCL. Datasheets must be provided for all Memory cuts.
23.	Memory Cuts views	1. LEF, GDS, transistor level netlist – CDL & HSPICE format 2. .v, .lib (NLDM, NLPM) for timing and power (Synopsys) 3. Row address & Column address bit information in document format for all cuts. 4. IP specific DRC, LVS, PEX Guidelines 5. Documentation 6. Views must be compatible with SCL PDK, which will be shared with the Vendor.
*** S.N. 11-17 are applicable to 256Kb macro having 32IO data width without ECC.**		

4B. Project Deliverables for successful porting of technology at SCL, apart from those indicated in *Table 4 : MTP-NVM IP* of Section-4A.

The vendor shall provide:

- Vendor shall provide GDS (along with documentation) of the following to SCL:
  - Qualification Macro
  - PCM (Process Control Monitor) specific to NVM Memory
  - Test chips related to electrical characterization and reliability

- Vendor shall provide documentation of the following to SCL
  - Test Methodology, Test Parameters & limits, Test algorithms for wafer level and device level testing of qualification memory macro, PCM with test limits and Test chips.
  - Bit cell operation.
  - Vendor to share applicable standard for qualification testing. Methodology of Qualification testing as per same standard.
  - Methodology for IP Integration flow in Digital and Analog designs.

- Methodology of joining of various Memory cuts to realize bigger memory macro.
- Characterization and qualification test results for the parameters defined in Table-4 of Section-4A.

4C. Acceptance Criterion

NVM IP shall be accepted by SCL, based upon characterization and qualification test results of Qualification macro meeting requirements defined in Table 4 of Section 4A and as per applicable qualification standards.

4D. Training

Comprehensive training onsite /offsite/ online as per mutually agreed schedule and duration. Vendor to propose training program schedule in advance for minimum 5 working days for SCL team preferably in two sessions.

4E. Warranty

Vendor shall provide support for 12 months after successful qualification and acceptance by SCL. During warranty, vendor shall support troubleshooting through help ticket, email or onsite visit.

4F. The vendor may support SCL on following:

i. Provide within three months of acceptance of Purchase Order to SCL a sample Memory cut of size 2K x 32 or similar with all views, Bit Cell Model (S.N. 23 of Table 4 of Section 4A) and “Methodology for IP Integration flow in Digital and Analog designs” document.

ii. Provide to SCL sample datasheet including timing diagram, pin configuration and timing parameters.

iii. Support SCL in replicating the testing of qualification macro at SCL site. For this purpose, the sample tested-wafers along with the results should be provided to SCL. The arrangements for tester/hardware shall be made by SCL as per vendor inputs. SCL shall share the list of test-resources available.

iv. Provide memory compiler to generate user-defined memory cut.

v. Share test raw database of characterization and qualification tests on SCL fabricated wafers.

vi. SCL may participate in the characterization and qualification testing at vendor’s site as per requirement/agreement.

vii. Provide 100 packaged devices (qualification macro) along with evaluation board.

viii. Return sample wafers/devices tested at vendor’s site to SCL.

4G. Intellectual Property Rights (IPR)

SCL shall have full control over the MTP-NVM IP and deliverables, including all licenses, enabling SCL to use the IP for internal usage as well as for external customers without any restriction and cost implications including but not limited to royalty and usage fees.

Section 5 : Supply and installation of MES / software

Scope

Scope of the Fab Automation/MES requirement is divided in to three parts:

1. Basic Manufacturing Execution System- MES compatible with 200 mm wafer having Modules and features as per detailed specifications in this document. Software has to come bundled with minimum of 50 Users' perpetual license.

    a. Providing various modules as per detailed specifications.

    b. Installing the software at SCL

    c. Customization of modules as per SCL requirements

    d. Integrating MES with various other software like Yield Management Software, Facility Monitoring System (FCMS) and Air Borne Particulate System etc.

    e. Providing training to operators, modeling engineers, process engineers & fab engineers on various modules

    f. Providing Administrative level training to CIM team

2. Hardware/Software required for running MES

    All such software & Hardware has to be licensed in Name of SCL

    a. Provide required hardware: Database servers & Application Servers, directly or through partner

    b. Provide any additional software/hardware to be installed on clients for running MES, directly or through partner

    c. Provide the required underlying database (Oracle/SQL Server etc.), directly or through partner

3. Automatic Data Capturing & Parsing– to be quoted as Optional

Vendor to provide required hardware/software for configuring various equipment (listed in Annexure G: MES Specifications) for capturing/parsing equipment & process data and feeding in to MES.

MES Selection Criteria:

1. MES being provided should not be a legacy MES. It should be latest MES version (not older than 2017) and being actively supported by the MES supplier with regular future updates for at least next 05 years.
2. MES supplied to SCL shall have been installed and customized in commercial production fabs. Vendor to provide certificate for same.

MES software Detail specification and modules are mentioned in *Annexure G : MES Specification*.

Section 6 : Clean-room & Utilities Distribution modifications & Tools Hook up

Scope of RFP includes Supply, Installation, Testing & Commissioning of the Utilities connections / tool hook-up and Clean Room modifications as detailed below to meet the requirements for supplied tools, up-gradation and relocation of existing 8-inch tools. Utility requirements for each of the equipment / Tool and Clean Room layouts are annexed herewith (*Annexure D : Schematic layout*).

1. Vendor shall carry out clean room modification as per the approved/ finalized layout and utility installations for tool hook-up for supplied equipment, equipment relocation, upgradation of existing 8-inch equipment and the support tools. Entire work shall be carried out as per the specifications given in *Annexure B : Scope of Work for Utilities and Cleanroom modification*.
2. Based upon the utilities matrix and equipment layout, vendor shall carry out the detailed engineering for the required Clean room modifications and tool hook-up for various utilities like Bulk Gases (N_2, O_2, H_2, He & Ar), Specialty Gases, Ultra-Pure water, Process Exhaust {Acid (AEX), Solvent (SEX) and General Exhaust (GEX)}, Process Cooling Water (PCW) system, CDA, PVAC and electrical.
3. Vendor shall prepare & submit the detailed engineering drawings including Cleanroom modification drawings to SCL for review and approval. SCL will review the drawings and provide the comments on the same for revision if required. Vendor will modify the drawings and will submit the same again. The drawings once approved will be named as Approved For Construction (AFC) drawings. AFC drawings will be followed for execution of the work.
4. The scope of tool hook-up installation for various utilities shall be from the respective POC (Point of Connection) available in sub-Fab (Ground Floor)/Fab (First floor) upto the process/support tool connection port. While the exiting utility-headers / sub-headers or lateral have spare POCs, in case the spare POC is not available in the nearest lateral, creating the same in the exiting lateral will be in scope of the vendor.

5. Also, in case the lateral needs to be extended to cater to the tool, same will be covered in scope of the vendor.
6. Regarding electrical works / tool hook-up, scope of the work includes supply, installation, testing and commissioning for augmentation/ modification of existing electrical panels, cabling from electrical panels to tools, Local isolator, cable tray, cable termination, earthing, tagging, etc. as required. Scope also includes minor modification/addition of clean room fixtures, LAN, cable tray, ESD earthing cable, associated cabling etc., if required, due to change in the clean room modification work out as per the enclosed drawings.

   As part of the detailed engineering, vendor shall review the existing electrical distribution network to utilize to the maximum extent the existing MVDBs/ PCCs/ cables.

   Contractor to work out on existing electrical panels and their sub panels (Vertical DBs) to meet the power requirements for augmentation/relocation of Fab tool. Based on the detailed engineering, contractor shall have to supply and install new electrical panel (1no.), DBs (2 nos.), associated cabling, termination, earthing, etc. as required.

7. The scope of work includes supply and installation of pipe/ducts/tubes including complete fittings, valves, regulators, cables, Cable treys, Supports, clamps, saddles, auxiliary items like labels, etc. all complete required for executing the tool hook-up.
8. Clean room modification including making cut-outs in clean room wall panels, floor, civil wall, sprinklers modifications etc., if required is covered in scope of the vendor for executing the work. The vendor shall seal the same upon completion of the installation.

Section 7 : Module Acceptance

The supplied equipment/ upgrade of process/metrology/support equipments and subsequent enablement of the Process-of-Record (POR) on such equipments requires porting and acceptance of equipment-specific unit steps and modules of the POR.

Acceptance procedure criteria for upgrade or supplied equipments are listed in *Table 5 : Module Acceptance criteria for Upgrades* and *Table 6 : Module Acceptance criteria for Supplied Equipment.* The wafer work plan defining Design of Experiment (DOE) shall be agreed upon prior to the execution of the wafer experiment. The vendor may opt to include injection wafers to expedite unit step (US)/module setup, however, final acceptance shall be on wafers processed in SCL.

Table 5 : Module Acceptance criteria for Upgrades

Acceptance criteria for Upgrades		
SN	**Equipment Description**	**Acceptance Criteria**
1	**Metal Etcher** (1 DPS chamber + 1 ASP chamber)	Criteria applicable to: a) M1 (Al:450nm, Stack: Ti/TiN/Al-Cu/Ti/TiN, Thickness: ~550nm, DR L/S=230nm/230nm, DUT Comb/Serp area: ~2.42mm^2) and b) ML (Al: 900nm, Stack: Ti/TiN/Al-Cu/TiN, Thickness: ~1000nm, DR L/S=440nm/460nm, DUT Comb/Serp area: ~2.42mm^2)
		ET yield of DR Comb/Serp DUTs in M1 and ML layers >97.5% cumulative on three wafers (144 DUTs) @Nominal FICD including ±10% Aluminum thickness and ±25% OE time.
		Metal attack and corrosion: None
2	**HDP Oxide CVD (3 chamber** Upgrade existing RF generators for STI and Via chambers	Void free fill in STI space ≥200nm
		Void free fill in M1 space ≥220nm (typical aspect ratio: 3:1)
		Void free fill in ML space ≥440nm (typical aspect ratio: 3:1)
		No metal attack
3	**PECVD TEOS** Add Semi Atmospheric Chemical Vapor Deposition(SACVD) chamber for BPSG	Void free fill in GC (poly-Si with spacer) space ≥400nm
		B & P concentration as <5% and <6% respectively with total not exceeding 10%
		Shrink% after anneal: 3%~6%in N2 environment @ Temp=700C, Time=30min
		ET yield of contact chain over N+AA, N+GC, P+AA and P+GC at nominal design rule with number of contacts in chain exceeding 150k >99% cumulative on three wafers.
4	**Pre-Diffusion Clean** Upgrade ozone generator	Gate oxide integrity through Vramp including provision of discarding maximum one outlier wafer from minimum five wafers meeting: Mode-A (Ebd≤1MV/cm) defect density @50% CL: <5defects/cm^2 Mode-B (1MV/cm<Ebd≤8MV/cm) defect density @50% CL: <1defects/cm^2

		No degradation w.r.t. baseline performance of N+/P (1.8V and 3.3V), P+/N (1.8V and 3.3V) and NW/PW diodes of various area-to-periphery ratio.

Table 6 : Module Acceptance criteria for Supplied Equipment

Acceptance criteria for Supplied Equipment		
SN	**Equipment Description**	**Acceptance Criteria**
1	**Photo-resist Stripper and Pre-diffusion Clean**	Gate oxide integrity through Vramp including provision of discarding maximum one outlier wafer from minimum 5 wafers meeting: Mode-A (Ebd≤1MV/cm) defect density @50% CL: <5defects/cm^2 Mode-B (1MV/cm<Ebd≤8MV/cm) defect density @50% CL: <1defects/cm^2
		No degradation w.r.t. baseline performance of N+/P (1.8V and 3.3V), P+/N (1.8V and 3.3V) and NW/PW diodes of various area-to-periphery ratio.
2	**Back-end Polymer Stripper for Post Metal and VIA etch Clean**	ET yield of DR Comb/Serp DUTs in M1 and ML layers >97.5% cumulative on three wafers (144 DUTs) @Nominal FICD including ±10% Aluminum thickness and ±25% OE time.
		ET yield of Via2 and ViaLast chain at nominal design rule with number of Vias in chain exceeding 260k (Via2) and 110k (ViaLast) >99% cumulative on three wafers (576DUTs)
		No attack and corrosion
3	**Oxide Di-electric Etcher**	ET yield of DR Comb/Serp DUTs in M1 layer >97.5% cumulative on three wafers (144 DUTs) @Nominal FICD including ±10% Aluminum thickness and ±25% OE time.
4	**Plasma Asher**	Gate oxide integrity through Vramp including provision of discarding maximum one outlier wafer from minimum 5 wafers meeting: Mode-A (Ebd≤1MV/cm) defect density @50% CL: <5defects/cm^2 Mode-B (1MV/cm<Ebd≤8MV/cm) defect density @50% CL: <1defects/cm^2
5	**Metal Sputter**	For Metal stack, BEOL flow (M1 to EOL including MIM) wafer lot shall be fabricated to prove no degradation w.r.t. Electromigration of Metal and Via layers through WLR and meeting following:
		ET yield of DR Comb/Serp DUTs in M1 and ML layers >97.5% cumulative on three wafers (144 DUTs) @Nominal FICD including ±10% Aluminum thickness and ±25% OE time.
		ET yield of Via2, Via3 and ViaLast chains at nominal design rule with number of Vias in chain exceeding 260k (Via2), 260k (Via3) and 110k (ViaLast) >99% cumulative on three wafers (576DUTs)

Gist: Scope of Work

Action Item	Activity details	Deliverable
Equipment Relocation	Fingerprint, De-hook, de-install, roll out, re-install/ crating of equipment, as listed in Table 1 : Equipment Relocation/Re-installation as per Layout and Acceptance Table 2 : Equipment for De-install and Crating	Fingerprint, De-hook, roll out Utilities, hook up modification plan Acceptance, qualification of reinstalled equipment Table 1 : Equipment Relocation/Re-installation as per Layout and Acceptance
Supply of Equipment	Supply of Equipment with all related accessories and sub-modules, Special Tools/wafers, Consumable Spare parts, as listed in Table 3 : Equipment and Configuration	- Equipment with all necessary accessories & Sub-modules (as per configuration in Table 3 : Equipment and Configuration) -Documents – all Manuals (from OEM), Best Known methods (BKM) - Acceptance criterions, -Training Plans -Specification for raw material for supplied equipment and upgrade as per scope of work of RFP Specific raw material for supplied equipment sputter target, dopant for BPSG etc. for one year of operations -Special Tools -Calibration/Golden wafers - List of spares -Equipment licenses to SCL
Installation & Commissioning of Supplied Equipment	Installation and commissioning of New equipment with all related accessories and sub-modules Annexure F : Equipment Acceptance Procedure	-Uncrating, site prep, Roll-in -Installation (assembly, utility hookup, power up) -Utility Acceptance and Safety Checks all utilities, including electrical installations. -Equipment Acceptance (verification of configuration, Handling, QC, Stability, BKM) Annexure F : Equipment Acceptance Procedure
Equipment Upgradation	Equipment upgrades, as listed in Annexure E : Equipment Upgradation and acceptance procedure	Equipment Upgradation and acceptance procedure 1. Upgrades Installation 2. Acceptance 3. Unit Process Qualification 4. Module Qualification Specification for raw material for upgrade as per scope of work of RFP Specific raw material for BPSG dopant for one container for each dopant with shelf

Action Item	Activity details	Deliverable
		life of minimum 01 year - List of spares
Module Qualification	Establish Unit Steps in the supplied equipment/chamber upgrades	Unit Step acceptance criteria document, Recipe Document
	Establish Process modules for the current 180nm Process and Module Acceptance given: Table 5 : Module Acceptance criteria for Upgrades Table 6 : Module Acceptance criteria for Supplied Equipment	Module acceptance criteria and procedures Table 5 : Module Acceptance criteria for Upgrades Table 6 : Module Acceptance criteria for Supplied Equipment
Technology Acquisition	Embedded NVM single-poly	Test chip Characterization and qualification Final macros with EDA view
Supply of Software and port the same in existing fab-line	Manufacturing Execution System and other Software for efficiency enhancement Annexure G : MES Specification	Manufacturing Execution System -Fab Modeling -Process flow and Process flow management -Queue Time management -Engineering data collection -WIP management -Out of control action plan -Statistical Process Control -Hardware and software -Automatic Data collection from few metrology equipment Annexure G : MES Specification
Detailed Engineering, Supply, installation, testing and commissioning for clean-rooms and utilities modifications	Detailed engineering w.r.t. to Cleanroom & Utilities requirement for supplied equipment, relocated equipment, upgradation of equipment Utilities and cleanroom modification/ augmentation, as per detailed engineering report	Detailed engineering: Approved for construction drawings Execution as per AFC drawings Modification/augmentation of Cleanroom Modification/augmentation of Utilities Annexure B : Scope of Work for Utilities and Cleanroom modification Annexure C : Utility requirement Annexure D : Schematic layout
Training	Operation and maintenance Training on the supplied equipment / upgrades	-Hands On (operation, process & Maintenance troubleshooting) -On-site at SCL

Section 8 : Training

For the supply of equipment vendor shall arrange at least 2-3 weeks extensive operation and maintenance training for minimum 2 SCL Engineers per equipment as mentioned in Table 3 : Equipment and Configuration

During commissioning of the tool vendor shall provide on-site hands-on training to the SCL personnel (including classroom training) on Operations/Process, application software, related applications, trouble-shooting and Preventive Maintenance of the tool supplied at SCL. The training should be extensive (at least for two weeks) enough so that quick diagnostics of problems and remedial actions is possible at SCL.

The training requirement for NVM IP porting and MES are mentioned in the respective sections at Page 30 & Page 208 respectively.

Section 9 : Safety

All the tools/ Equipment and equipment upgrades shall conform to the applicable requirements of SEMI standards and appropriate safety mechanism in terms of warning alarms with interlock shutdowns, emergency machine off etc shall be provided for operator and environment safety.

The equipment safety assessment document as per applicable SEMI standard shall be provided along with operator and tool safety manual for model supplied.

Table 7 : Safety Assessment Results

Summary of Assessment Results: EQUIPMENT/ Tool ID __________

Sr. No	Title	Conforms to appropriate section of SEMI standard	
		Yes (√)	No (X) / NA
1	Hazard warning labels		
2	Safety interlock systems		
3	Emergency shutdown		
4	Electrical design		
5	Fire protection		
6	Heated chemical baths		
7	Ergonomics and human factors		
8	Hazardous energy isolation		
9	Mechanical design		
10	Seismic protection		
11	Automated material handlers		
12	Environmental considerations		
13	Exhaust ventilation		
14	Chemicals / Gas		
15	Ionizing radiation		
16	Non-ionizing radiation and fields		
17	Lasers		

SAFETY PROTOCOL

1. SCL and Contractor team to prepare plan for relocation and new equipment install in line with approved FAB TOOL LAYOUT drawing.
2. Safety procedure for Tool/ Equipment utilities execution for Tool installs / De-install to be followed as under:

   SLE-Safety Check Electrical – Switch Gear Power Rating, Safety Interlocks, EMOs, Earthing etc

   SLO- Safety Check - Hazard warning labels, Construction & connections were done acc. procedures for Bulk Gases, PCW, UPW, PV, CDA, Exhaust, drain), Protection of Rotating/Moving parts etc.

   SL1- Safety Check – Safety requirement for process hazardous chemicals/ gases, All Alarms (Fire, Gas, liquid leak, Fire Protection, Approved Laser, UV, Ionization source safety etc

Final Tool sign off & Acceptance

1. Authorization for Hot works is required to be obtained from Fire and Safety Division (FSD) prior to start of work. Vendor to make request giving details of work to be carried out.
2. Personal Protective equipment (PPEs) provision and adherence to wear as per Job requirement shall be vendor's responsibility.
3. Contractor to identify site focal safety officer who shall be coordinating with SCL Safety Division and shall be responsible for generating report of near misses / incident report as required.

Section 10 : Warranty

Supplied Equipment

Vendor has to provide a comprehensive part and labor warranty for a period of 24 months after acceptance of the system at SCL. Vendor to guarantee 85% uptime for the tool based on 24 hours working, 7 days a week. Vendor has to give two Preventive Maintenance Visits per year in the Warranty Period of the tool. Vendor shall provide all spares (including consumable spares: PM Kits, additional Process kits) which will be required during preventive maintenance during the period of warranty. The format for consumable and spare required for preventive maintenance is as per *Annexure H : Recommended Consumable for PM*

Equipment Upgrade

One year warranty for equipment upgrades as per *Annexure E : Equipment Upgradation and acceptance procedure.*

Vendor shall provide all spares (including consumable spares: PM Kits, additional Process kits) which will be required during preventive maintenance during the period of warranty. The format for consumable and spare required for preventive maintenance is as per *Annexure H : Recommended Consumable for PM*

Section 11 : Recommended Spares and Consumables

Vendor to provide itemized List of Recommended Spares (for reference) for recommended essential spares and consumables which may be required for meeting the tool uptime. The format for recommended consumable and spare is as per *Annexure I : Recommended Spares and special tools*.

Annexure A : Pre Bid Queries Format

PRE-BID QUERIES: REQUEST FOR CLARIFICATIONS

Bidders requiring specific points of clarification may communicate with SCL during the specified period using the following format:

Bidder's Request for Clarification

<table>
<tr><td colspan="4">Name of the Organization</td></tr>
<tr><td colspan="4">Representative Name</td></tr>
<tr><td colspan="4">Position/Designation</td></tr>
<tr><td colspan="4">Email Address</td></tr>
<tr><td colspan="2">Contact Details</td><td>Mob:</td><td>Email Id:</td></tr>
<tr><td colspan="4">Clarifications Requested</td></tr>
<tr><td>S.No.</td><td>RFP Page No–Section–Sub-section</td><td>Content of the RFP</td><td>Points of Clarification</td></tr>
<tr><td>1</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td></tr>
</table>

Yours faithfully,

Designated Contact Person Company name

Designation

Company Seal

Annexure B : Scope of Work for Utilities and Cleanroom modification

I. SPECIFICATIONS: CLEAN ROOMS (CR) MODIFICATION WORK

1. CR modification based upon the tools positioning/relocation requirement is covered in scope of the vendor.
2. CR modification will be carried out strictly as per the Approved for Construction (AFC) drawings.
3. Process Tools are installed in CRs of Class 3 to Class 6 (As per ISO14644-1). The CRs modifications to be planned in such a way that existing CR classification should be maintained.
4. The MOCs of the existing CR are as under:
   a) 50 mm thick Al honeycomb sandwich panel with 0.8 mm thick AL sheet both sides.
   b) T-grid of approx. 50 mm size in extruded Al construction.
   c) U15 Grade of ULPA terminal filters in AL construction.
   d) Perforated floor in Al die cast construction floor tiles and AL pedestals.
   e) Flexible ducts, 12” Diameter, Un-insulated, layers of Al - polyester laminated with spring steel wire helix.
5. Material required for the CR modification will be provided by SCL.
6. Clean room modification work involves the following:
   a) Wall panels movement
   b) Ceiling grid modification
   c) Doors relocation/installation
   d) Raised floor modification
   e) Filters/Blank panels relocation
   f) Air shower movement if required
   g) Wall panels cutting for Tools Bulkhead mounting

II. SPECIFICATIONS: PROCESS COOLING WATER (PCW) SYSTEM:

1. The scope of work involves the Hookup of the New/Relocated/upgraded Tools with the PCW distribution system as per the tool requirement.
2. The MOC of existing PCW distribution system is True bore SS304L designed for 25 bar pressure.
3. PCW Laterals are having 2”/1.5” SS ball valves for connecting the tools.
4. From Ball valves to the tools, the piping is of PVC-U material.
5. For the new tools, similar configuration will be adopted.
6. POCs will be identified by SCL for the tool hookup and drawings will be generated accordingly by the vendor. If spare POC is not available in the nearest lateral, spare POC in the adjacent laterals will be used. However, if spare POC is not available in particular area, creating spare POC will be in scope of the vendor.
7. Vendor to provide well trained technical manpower for creating new POCs in the running system with the minimum disturbance to the existing system.
8. For creating new POC in the existing lateral/main header, True Bore SS304L pipe/fittings/valves suitable for 25 Bar Pressure rating shall be used. SS welding will be carried out using Orbital welding technique only.
9. From POC to the tool, the PCW piping shall meet the following specifications:

a) Providing, fixing, testing and commissioning of PVC-U piping system including all the fittings, PN16 rated, confirming to EN ISO 15493, DIN 8061/62, DIN EN 1452 standard.

b) Ball valves shall confirm to EN ISO 16135 shall be provided near the each tool.

c) Flow meter shall be provided in each line to check the PCW flow in the line.

d) Pressure gauge with the isolation valve to be provided in each line near the process tool.

e) All the fittings shall be joined with OEM make/recommended cement. Jointing surface of pipe and fitting must be cleaned and free of grease as per the OEM recommendations.

f) PCW piping shall be supported and clamped at suitable intervals as per the OEM standard to avoid any line sagging.

g) After laying down the line, each line shall be tested for minimum 10 bar working pressure for a period of 24 hours before connecting to the process tool.

10. Approved Vendors:

S.No.	Description	Approved makes
1.	PVC–U pipe and fittings	+ GF / Asahi/AGRU
2.	SS Pipe and fittings for new POCs	Dockweiler/ Oetoaumpu

III. SPECIFICATIONS: PROCESS EXHAUST DUCTING

1) Hookup of the Tools with the Process exhaust (Acid Exhaust – AEX and General Exhaust GEX) is in the scope of the vendor.
2) The MOC of existing Process Exhaust system ducting is FRP for the AEX and GI for the GEX.
3) Exhaust laterals are having POCs for connecting the tools.
4) From POCs to the tools, the ducting is of PVC-U material for both the AEX and GEX.
5) For the new tools, similar configuration will be adopted.
6) POCs will be identified by SCL for the tool hookup and drawings will be generated accordingly by the vendor. If spare POC is not available in the nearest lateral, spare POC in the adjacent laterals will be used. However, if spare POC is not available in particular area, creating spare POC will be in scope of the vendor. Each POC should have a damper at the outlet of the POC.
7) In case, it is required to extend the lateral of the exhaust system, it will be in scope of the vendor. MOC of the lateral will be fire retardant FRP for AEX and GI for GEX.
8) Vendor to provide well trained technical man power for creating new POCs in the running system with the minimum disturbance to the existing system.
9) MOC for the POC will be fire retardant FRP for AEX and GI for GEX.
10) From POC to the tool, the PCW piping shall meet the following specifications:
    a) Providing, fixing, testing and commissioning of PVC-U piping system including all the fittings, PN16 rated, confirming to EN ISO 15493, DIN 8061/62, DIN EN 1452 standard.
    b) Ball valves/damper confirming to EN ISO 16135 shall be provided near the each tool.
    c) Magnehelic gauge will be provided in each line near the process tool.
    d) All the fittings shall be joined with OEM make/recommended cement. Jointing surface of pipe and fitting must be cleaned and free of grease as per the OEM recommendations.
    e) Exhaust piping shall be supported and clamped at suitable intervals as per the OEM standard to avoid any line sagging.
11) Approved Vendors: + GF / Asahi/AGRU

IV SPECIFICATIONS: GAS DISTRIBUTION PIPING

A. MATERIAL SPECIFICATIONS:

PIPE/TUBING

Stainless steel piping/tubing shall be Seamless, 316L, stainless steel, ASTM A 213, ASTM A 269, ASTM A 632; hydrogen bright annealed having a controlled inside diameter finish with a maximum roughness not to exceed 10 micro inch and a hardness of Rb 60 to Rb 80, with 5% maximum allowable chromium carbide, 0.005 to 0.017% maximum Sulphur content, and chrome/iron ratio 2:1.

The tubing supplied shall have the same heat number for the same size.

CO-AXIAL TUBING: The containment jacket for co-axial tubing shall be of seamless 316L stainless steel, meeting the requirements of ASTM A269 and ASTM A362. Diameter shall conform to the following:

Gas Transmission pipe OD size (Inch)	Containment Jacket Pipe OD Size (Inch)	Wall thickness (Inch)
0.25	0.50	0.049
0.375	0.625	0.049
0.5	0.75	1.22
0.75	1.0	1.65

FITTINGS

Weld Fittings:

a) Tees: Fabricated by using seamless 316L stainless steel tubing having fabrication dimensions and tolerances compatible with orbital welding equipment.

b) Elbows: Manufactured, long radius type with the same wall thickness and heat number as that of tubing for each respective size. Field bending will not be acceptable. Fabrication dimensions and tolerances shall be compatible with orbital welding equipment.

Mechanical fittings:

a) All mechanical fittings for sizes ≤ 1" Ø shall be VCR® type with Nickel gaskets and 316SS retainer ring, for all process gases unless the gas type does not allow this like with CO then the gasket will be SS.

b) Compression fittings (double ferrule fittings) of 316SS shall be used only for non-critical applications like CDA, PVAC etc.

VALVES

Pack-less bellows type rated at 150 psi, provided with 316L stainless steel bodies, Kel-F seats, integral purge ports downstream of seat with VCR fitting caps. VCR gasket seal shall be constructed of electro-polished pure nickel.

The valves shall be Pre-cleaned for Ultra high purity gas system and shipped to site in sealed, unopened, double polyethylene bags.

The valves shall be provided with 6" tube extensions, cut and faced for automatic but-weld system, with tube wall thickness to match system. Valve tube extensions shall be the same as tubing material.

Leak test of each Valve

Each valve shall be tested by Pressurization to 150 psi with 100 % Argon. Valves shall be tested for compliance with a leak rate not exceeding 1 x 10-9 atm Cu.cm/sec between the valves and ambient, and across seat.

FINISH: Electro-polish interior valve surfaces to a surface finish 10 Ra Micro- inch Max and 7 Ra average after tube extensions and purge ports have been welded to valve body.

B. EXECUTION / FABRICATION:

a) All fabrication activities staring from un-packing the clean pipe/fittings to welding etc. shall be carried out in the clean room facility with clean rooms classification 100 vertical laminar flow station to be provided by the vendor.

b) A sufficient I.D. purge (Ar or N2 grade 6) velocity shall be provided during cutting deburring and bending of pipe to prevent back-streaming of particles in the tubing. Purge shall be from the end farthest from the cut or deburred point.

c) Cut pipe using a wheel-type cutter. Deburr each cut with the tubing piece oriented vertically with the end to be deburred pointing downward.

d) Following cutting and deburring of pipe, cleaning of the inside diameter shall be done.

e) For butt-welds, ends shall be squared, cleaned, cover ends with Aclar-33C cap.

f) The ends are to be closed with 6 mil polyethylene bags sealed at least 6” from the ends with clean room low residue tape and left under atmospheric Nitrogen gas pressure.

g) A continuous Argon gas purge on piping segments shall be maintained when system is not being fabricated or installed. This “inside” purge is separate and distinct from the Argon Purge Welding. Regulate Argon gas delivery pressure to 30 psi at the cylinder.

h) Place a clean, once used Aclar-330 pipe bag over the end of a piping segment for purging. Provide bags with the following hole sizes:

- Less than ¾”, use 1/8” diameter hole.
- ¾” to 1-1/2”, use ¼” diameter hole.

i) Prior to welding components together, begin Argon backing gas purge. Maintain purge to reduce moisture level to less than 2 ppm and Oxygen level to less than 3 ppm. Instruments shall be contract furnished, Owner approved. Continue exterior argon purge after completion of weld unit joint has cooled to less than 25 deg. C (77 deg. F) . Exterior Argon Purge rate shall be in strict accordance with the welding equipment manufacturer’s recommendations.

j) Fabricate piping subassemblies in the clean room/clean environment to minimize field welding. Clean and seal fabricated sections in poly ethylene bags, purged with argon, and transport to the point of final installation. Do not remove bags until actual installation is to begin.

k) Once installation of a piping system has begun, continue the inner argon gas purge without interruption until the system is completed and can be isolated from contact with the environment.

l) Upon completion of the installation, maintain a constant Argon purge at the end of each branch using the last valve as a regulating flow orifice. Maintain the system in this condition until acceptance. Testing is to be performed as specified.

m) Make valve/pipe terminations with VCR cap fittings.

C. TESTING

Detailed information pertaining the instruments and methods to be used in performing the gas analysis for purity and particulate certification of the distribution system shall be submitted to the SCL for review prior to testing. SCL shall have the right to be present and witness the testing and certification of the piping systems.

PRESSURIZATION TESTING:

- Use Argon/Nitrogen for pressurization of the distribution systems.
- Filter Argon immediately before introduction into the piping system.
- Maintain the system at 250 psig static pressure for a period not less than 24 hours without a delta pressure 0 psi. During this period Argon gas source is disconnected and isolated.

HELIUM (VACUUM) LEAK TEST

- Prior to testing, thoroughly inspect the gas systems to assure compliance with flow diagrams.
- Bag all orbital weld joints, valves and VCR connection with 4 mil, Aclar – 33C bags.
- Pump system down to 1 x 10^{-9} atm cm^3/sec.
- Starting from the closest point from the vacuum pump, inject 100% helium into each Alcar bag.
- Using the approved (i.e. Edwards, Model 300E, Portable Helium Leak Detector or equivalent with sensitivity at least 4 x 10^{-10} atm. Cu cm/sec.

As determined in accordance with American Vacuum Society Standard T.S. 2.1 and Record in chart strip charge recorder), locate and identify all leaks by systematically checking all welds, valves and VCR connections. Clearly mark and document leaks. Report leaks to SCL in writing.

- Inboard Helium leak check – 1x10-9 sccm He/sec shall also be performed.
- Before any leak is repaired or sections replaced, contractor shall submit procedures to SCL for approval. Upon completion, retest the system as specified.

PURITY / PARTICULATE TEST

- Mains and branch, valves of the system shall be sampled and analyzed. Total residue, gas impurities shall be no greater than those existing at the primary gas source specified.

	1) Start of Header	2) End of Header
Moisture –	1) 10 ppb	2) 10 ppb
Oxygen –	1) 10 ppb	2) 10 ppb

- The particle counts taken at the farthest end shall be well within the limits to be specified. Particles <10/scf @ .02μm.
- Record location and analytical results for all points sampled. The names and signatures of operators and witnesses shall be recorded for each sample.
- If a gas/particle analysis reveals that a sampled point does not comply with specifications, retest said point(s). If a second testing of that point also indicates noncompliance, SCL shall determine the extent of the segment of the system to be removed and replaced as a result of noncompliance. The procedures to be followed for such remedial action shall be in strict accordance with these specifications. The installing contractor shall be held responsible for all costs incurred in performance of corrective action taken, due to non-complying piping

segment, including costs associated with retesting of the system until acceptable. Waiving of testing will not be allowed.

D. LIST OF APPROVED VENDORS:

	ITEM	APPROVED MANUFACTURER
1.	Electro polished Stainless Steel tubing's and fittings (ordinary and co-axial)	Cardinal / Valex / Dockweiler / Fujikin
2.	High Purity SS Fittings (Double Ferrule and Gasketted)	Swagelok / Cajon / Parker / Hamlet
6.	Pressure Regulators	Veriflo / /AP Tech/ Tescom
7.	Point of use valves (Diaphragm Valves)	/ Tescom /Nupro/Ap Tech
8.	Point of use filters	Millipore / Pall
9.	Pressure Gauges	USG / Tescom/ Wika

E. CODES AND STANDARDS

The design, manufacture, testing and inspection of the Ultra Purity Stainless Steel Piping covered under this specification shall conform in general to the codes and standards (latest edition) mentioned below:

- American Society for testing of materials (ASTM) Standard.
- American Welding Society Standards.
- Pipe fabrication Institute Standards ES-3.
- American Vacuum Society Standards.
- ANSI-ASME B 31.8 – 1982 Gas Transmission and Distribution Piping System.
- Industrial Practice for gaseous oxygen transmission and distribution piping system per Compressed Gas Association Inc.
- ANSI B 36.19: Stainless Steel Pipe.
- SEMI – Standards.

V SPECIFICATIONS: PVDF DISTRIBUTION NETWORK FOR UPW

A. MATERIAL SPECIFICATIONS

Semi-Conductor grade piping, fittings and valves shall be pre-cleaned, capped or sealed in a bag and enclosed in a container to prevent contamination during shipment and storage at site.

UHP PVDF PIPING:

Piping fabricated of virgin Kynar or Solef, a pure Poly Vinylidene fluoride (PVDF) homopolymer of a type which shall not introduce contamination with UHP water. The tubes shall have glasslike I.D. finish. The maximum roughness in micro-inches shall be identified by the tubing manufacturer. Internal surfaces shall comply with the following:

a. Not more than 5 pore per 1300 sq.mm with no pore larger than 5 microns across.

b. No visible flow lines in the interior.

c. Non fragmenting and smooth shouldered pores.

d. Glass like finish.

The tubings shall be supplied in 20' – 0" lengths, in lots of 20 section each. Each tube shall be nitrogen purged and then securely capped.

PVDF FITTINGS

Elbows shall be long sweep type.

Fitting thickness shall be same as tubing wall thickness whenever possible. Heavier wall thickness with machined ends compatible with adjoining tubes is acceptable.

Fitting roughness – The manufacturer shall identify the interior surface roughness in micro inches.

Piping, fittings and valve joints shall be made by Butt fusion process in strict accordance with manufacturer's specifications.

The Stub flanges shall be Butt- fused, for use with Teflon – coated Viton rubber gaskets. UNC hex-head 316 SS machine bolts & nuts are to be provided.

VALVES

The valves shall be of PVDF body with Teflon diaphragm provided with position indicators. Valves upto 2" size shall be butt fused. Valves of 2 ½ " or larger size shall be butt fused or flanged.

SUPPORTS

Piping supports shall be in accordance with recommendations of piping manufacturer.

B. **EXECUTION/ FABRICATION**

A condition of Ultra High Purity must be maintained inside of PVDF system throughout the duration of fabrication and installation activities. All fabrication activities starting from un-packing the clean pipe/fittings to welding etc. shall be carried out in the clean room facility with clean rooms classification 100 vertical laminar flow station to be provided by the vendor.

PIPING

a. The pipe shall be cut using wheel type cutter only. Each cut shall be deburred with the pipe piece oriented vertically with the end to be deburred pointing downward to ensure that burr does not get entrapped with in the pipe.

b. Prior to butt fusions, pipe ends shall be squared and cleaned of particulates, the cut end shall be wiped clean with a lint-free cloth saturated with semiconductor grade acetone. Once used, the cloth shall be discarded.

c. Strict attention should be paid to progress of assembly so as to ensure that system ends and components are not left exposed to the environment when the work is not in progress.

d. When the piping system is not under construction or work has been interrupted, open pipe ends should be capped.

JOINTS

a. Butt fused joints shall be made up in strict accordance with manufacturer's instructions.

b. Threaded joints shall be used only at equipment connections. Teflon tapes shall be used for make up using not more than 2 wraps beginning at large end of threads, wrapping towards small end, and leaving 2 end threads exposed. No sealant material other than Teflon tape is acceptable.

VALVES

a. The valves and in-line specialties shall be located in readily accessible positions for operation and maintenance. Unions and flanges shall be provided at equipment and work station connections or at other in line locations requiring maintenance.

b. Millipore sampling valves shall be provided at the end of each sub-loop/ chase.

C. TESTING

Test procedure for the piping system shall comprise of the following:

a. Test fluid shall be semiconductor grade deionized water filtered to 0.2 micron absolute for all times.

b. Test piping shall be pressurized hydrostatically.

c. The piping system shall be filled with DI Water, opening all valves and ports to purge system or air.

d. 100 psi pressure shall be applied to the system using specification grade nitrogen. The leaks, if any, shall be noted, the pressure released and the DI Water removed by purging with specification grade nitrogen.

e. Special care shall be taken while repairing leaks. The fragments and particular matter produced during joint preparation shall be removed. The test shall be resumed after repairing the leaks.

f. The piping system shall be recharged & maintained at 100 psi test pressure for 24 hours with no decay.

D. LIST OF APPROVED VENDORS

	ITEM	APPROVED MANUFACTURER
1.	PVDF PIPING and FITTINGS	+ GF / Asahi/AGRU
2.	VALVES	+ GF/Gemu/AGRU

VI SPECIFICATIONS: CDA/PVAC/DRAINS/CITY WATER CONNECTIONS

	COMPONENT	SPECIFICATIONS
1	**COMPRESSED DRY AIR (CDA).**	**PIPING:** Truebore TCC orbital weldable SS 316L pipes/Tubing shall be of controlled ID finish and shall be supplied from the manufacturer in pre-cleaned condition completely free from oxide, oils, greases, other lubricants, mill chips, scales etc. **FITTINGS:** Orbital Weldable SS Fittings compatible with adjoining pipes. **VALVES:** Ball valves with NPT connections, SS ball with Teflon seat or stem seals, quarter turn handles, and a locking plate. Valves shall be designed for vacuum and working pressure upto 250 psi. Valves shall be factory cleaned for oxygen service. **PRESSURE REGULATOR:** Precleaned single stage regulators with SS body, Kel-F or equivalent seats, reinforced nylon/ neoprene diaphragm, inlet & outlet gauges and end ports with double ferrule compression fittings (for < ¾” dia). **FLEXIBLE CONNECTIONS:** Nylon tubing with double ferrule brass fittings.
2	**PROCESS VACUUM**	**PIPING:** Truebore SS304L. The tubing shall be supplied by manufacturerin pre-cleaned condition completely free from oxide, oils, greases, other lubricants, mill chips, scales etc. **FITTINGS**: Weldable Fittings compatible with adjoining pipes. **VALVES:** Ball valves with NPT connections, SS ball with Teflon seat or stem seals, quarter turn handles, and a locking plate. Valves shall be designed for vacuum and working pressure upto 250 psi. Valves shall be factory cleaned for oxygen service.
3	**DRAINS**	
a.	Acid and Chemicals (except solvents)	**PIPING:** The chemical and acid drains shall run through Sch-80 CPVC tube: - Sch-80 CPVC pipe shall be as per ASTM F441 - Fittings, solvent socket welds - Solvent cement shall be as per ASTM C 2646 **VALVES:** All wetted parts of the valve shall be appropriate for the chemical service – VITON, EPDM or equivalent. For aggressive chemicals Teflon or Teflon coated elastomers shall be provided

b.	Organic Solvents	**PIPING & FITTINGS:** Welded SS304 **VALVES:** S.S.Butterfly/ Ball valves with flanged end connections
4	**CITY WATER**	**PIPING & FITTINGS:** C-class G.I. piping and fittings **VALVES:** S.S. Ball valves. **FLEXIBLE CONNECTIONS:** Braded hoses having female NPT end ports

VII SPECIFICATIONS: Electrical

Brief Scope of the work:

a) Study of 400 volts and 208 volts LT panels, vertical/horizontal DBs catering to the 8” Fab tool.

b) Identification and list out the spare feeders/isolators with their power rating in the electrical panels/DBs to match the same with new/relocated tools and their accessories power requirement.

c) If required, Design, Supply, Fabrication, Installation, Testing and Commissioning new IEC 61439 compliance electrical panels, vertical DBs, their cabling, termination, earthing etc. based on the above requirements.

d) Vendor shall relocate/modify the existing lighting fixture, GI conduits, wiring, fire detection system, speakers, LAN, ESD active ionizers etc. as may be required to match the modified clean room layout as approved by SCL.

e) To work out the requirements of cables, Cable trays, cable termination, cable tie, earthing etc. to meet the any modification/alternation of the electrical infrastructure for augmentation/relocation of the fab tools.

f) SITC of XLPE insulated, Copper, flexible cable as per IS, GI perforated/ladder cable tray, local isolator, earthing, tagging etc. from the electrical panels/vertical DB for tool hook up to augment the new/relocated Fab tools.

g) 6A/16A Power / utility service sockets as may be required for Single/three Phase loads for new/relocated 8” tools.

h) Cabling, wiring, MCB-DBs for items under (g).

i) Power and ESD earthing.

j) Shifting of the 10 loop fire panel and LSS (Life safety system) node from the existing ERT room to the new ERT room, as per the layout drawing.

k) Dismantling, strip our and reinstallation of electrical material for clean room modification, augmentation/relocation of Fab tool. Vendor may utilize the existing material as required to the maximum extend to achieve the same.

l) Material, accessories, hardware and all required items/ services, whether Specified or not, for satisfactory completion of electrical work.

A. CODES AND STANDARDS:

The Electrical system shall conform to the requirements of the following Standards:

a) Indian Electricity Rules.

b) IS/ IEC standard for electrical

c) National Electrical Code of India

d) National Building Code of India (NBC).

e) Applicable standards issued by Bureau of Indian Standards (BIS)

f) Regulations of local electricity and fire authorities

g) Requirements stipulated by Pollution Control Board for Noise, Air & Water Pollution.

B. System Configuration:

For process tools

Main power circuit: - 400 volts and 208 volts AC 3 phase and solidly Grounded neutral.

Control circuit: - 230 volts AC/120 volts AC

Emergency power: - 400volts AC from DG set and UPS

For utility Equipment

Main power circuit: - 415volts+_10 % AC, 3 phase, and solidly grounded neutral.

Control circuit: - 240 volts AC

Emergency power: - 415volts AC from existing DG set and UPS

Frequency Variation: - 50±5% Hz.

C. Technical Specifications

1. Technical specification for Electrical Panel (3 Phase 208V/3 Phase 400V)–

The vendor to assess SCL's electrical panels, vertical DBs to cater power to new/relocated tools based on the Approved Fab layout drawing and try to utilize the existing POCs to maximum extent without taking power shutdown. However, if requirement could not be met from existing infrastructure, vendor to plan for new electrical panel/vertical DB and their cabling etc. as required to power up the tools. Specification of new panel/ vertical DB is as under:-

General

- Panel shall be fabricated as per IEC 61439 part 1 & 2.
- Panel shall be indoor, metal clad, air insulated floor mounted extendable to side, single front construction, front wired, front connected.
- Minimum thickness of sheet metal used shall be 2 mm and panel shall confirm to IP54 protection. IP test certificate shall be furnished along with the offer.
- The design should be fully compartmentalized with metal partitions between compartments. All doors shall be gasketed. Each vertical section shall have removable back cover.
- All switches, push buttons, lamps, indicating instruments shall be flush mounted.
- A full height vertical cable chamber with cable supports shall be provided in each section to facilitate unit wiring. Cable chamber shall be sized to accommodate all cable and shall have removable covers. A horizontal wire way extending the entire length shall be provided at the top of panel for inter panel wiring.
- The Panel shall be mounted on a robust base frame made up of steel channels with a minimum height of 75 mm. The base frame shall be able to withstand the static and dynamic loads of the LT Panels. The steel channels shall be painted with two coats of black enamel paint over a coat of zinc chromate primer. The steel channels shall have slots/ holes provided for fixing the panel.

- The panel shall undergo seven tank or better process as per relevant IS/IEC standards.
- Lifting hook shall be provided at each section for easy transportation.
- Different compartment of the panel shall be provided with dust proof type air filter louvers /explosion vents or similar safety arrangements in the panels to let out gases under pressure generated during event of any fault inside the panel.
- Panel shall have pocket for the Panel drawing in the incomer section.
- The LT Panel shall be designed for usage up to an altitude of 2000 m as per IS/IEC 61439.
- The Panel shall, in all respects, be suitable for operations in service conditions and shall withstand the stresses due to the seismic conditions.
- The Panel along with Switchgears, Busbars and connections shall have all type tests a defined in latest IS/IEC 61439-1 & 2with latest amendments for the ratings specified from CPRI/ERDA/Independent international test house. All type test reports as per IS/IEC 61439 shall be submitted along with the offer for verification.
- Panel shall be tested to withstand internal arc fault and valid Type Test Certificates have to be provided as per IEC61641 (with latest amendments).
- The LT panel enclosure shall have designed to take care of normal stress as well as abnormal electro-mechanical stress due to short circuit conditions. All covers and doors provided shall offer adequate safety to operating persons and provide minimum ingress protection of IP 54. Ventilating openings and vent outlets, if provided, shall be arranged such that same ingress protection of IP 54 is retained.
- Panel shall also have test certificate for seismic withstand capacity as per relevant standards.
- The LT panel shall be provided with front and back access and the maximum height of the panel shall not exceed 2300 mm. All operating devices on the LT panel shall be positioned at an accessible height.
- The switchgear assembly/sub-assemblies or panels shall be termite and rodent proof. The sub-assemblies of similar equipment shall be interchangeable.

- Electrical panel shall be installed either on ground floor or on first floor. Necessary crane/ hydra for shifting the panel from ground to first floor of the building shall be arranged by the contractor.

IEC /IS STANDARDS (with latest Amendment as applicable)

IEC 61439 (Part-1 & 2)	Low-voltage Switchgear and Control gear assemblies
IEC 60044 (Part-1 & 2)	Instrument Transformers (Current Transformer & Potential Transformer)
IS/IEC 60947 (Part-1 to 5)	Low voltage switchgear and Control gear
IEC 61641 : 2008 / IS: 2147:1962	Specification for Internal Arc Containment Test
IS/ IEC 60529	Degree of protection provided by enclosures (IP code)
IEC 60073	Basic and Safety Principles for Man-Machine Interface, Marking and Identification – Coding Principles for Indicators and Actuators.
IEC 60417	Graphical symbols for use on equipment.
IEC 62052-11	Electricity metering equipment (AC) General requirements, tests and test conditions Part 11: Metering equipment-First Edition.
IEC 62052-21	Electricity metering equipment (A.C.) General requirements, tests and test conditions Part 21: Tariff and load control equipment-First Edition
IEC 62208	Empty enclosures for low-voltage switchgear and Control gear assemblies General requirements
IEC 60228	Conductors of Insulated Cables.
IS 694	PVC insulated cables for voltage including 1100 V with copper conductor.

Busbar and Bus Taps

- Construction of Busbar, Busbar connections, Busbar chamber, supports and conductors shall be as per the type tested/ verified design in compliance to IS/IEC 61439. Busbars shall be provided with colour coded sleeves for phases and Neutral identification.
- The short-time withstand current rating shall be 35kA.
- Busbar shall be of rectangular section with hard drawn high conductivity with minimum 99.0% purity, aluminium conductor adequately rated and supported by moulded insulators spaced at suitable intervals. The complete

assembly shall be capable of withstanding the maximum mechanical stresses to which it may be subjected to under fault conditions.

- The configuration of LT panel shall be such that its bus bar shall be extensible on both sides by addition of vertical sections after removal of the end covers.
- The cross section of neutral busbar shall be same as that of the phase busbars.
- Auxiliary buses for control power supply, space heater power supply or any other specified service shall be provided. These buses shall be insulated, adequately supported and sized to suit specific requirement.
- Barriers shall be provided between the busbar chamber cover and live busbar in order to avoid accidental contact with live parts.
- The main bus and connections shall be of high connectivity Aluminium/Aluminium alloy, sized for specified current ratings with maximum temperature limited to 85° C. i.e. 35° C rise above ambient temp. of 50° C.
- Separate vertical bus bars shall be provided for each vertical panel.
- Adequate contact pressure shall be ensured at bus connections by means of two bolt connections with plain and spring washers and lock nuts.
- Bus bar and connections shall be fully insulated for working voltages with adequate phase/ground clearances. Insulating sleeves heat shrink type for bus bar and shrouds, removable type joints shall be provided. Bus insulators shall be flame retardant.
- Busbar should be connected in such a way that it can be dismantled/ assembled while separating different section of the panel.
- Shrouds of transparent sheet on the exposed bus in cable alleys, for adequate safety measure.
- Clearances between phases-phases, phase – Earth/ neutral should be in line with IS/IEC 61439.
- Bus Bar supporting Material shall be of SMC/DMC.

Surge Protection Devices (SPDs)

- Panel incomers shall be protected by providing a suitable Surge Protection Device (SPD) having voltage protection level ≤ 1.5 kV. At the line entrance into the structure (at the boundary of Lightning Protection Zone-1, for

example at the main LT panel), SPD tested with typical 10/350 impulse current waveform and tested with 8/20impulse current waveform i.e. SPD Class1 & 2 shall be provided. Sub-distribution panels (at the boundary of Lightning Protection Zone-2 and higher) shall be protected with SPD tested with typical 8/20 impulse current waveform i.e. SPD Class 2.

- SPD shall be installed in LT panel in such a way that the maximum length of wire/ cable connecting SPD and Earth Bus shall be lesser than 0.50m.

Control Module

- Fixed type control module shall house the control components for a circuit.
- The equipment layout shall provide sufficient working space in between the components and subject to SCL approval.

MCCB

- The MCCBs should be extra current limiting type with trip time of less than 10 msec under short circuit conditions. The current limiting action should be achieved with repulsion principle. The MCCBs should preferably have an anti-reclosing feature.
- The MCCBs should be 4 poles for incomer and outgoing feeders.
- The MCCBs shall be arranged in multi-tier formation.
- The MCCBs should have a Service short circuit breaking capacity (Ics) of not less than 35 kA rms at 400 Volts 50Hz AC for incomer. The service breaking capacity should be equal to ultimate breaking capacities (Icu) (i.e. Ics= Icu=100%).
- The release should be thermal magnetic having adjustable overload and short circuit.
- Cubicle doors of incoming and outgoing shall be mechanically interlocked with switchgear to prevent unintentional openings of the door while the unit is in energized condition. However, defeat interlock provision is also to be provided.
- All incoming and outgoing feeders shall be provided with bolted disconnect link for isolation of neutral, if necessary. Selector switches shall be of rotary type.

- The MCCB shall be provided with rotary drive kit, spreader terminals and ON/OFF/Trip (MCCB) position of switch handle to be clearly marked.
- For incomers MCCB should be microprocessor based communicable MCCB (35 kA or above) with numerical releases for O/L, S/C & EFR.

Contactor

- The contactor shall be 3 pole, air break type AC3 Duty continuous rating for motor starter feeders with non-bouncing silver/ silver alloy contacts.
- Contactor shall be of electromagnetic type rated for uninterrupted duty as per relevant standards and also suitable for capacitor duty
- Contactor shall be provided with adequate auxiliary contacts rated for 10Amps @ 240VAC for interfacing with control scheme.
- Contactor coil rating shall be minimum pick up of 85% of rated voltage and minimum drop out of 75% rated voltage.

Control and Indications

- Push buttons will be heavy duty, oil tight, and push to actuate type with integral plate marked with its function.
- Each push button shall be provided with 2NO+2NC contacts rated for 10Amps @ 240VAC.
- Lamps shall be LED type rated for 240V AC. Lens and lamps shall be replaceable from the front.

Meters

- All indicating instruments shall be digital, Switchboard type with accuracy class +/- 2% full scale.
- MFM of suitable rating shall be used in the incomer feeder.
- All outgoing shall be equipped with digital ammeter. Selector switches shall be furnished at outgoing feeders for ammeter.
- All meters shall be of digital type flush mounted industrial pattern of size 96x96 mm with accuracy class 0.5.
- Multifunction meter shall be of digital type flush mounted industrial pattern of size 96x96 mm with accuracy class 0.5 as per IEC 62052/53 suitable for measurement of Current, Voltage, Power, Frequency, Power factor, Energy

and ready port to communicate with FCMS through RS 485. The Meter should have Modbus communication port as well.

CT (Current transformer)

- CT will be cast resin type rated 15VA or more burden with Maximum accuracy limit of class 0.5.
- The current transformers for metering and for protection shall be mounted on the busbars with proper supports.
- Current transformers ratings shall be as per the feeder rating.
- Current transformers shall conform to latest edition to relevant standards. The Current transformers shall be epoxy resin cast with bar Primary or ring type.
- The design and construction shall be sufficiently robust to withstand thermal and dynamic stresses due to the maximum short circuit current of the circuit. CT core laminations shall be of high grade silicon steel.
- Secondary terminals of CT shall be brought out suitably to a terminal block which will be easily accessible for testing and terminal connections.
- Access to the CTs for cleaning, testing or changing shall be from front, back or top of the panel.
- Name plate details and terminal markings shall be according to the latest edition of relevant Indian Standard.

Secondary wiring

- All control wiring for panel shall be with FRLS copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm. All CT connections/ circuits shall be provided with copper conductor control wires with a minimum size of 2.5 sq. mm. Runs of wires shall be neatly bunched and suitably supported and clamped. Identification ferrules shall be used at both end of wires.
- Panel shall be fully wired at the factory to ensure proper functioning of control and protection.

- Fuse and links shall be provided to permit individual circuit protection from bus wires without disturbing other circuits. All spare contacts of relays, push buttons and other devices shall be wired up to terminal blocks.
- Wire termination shall be done with crimping type connector with insulating sleeve.

Power/control Terminal Blocks

- Terminal block shall be 660V grade box clamp type with marking strips similar to ELMEX 10 mm2 or equal for Control.
- Terminal for CT secondary leads shall have provision for shorting.
- Not more than two wires shall be connected to any terminal.
- Spare terminals equal in number to 20% active terminals shall be provided.
- Terminal blocks shall be suitably located in cable alleys.
- For Power cable, Bus Bar type cable connector (Melamine material) shall be provided.
- For Control cable, heavy duty screw type cable connector (Melamine material) shall be provided.

Cable termination

- Panel shall be designed for cable entry from top.
- Each cable shall be clearly marked at both ends with an indestructible marker, preferably a cable tag made of Aluminium tacked with indicating cable number & both end feeder tags with switchboard tags. Cable tags at ends of cable shall be provided inside the gland plate as well as outside the gland plate
- All provisions and accessories shall be furnished for termination of cables including removable gland plates, cable supports and terminal blocks.
- Gland plate shall be minimum 3 mm thick.

Heating & Ventilation of Panel

- Anti-condensation space heaters shall be fitted in cubicles together with an ON/OFF isolating switch suitable for electrical operation at 230 volts 50 Hz AC supply. The space heater shall be of sufficient capacity to raise the

internal temperature of LT panel by 50°C over the outside ambient temperature. The design shall be such that the maximum permitted rise in temperature inside panel is not exceeded if the heaters are energized while the LT panel is in operation. Heaters shall be provided with protection against overheating such as thermostats, sensors etc. and associated disconnecting circuits.

- LT Panel cubicles shall be properly ventilated with grills, louvers, fans etc. as per the design verified by IS/IEC 61439 while maintaining the IP.

Ground Bus

- Continuous earth bus suitably (as per IS/IEC 61439) for prospective fault current to be provided with arrangement for connecting to station earth at two points. Hinged doors / frames to be connected to earth through adequately sized flexible braids.

Nameplate and Labels

- Suitable engraved metal name plates and identification labels shall be provided for all LT panels and Circuits. These shall indicate the feeder number, feeder designation, rating of switchgear. Nameplate shall carry the name of the LT panel manufacturer and / or Original Manufacturer.
- LT panel shall be provided with “Danger Notice Plate” conforming to relevant Indian Standards, preferably on busbar chamber cover.
- Permanent marking of SLD shall be provided on the LT panel.
- Drawing Pouch shall be provided at the incomer cable allay.

Painting

- Panel shall be painted with light grey epoxy powder painted (Siemens Gray RAL 7032) and shall have matt finish.
- The minimum powder coating thickness of LT panel shall be 60 microns as per IS 13871.
- Caution notice plate shall be fixed at the back of each vertical/horizontal bus bar allay of the panel.

Cable Alley Illumination:

- All cable alley compartments shall be provided with 10W LED batten type lamps, provided with MCB of suitable rating operating on 240 volts, 1 phase 50 Hz AC supply.

Test Reports:

- Complete set of type test reports/ design verification reports as per IS/IEC 61439 for the offered panel shall be submitted along with the offer and along with the GA drawings submitted for Department clearance.
- Type test reports as per IS/IEC 60947 for all type of switchgears proposed for the LT panel, shall be furnished to the department.
- Following routine tests shall be carried out as per IS/IEC standards at the LT panel fabricators shop in the presence of Department representative prior to dispatch.

  a) Physical verification and dimensional check with Functionality check.
  b) Verification of bill of materials, SLD, control circuits etc.
  c) HV test
  d) Insulation resistance test

- Following pre-commissioning tests shall be carried out at site on LT panels:

  a) Physical verification and dimensional check.
  b) Verification of bill of materials, SLD, control circuits etc.
  c) Check cleanliness of cubicles, busbar chamber and interconnections and Check the tightness of busbar interconnections.
  d) Functionality check.
  e) Earth continuity test.
  f) Insulation resistance test.

Drawing & Information:

- The Vendor shall furnish following drawings/documents in accordance with enclosed requirements:
  a) General Arrangement drawing of the LT Panel, showing front view, plan, foundation plan, floor cut-outs/trenches for external cables and elevations, transport sections and weights.

b) Sectional drawings of the circuit breaker panels, showing general constructional features, mounting details of various devices, bus bars, current transformers, cable boxes, terminal boxes for control cables etc.

c) Schematic and control wiring diagram for circuit breaker and protection including indicating devices, metering instruments, alarms, space heaters etc.

d) Terminal plans showing terminal numbers, ferrules markings, device terminal numbers and function details etc.

e) Wiring diagrams.

f) Equipment List.

- Vendor shall furnish required number of copies of above drawings for Department review. Fabrication of switch boards shall start only after clearance from Department. After final review, required number of copies (reproducible) shall be furnished as final certified drawings. The information furnished shall include the following:
  a) Technical literature giving complete information of the equipment.
  b) Erection, Operation and Maintenance Manual complete with all relevant information, drawings and literature for auxiliary equipment and accessories, characteristics curves for relays etc.
  c) A comprehensive spare parts catalogue.

Installation and Commissioning:

- LT panels shall be supplied in properly packed conditions. After ascertaining that there is no damage to packing, all the items shall be inspected after unpacking. It shall be ensured that all LT panel components are in accordance with the requirements. It shall also be ensured that all the components like switchgears, relays, indicating lamps, meters etc. are in good condition and has not suffered any damage during transit.
- Any damaged components received at site shall be replaced at no extra cost by the supplier. Any damage over the finished sections including scratches on the paint etc. shall be attended and suitably finished by the supplier.

- LT panels shall be installed using necessary bolts for grouting of panels and shall furnish the drawing / templates if any required for grouting the foundation bolts.
- All loading and unloading arrangements and transporting of panels to site with necessary tools and equipment's shall be the part of the scope of work and all required man power shall also be provided by the supplier for unloading and installation and commissioning the panels in the designated location at site.

Make of Electrical panel: As per Approved Panel manufacturer list (attached).
Make of Switchgears etc.: As per Approved make list (attached).

2. Earthing (Grounding) System:

- The system will be designed/modify to limit the earth loop impedance so as to ensure positive and timely operation of the current operated safety devices.
- The grounding system is to be designed/modify to limit the resistance to one ohm or less.
- Dedicated earthing, as required.

Earthing conductor:

As per IS: 3043,inclusive of brazing, welding, jointing, clamping, hardware, bituminous paint at joints, connection to equipment and all required material, to be laid along conduit, trays or on floor / wall / ceiling /roof / structure etc. with clamping at 500 mm intervals. All electrical equipment, metal casings, frames, electrical panels, conduits, cable trays etc. shall be independently earthed at two points. Metallic sheaths, screens, armor of cables shall be earthed at both ends of cable. Vendor shall connect all earth continuity conductors from process tools/all other equipment to risers from the existing underground earthing in sub fab.

The earthing conductor shall be of the same material as the electrode in the form of wire or strip.

The size of earthing conductor shall not be less than the following

(a) 4mm dia (8 SWG) copper wire

(b) 25mmx4mm in the case of GI strip, or,

(c) 20mmx3mm in the case of copper strip

ESD Active Protection

Addition/modification of the ESD Active Protection will be provided by installing active Ionizers in Photo and Starting Material Areas.

3. Illumination in clean room and gray area.

- The envisaged Lighting level in clean Rooms is 500 Lux and 400 Lux in grey and other utilities areas, at 80 cm above the floor. Vendor to design the lighting layout to achieve the prescribed lighting levels for the clean room/gray area being modified as per the Fab layout drawing.
- Clean Room light fixtures shall be tear drop, suitable for laminar airflow system, grid mounted complete with special shape diffuser to minimize turbulence in clean room 1x 28W with florescent T5 lamp/LED lamp and HE 28 W/62 Chip Control T5 Florescent Lamp (Gold Lamp), as required with high frequency electronic ballast having power factor >0.95 and THD < 10%.
- Light fixture in Grey and other utilities areas will be 2x28 W, suspended from steel structure/ wall mounted, as required.
- Grey and other utilities areas light fixture will be batten with powder coated reflector and cool day T5 light lamp with high frequency electronic ballast having power factor >0.95 and THD < 10%.
- About 25% of the light fixtures in the utilities areas will be backed by SCL's captive power system and vendor will design and install separate wiring system accordingly.
- The lighting wire shall be 1.5 sq mm copper conductor, FR PVC as per IS 694 and run in 20/25 mm bore GI conduit. Modular Switches will be

provided in each room/area for local control of the lights and 2-3 light fixtures shall be controlled through one (1) switch.

- Vendor shall prepare lighting layout and wiring scheme as part of the detailed engineering for the lighting.

4. Fire detection System

Scope for fire detection system includes supply/modification/relocation, installation, testing, commissioning of Apollo make Addressable multisensory Fire detection devices, Manual Call Points, Addressable loop sounders, 2x1.5sqmm fire Cable, MS junction boxes for loop in loop out of cable and integrating the same with fire/repeater panel as per the requirement for the area being modified in the clean room matching with the existing system details to be worked out as per Fab layout drawing.

Shifting of the 10 loop fire panel and LSS (Life safety system) remote node (Rockwell make) from the existing ERT room to the new ERT room including supply of necessary, cable, gland, cable, tray, wire, LAN cable required for relocation of the systems.

5. Paging

Scope for paging includes supply/modification/relocation installation, testing, commissioning ofBosch make Cable, MS junction boxes for loop in loop out of cable and integrating the same with SCL paging system as per the requirement for the area being modified in the clean room matching with the existing system details to be worked out as per Fab layout drawing.

6. Cables, wire, conduit, Switchboards, Switches/Sockets etc.

Cables: The scope includes the Supply and installation of ISI marked PVC/XLPE insulated, Extruded PVC inner sheath, GI strip armoured/ unarmoured overall FRLS PVC outer sheathed, Copper cable on wall/surface/ existing cable tray as required. Control cables shall be copper conductor PVC insulated and power cables shall be XLPE insulated. The necessary hardware for installation of cable like cable tie, clamps, tags etc will be in the scope of Contractor.

Instrumentation cables shall be conforming to BS 5308, type II, 300/500 V grade with stranded 0.75sq mm copper conductor, PVC insulated, colour coded, twisted to form a pair/pairs, twisted to form a unit, units laid up, myler taped binding, overall screened with aluminium myler tap with tinned copper drain wire, extruded inner sheathed, galvanized steel round wire /strip armoured, overall FRLS PVC sheathed.

Wire: The scope includes the Supply and installation of stranded Copper conductor wire, 1100-volt grade, FR PVC insulated single core conforming to IS 694 as required.

Conduit: The scope includes the Supply/modification/relocation and installation of ISI make rigid steel, hot dip galvanized conduits of different size for the area being modified. The conduit shall be installed on wall/surface/ metal truss/existing cable tray, as required. Flexible conduit shall be made with bright cold rolled annealed and electro-galvanized mild steel. Installation of conduits shall include all necessary hardware, metal strip, welding, clamps etc.

Switchboards and Switch/Sockets: The scope includes the Supply and installation of Different sizes of Switchboards and switch/socket for Lighting, Power Distribution as per the requirement for the area being modified as per Fab layout drawing. The industrial type sockets of suitable rating will be planned for process tools/utility equipment. Modular power sockets, switches will be planned for clean room lighting, office area, workstations & general-purpose utilities.

7. Cable tray

Scope includes supply/modification/relocation, installation, testing, commissioning of perforated/ladder type etc. hot dipped, galvanized iron (GI) cable tray as per the requirement. All the accessories such as bend, Tee, cross member, reducer, channel, unistrud etc. shall be part of the scope as per the site requirements.

8. Tool Hook Up-Electrical

The scope includes design, supply, installation, testing and commissioning of all material for providing power upto the local isolation for the process tools envisaged to be installed by SCL in the Clean Rooms as per the equipment layout. The power to the process tools shall be bottom/top entry, catered from the electrical panels for the process tools which shall be installed by the vendor as per the SCL instruction.

The scope of work shall include the following

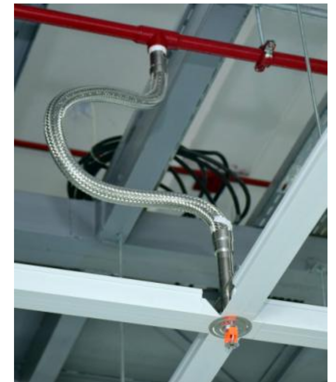
- Supply of 4/3/2 Core copper flexible PVC/XLPE insulated, unarmored, FRLS PVC outer sheathed cables of suitable size matching the process tool power rating / kVA / kW rating at 400V 3 phase / 230V 1 phase or 208V, 3 phase / 120V, 1 phase. As part of design, vendor shall work out the cable size meeting the requirements of KVA/KW/ Specified Feeder rating of each tool.
- Supply of all required hardware viz. cable trays, cable glands, lugs, tie wraps and cable markers etc. from the electrical Panel up to the tool
- Supply of copper earth cable matching the process tool KVA rating for process tool Earthing.
- Installation of all the above material.
- Testing & commissioning up to the Tool isolator.

Supply and installation of Floor mounted TPN SFU for local isolation of the power to the tool. The Switch shall be mounted on an epoxy coated steel frame to be fixed on the false floor tile

VIII SPECIFICATIONS: LIFE SAFETY SYSTEMS (LSS)

A. SPRINKLER SYSTEM

Wet Type sprinkler system is installed in FAB Area (Clean Room and Grey Areas and under HVAC supply air Ducts) as per NFPA 13 Code for sprinkler installation / IS 15105-2002 for Design and Installation of Fixed Automatic Sprinkler Fire Extinguishing system for ORDINARY HAZARD. In clean room sprinklers are installed with SS sprinkler flexible drop connection of FlexHead make and in Clean room grey areas directly on the MS sprinkler range pipe. The existing Sprinkler installation is fully tested and about 7 Kg/cm^2 is maintained.



Typ. Clean Room sprinkler installation

Scope of Work

The existing Clean rooms will be modified to accommodate new tools/tools relocation. Corresponding to the CR modification, sprinkler modification will be required and scope of work covers as under:

1. The vendor shall modify the sprinkler range pipe to match the new clean room layout as may be required.
2. Dismantling of existing piping, sprinkler head, pipe support and using them wherever feasible.
3. New supports as may be required shall be provided as per referred code.
4. Pneumatic Testing of overhead lines shall be carried out at minimum4 Kg/cm^2 before final hydraulic testing at 10.5 Kg/cm^2 for 2 hours without any drop in pressure.
5. Painting of new overhead range pipe and support with red synthetic enamel paint of the existing piping providing one coat of red oxide primer with 2 coats of red synthetic enamel paint.
6. Contractor shall list out items along with quantities and shall provide the same to SCL upon detailed engineering.

B. SAFETY EYE AND BODY SHOWER SYSTEM

Safety Eye and body shower combination units are installed in clean Room/ Clean room grey areas on network of GI piping connected to independent automatic water supply arrangement. Collection containers are provided under the raised floor and drain is connected to the common ACID Waste Drain in SUB FAB. The existing system working pressure is at 4 Kg/cm^2.

Scope of Work

Few safety eye cum body shower units are to be removed (03 nos.) and one no. is to be relocated along with collecting tray underneath raised floor etc. and scope covers the following:

1. The vendor shall relocate the existing safety shower units including water collection tray and drain piping etc as may be required to match the new clean room layout approved by SCL.
2. Dismantling of existing safety shower unit (3 Nos.), GI piping (size 25mm), collection container, CPVC drains (size 32mm) etc and providing blanks as may be required.
3. Provision of Drain POC in the existing ACID Drain in SUB FAB.
4. New supports as may be required shall be provided.
5. Pressure Testing of GI line at 1.5 times the working pressure and leak integrity testing for drains.
6. Painting of new overhead range pipe and support with red synthetic enamel paint of the existing piping providing one coat of red oxide primer with 2 coats of red synthetic enamel paint.

C. TOXIC GAS MONITORING SYSTEM FOR NEW OXIDE ETCHER TOOL

Toxic gas monitoring for Hazardous/Toxic process gases in FAB TOOLs is achieved using Fixed Gas Detector per gas type connected to centralized Drager Rack / Concentrator.

Scope of work:

1. Supply of MIDAS Fixed Gas detector with Pyrolyzer Model MIDAS –T- NP1 and sensor for C4F6 and CH2F2 gas. Part No. MIDAS-E-XCF (Total =2 nos.) complete with Teflon Air sample tubing.
2. In Oxide Ether (Tool ID - UNT 31), Install new fixed gas detector with pyrolyzer and sensor for leak monitoring in TOOL GAS BOX and TOOL Exhaust in FAB Grey Area / SUB FAB.
3. The vendor shall supply and install 3 core x 1.5 sq.mm multi strand shielded cable (about 25meters) for interconnection of gas detector up to junction box/ concentrator (Located in SUB FAB). The cable shall be laid in FRLS PVC conduit/ GI cable tray of size 50mm complete with cable tags etc
4. New supports as may be required shall be provided.

D. LIQUID LEAK DETECTION(LLD):

TraceTek make Model TTDM LLD system with Sensor cable at 20 points are installed under raised floor in FAB area for wet Tools.

TRACETEK TTDM -128

Scope of Work

The existing LLD panel will be shifted to the new ERT room and existing POC will be relocated to the 8”Quartz Clean room

1. Vendor to install PP drip tray underneath the DI water supply/drain connections to tool.
2. Relocate the TraceTek main panel in new ERT Room.
3. Extend the existing jumper cable from TTDM to new 8” Quartz Clean Room and reinstall the TT 3000 aqueous chemical sensor cable with floor clips.

Exclusion items:

1. Material such as Flexible sprinkler hose, sprinkler head shall be issued free of charge to vendor to carryout sprinkler modification work.

2. Arrangement for shutdown of sprinkler system for modification and nitrogen supply for Pneumatic testing as may be required.
3. Configuration of TGM Panel/ concentrator and testing.
4. TGM and LSS SCADA Augmentation to display Alarms & faults, Development of new Screens etc.
5. Configuration of LLD Panel and testing.

IX - DELIVERABLES

1. Detailed engineering/construction drawings for:
    a. Clean Rooms modification (Clean room Walls, Ceiling, Raised floor, Lighting, Sprinklers, etc.) including FFUs, if required
    b. Air Distribution Ductwork showing ducting arrangement, sizes, supporting arrangement etc, if required.
    c. Total power calculation needed in each Tool voltage, net and UPS, emergency for tools and utilities.
    d. Tool Hook-up for each utility as per the tool requirements
    e. Electrical distribution: Electrical connections of suitable ratings for supplied / relocated equipment, their support tools & sub-assemblies and interconnections between tool & sub-tools.
2. Engineering details for pipe / duct supports, cable treys and routing hierarchy for different utilities etc. in the Clean Room/Service Chase areas. Detailed engineering drawings to be submitted for review and approval of SCL.
3. All materials and labour to complete the work as per the scope of RFP.
4. Contractor shall submit for approval the makes/model nos. for each item to be supplied under the contract and provide detailed technical specifications for all the items in its technical offer.
5. Develop quality program and quality check document to ensure ‘Built Clean’ installation in line with industry standard for 8” wafer fab. Contractor shall submit Installation Quality Control and Field Quality

Assurance procedures for review and approval by SCL to be followed by the Contractor for implementation.

6. Contractor shall list out items along with quantities for each utility and shall provide the same to SCL upon detailed engineering.

7. Test reports in respect of various materials& installations to be supplied by the Contractor.

	Utility Matrix & Availability/ Requirement of POCs - PN2		
NEW 8" TOOLS	PN2 dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	1/4"x2	1/4"x 1 at D-8	Existing
OXIDE ETCHER (UNT 31)	3/8" VCR x1 1/4"VCR x4	1/2" VCR x1 1/4"VCR x4 (Valve purge ports) Near Column E2-15	Existing
METAL SPUTTER (SPA 48)	1/4" SW 1/2"VCR 1/2"VCR x2	From existing 1" lateral of HPN2 Near Column G-8	New
ZETA TOOL (ZTA-10)	3/4"VCR	From existing 1" lateral of HPN2 Near Column D-6	New
DVI TOOL (DVI-02)	1"VCRM x 2	From existing 1" lateral of HPN2 Near Column G-8	New
8" TOOLS TO BE UPGRADED	PN2 dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	1/4" VCRF 1/2"X1 VCRM 1/4"X2 VCRM 1/4" VCRF 1/4"VCRM	1/4" x 2 (Near Col D-8) 1/4" x3 and 1/2" x 1 (Near Col E-8)	Existing New
SACVD CHAMBER IN TEOS TOOL (CVA-01)	1/2" SWMX2	From existing 1" lateral of HPN2 Near Column E-12	New
8" TOOLS TO BE RELOCATED	PN2 dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	130 psi		
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- GN2		
NEW 8" TOOLS	GN2 dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	1/4"x2 and N2 Gun	1/2"x 1 Near Column D-8	Existing
OXIDE ETCHER (UNT 31)	1/4"SWx4 1/4"SWx5 GN2 gun x 1		New
METAL SPUTTER (SPA 48)	--	--	--
ZETA TOOL (ZTA-10)	--	--	--
DVI TOOL (DVI-02)	--	--	--
8" TOOLS TO BE UPGRADED	GN2 dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	1/4"SW X2	Near Column E8 / D8	New
SACVD CHAMBER IN TEOS TOOL (CVA-01)	1/4"SW X1 (pump) 1/4" SSVCRF (ozonator) 1/4"VCR X2 (chemgaurd)	From existing 1" lateral of GPN2 Near Column E-12	New
8" TOOLS TO BE RELOCATED	GN2 dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	--	--	--
XRA (XRA01)	90 psi	From existing 1" lateral of GPN2 Near Column F-12	New
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- CDA		
NEW 8" TOOLS	CDA dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	1/2" NPTF	1/2" SW Near front gate of Sub Fab	Existing
DARK FIELD DIA (DF104)	1/4"	Front side of Post CMOS Lab	New
ASHER (ASH-56)	1/4"x4	1/2"x 1 Near Column D-8	Existing
OXIDE ETCHER (UNT 31)	1/2"SW	1/2"SW Near Column E2-15	Existing
METAL SPUTTER (SPA 48)	3/8" SW CDA for SMIF x2	From existing 1" lateral of CDA Near Column F-8	New
ZETA TOOL (ZTA-10)	3/4"SW x 1 1/2" x 1	Near Column D-6	New
DVI TOOL (DVI-02)	3/4" VCRM x 2 3/8" (pump)x1 1/4"X1	From existing 1" lateral of CDA Near Column F-8	New
8" TOOLS TO BE UPGRADED	CDA dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	3/8" SWF X2	1/2" x 2 (Near Colum D-8)	Existing
SACVD CHAMBER IN TEOS TOOL (CVA-01)	1/4" push lockx1 (ozone) 1/4" SWMx1 (HEX)	1/2" x 1 (Near Column E-12)	Existing
8" TOOLS TO BE RELOCATED	CDA dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	95 psi		
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	130 psi		
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	--	--	--
Laser Marker	105 psi		
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- PVAC		
NEW 8" TOOLS	PVAC dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	1/4"	From existing 2 " lateral near Column F-12	New
BRIGHT FIELD DIA (DIA 04)	3/8" NPTF	From existing main header in front of Post CMOS Lab	New
DARK FIELD DIA (DF104)	1/4"	From existing main header in front of Post CMOS Lab	New
ASHER (ASH-56)	KF50x3 NW63	From existing 2 " lateral Near Column C-8	New
OXIDE ETCHER (UNT 31)	--	--	--
METAL SPUTTER (SPA 48)	1/4"x1 1/4"x1 KF40	From existing 2 " lateral Near Column F-8	New
ZETA TOOL (ZTA-10)	1/2"SW x 1	1" Near Column D-4	Existing
DVI TOOL (DVI-02)	1/2" VCRM x 1	From existing 2 " lateral Near Column F-8	New
8" TOOLS TO BE UPGRADED	PVAC dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	--	--	--
SACVD CHAMBER IN TEOS TOOL (CVA-01)	--	--	--
8" TOOLS TO BE RELOCATED	PVAC dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	1/4"		New
SHEET RESISTANCE MEAS.	1/4"		New
CV PLOTTER (CVP01)	1/4"		New
QUARTZ CLEANER	--	--	
XRA (XRA01)	--	--	
STRESS MEAS. EQPT	1/4""		New
Laser Marker	1/4"		New
Sorter (SRT01)	1/4"		New

	Utility Matrix & Availability/ Requirement of POCs- PCW		
NEW 8" TOOLS	PCW dia S/R	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	3/8"x3	2" x 1 Set Near Column E-8	New
OXIDE ETCHER (UNT 31)	3/8"SWx1 1/2"SWx4 3/8"x2	2"x 1 set Near Column E2-15	Existing
METAL SPUTTER (SPA 48)	1/2" 3/8" 1/4"	2" x 1 Set Near Column G-8	Existing
ZETA TOOL (ZTA-10)	--	--	--
DVI TOOL (DVI-02)	1/2" x 2	2" x 1 set Near Column F-8	Existing
8" TOOLS TO BE UPGRADED	PCW dia S/R	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	3/4"SWF X2 3/8"BARB X2 1/2" BARB X2 1/2"	Near Column E-8	New
SACVD CHAMBER IN TEOS TOOL (CVA-01)	3/8"BARB, Brass (HEX) 1/2"BARB, SS (chiller) 3/8"quick dis Female Brass	Dia 2" x 1 Set Near Column E-12	Existing
8" TOOLS TO BE RELOCATED	PCW dia S/R	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	0.1 m3/hr Size not		New
QUARTZ CLEANER			
XRA (XRA01)	1.6 m3/hr Size not	Dia 2" x 1 Set (Near Column F-12)	Existing
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- Helium		
NEW 8" TOOLS	Helium dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	--	--	--
OXIDE ETCHER (UNT 31)	1/4"VCR	1/4" VCR Near Column E2-15	Existing
METAL SPUTTER (SPA 48)	--	--	--
ZETA TOOL (ZTA-10)	--	--	--
DVI TOOL (DVI-02)	--	--	--
8" TOOLS TO BE UPGRADED	Helium dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	1/4"VCRF	1/4" Near Column D-8	Existing
SACVD CHAMBER IN TEOS TOOL (CVA-01)	1/2"SW X 2 1/4"VCR	1/4" x 4 Near Column E-12	Existing
8" TOOLS TO BE RELOCATED	Helium dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	--	--	--
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- Drain		
NEW 8" TOOLS	Drain flow (L/m)	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	--	--	--
OXIDE ETCHER (UNT 31)	--	--	--
METAL SPUTTER (SPA 48)	--	--	--
ZETA TOOL (ZTA-10)	200 (in all 15 No's connections)	4" Flange Near Colum C-6	Existing
DVI TOOL (DVI-02)	60 (Various connections)	Drain header near Column H-8 (8 mtr from tool)	New
8" TOOLS TO BE UPGRADED	Drain flow (L/m)	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	3/8"	4"dia Flange Near Column C-8	Existing
SACVD CHAMBER IN TEOS TOOL (CVA-01)	--	--	--
8" TOOLS TO BE RELOCATED	Drain flow (L/m)	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	Acid waste 68 lpm, Reclaim 58 lpm		
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- Sp. Gases, O2, Ar		
NEW 8" TOOLS	SP. GASES/Chemical	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	O2- 1/4"	1/4" FVCR Near Column D-8	Existing
OXIDE ETCHER (UNT 31)	C4F6 C4F8 CHF3 CH3F CF4 N2 CH2F2 Ar (1/4"VCR for all gases)x4 O2(1/4"VCR) x8	S-3 of VMB-5 (20 mtr away) ----- S-5 of VMP-3 (40 mtr away) ----- S-3 of VMP-5 (20 mtr away) ----- S-1 of VMB-6 (20 mtr away) 1/4" VCR x 4 (Near Column E2-15) 1/4" VCRF x 4 (Near E2-15) 1/4" x 4 Nos. (Near E2-15)	Existing New Panel Existing New Panel Existing New POC Existing Existing Existing
METAL SPUTTER (SPA 48)	Ar (1/4")	From main 1/2" Header (12 mtr away)	Existing
ZETA TOOL (ZTA-10)	--	--	
DVI TOOL (DVI-02)	--	--	
8" TOOLS TO BE UPGRADED	SP. GASES/Chemical		
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	CF4 BCl3	Stick 5 of VMP-2 From existing supply line of GC	Existing New tapping
SACVD CHAMBER IN TEOS TOOL (CVA-01)	NF3 O2X2 (chamber + ozonator TEOS	From existing supply line 1/4" x 2 (at Column E-12) Stick V-11 of TEOS LDS	New tapping Existing Existing
8" TOOLS TO BE RELOCATED	SP. GASES/Chemical	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	--		
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	--	--	--
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

	Utility Matrix & Availability/ Requirement of POCs- UPW		
NEW 8" TOOLS	UPW Dia	Location of POC	Existing/ New
SURFSCAN (CPX 01)	--	--	--
BRIGHT FIELD DIA (DIA 04)	--	--	--
DARK FIELD DIA (DF104)	--	--	--
ASHER (ASH-56)	--	--	--
OXIDE ETCHER (UNT 31)	--	--	--
METAL SPUTTER (SPA 48)	--	--	--
ZETA TOOL (ZTA-10)	(CUPWS) 1" flare x 1	3/4"dia x 2 1/2"dia x 1	Existing
DVI TOOL (DVI-02)	3/8" x 2 3/4" x 1 1/4"X1 1/2"x1	Only 1/2"set Near Column E-6 (10 mtr away) 1" Lateral with POCs near F-8	Existing New
8" TOOLS TO BE UPGRADED	UPW Dia	Location of POC	Existing/ New
METAL ETCHER- ADD ETCH + ASP CH (CNT-02)	3/8"	1/2" dia Purge Port in PVDF lateral near Column E2-7	Existing
SACVD CHAMBER IN TEOS TOOL (CVA-01)	--	--	--
8" TOOLS TO BE RELOCATED	UPW Dia	Location of POC	Existing/ New
ICPMS	--	--	--
ELLIPSOMETER	--	--	--
SHEET RESISTANCE MEAS.	--	--	--
CV PLOTTER (CVP01)	--	--	--
QUARTZ CLEANER	mean 58 lpm		
XRA (XRA01)	--	--	--
STRESS MEAS. EQPT	5 lpm		
Laser Marker	--	--	--
Sorter (SRT01)	--	--	--

POCs: Exhaust Connections

ADDITIONAL 8" EQUIPMENTS

S. No.	Tool Description	Acid Exhaust/ Location (Fab/Sub Fab)	POC Identification/Location	New/Existing POC	General Exhaust/ Location (Fab/Sub Fab)	POC Identification/Location	New/Existing POC
1	SURFSCAN	Nil	NA	NA	4" (fab)	6" dia POC GEX-12S (Fab)	Existing
		Nil	NA	NA	4" (fab)		
2	BRIGHT FIELD DIA	Nil	NA	NA	6" (fab)	POC in the main header in Expansion area (fab)	Existing
3	DARK FIELD DIA	Nil	NA	NA	8" (fab)	POC in the main header in Expansion area (fab)	New
4	ASHER	3" dia (fab)	Existing Ducting in Fab and Sub Fab can be used.	Existing	6" (fab)	10" POC GEX-8N (fab)	Existing
		NW40x2 (sub fab)					
		NW25x1 (sub fab)					
5	OXIDE ETCHER	6" x 4 no. (fab)	From main duct in Sub Fab near Column 16 and 17.	New	Nil	NA	NA
		NW40x 5 (sub fab)			Nil	NA	NA
6	METAL SPUTTER-ENDURA	1" & 3/8" (fab)	4" duct feeding the existing ICP-MS will be used for both the connections.	Existing	Nil	NA	NA
		NW25 (sub fab)			Nil	NA	NA
7	ZETA TOOL	6" x 3 (fab)	12" POC in AEX-D header (Fab) and Existing 8" line earlier used (Fab) for	Existing	Nil	NA	NA
		3" x 2 (fab)		Existing	Nil	NA	NA
		4" (threaded flange PVC) x 1 (sub fab)	8" POC earlier used (sub Fab) for ONTRACK.	Existing	Nil	NA	NA
		2"x 2 (sub fab)		Existing	Nil	NA	NA
8	DVI TOOL	D250 (fab)	12" Dia POC- AEX-G-600 being used for Quartz	Existing	Nil	NA	NA
		D250 (fab)	12" Dia POC- AEX-G-600	New	Nil	NA	NA
		D160 x1 (sab fab)	6" Dia - 2 ducts - used for ICP-MS (Sub Fab) will be used.	Existing	Nil	NA	NA
		3.5"OD x1 (sub fab)			Nil	NA	NA
			Tool Upgrade				
1	METAL ETCHER-ADD ETCH + ASP CH (CNT 02)	3/8" SWFx2 (sub fab)	Will be tapped from 8" ductwork from AEX 8 N being used for ASHER(Sub fab)	Existing.	Nil	NA	NA
2	SACVD CHAMBER IN TEOS TOOL (CVA01)	1/4" (OD x 1 O3 Dump VCR sub Fab)	Will be tapped from the duct work catering to CVC01 from AEX 14 N (sub fab)	Existing.	Nil	NA	NA
		5" (ozonator cab) Duct (sub fab)			Nil	NA	NA
		NW40 (pump) (sub fab)			Nil	NA	NA
			Relocated Tools				
1	8" Quartz Cleaner	8 " dia	Exhaust feeding 6" Quartz cleaner will be modified to feed both.	Existing	Nil	NA	NA
2	ICP-MS	Nil	NA	NA	6" Dia x 2 no. & 4" dia x 1 no (fab)	A lateral from existing 14"POC will be routed and will cater to all	Existing
3	THF01	Nil	NA	NA	4" Dia x 2 no. (fab)		Existing
4	CVP01	Nil	NA	NA	Nil	NA	NA
5	THO01	Nil	NA	NA	4" Dia x 1 no. (fab)	Existing ducting will be modifi	Existing
6	XRA01	Nil	NA	NA	3/8" (fab)	4" dia duct feeding the existing TWI01 will be	Existing
		Nil	NA	NA	2" (sub fab)		
7	TWI01	Nil	NA	NA	4" dia x 1 no.(fab)	POC from Expansion area main header (fab)	Existing
8	FSA01	Nil	NA	NA	Nil	NA	NA
9	LSM01	Nil	NA	NA	4" & 2 " Dia(fab)	Existing ducting will be modifi	Existing
10	SRT01	Nil	NA	NA	Nil	NA	NA

POCs: Electrical Connections							
Sl. No	NEW 8" TOOLS	Tool Code	POC New/existing	Location		Proposed supply source	Remarks
1	SURFSCAN	CPX01	New	Subfab	1. Column 13-15 2. Row E8-F2	To be catered from PBU 871: 1-ph MCBs to be replaced with 3 ph one.	Includes cabling and termination from source at Subfab.
2	BRIGHT FIELD DIA	DIA04	New	6" Expansion Area		1. One DB To be installed in 6" Expansion Area which will be supplied from new 208 v panel (subfab).	Includes cabling and termination from source at 6" Expansion Area.
3	DARK FIELD DIA	DFI04	New	6" Expansion Area		To be catered from 6" Expansion Vertical DB	Includes cabling and termination from source at 6" Expansion Area.
4	ASHER	ASH56	Existing	Subfab	1. Column 9 2. Row C-D	Existing POC	
5	OXIDE ETCHER	UNT31	New	Subfab	1. Column 17 2. Row E-E2	From new 208 V (I/C- 630A) Panel (PBU88) which will be charged from DRUPS 208V panel.	Includes cabling and termination from source at Subfab.
6	METAL SPUTTER	SPA48	New	Bay G-Yield Metr	1. Column 7-9 2. Row E-E2	1. To be cater from DPU 85 2. feeder rating to be check based on actual rating	Includes cabling and termination from source at Subfab.
7	ZETA TOOL	ZTA10	New	Subfab	1. Column 7 2. Row C-D	Dummy feeder of DPU 41 to be modified for catering 175A Load.	Includes cabling and termination from source at Subfab.
8	DVI TOOL	DVI02	New	Subfab	1. Column 7-9 2. Row F-G	To be catered from DPU 81 / new DB.	Includes cabling and termination from source at Subfab.

	8" TOOLS TO BE UPGRADED						
	METAL ETCHER- ADD ETCH + ASP		Existing	Fab		Existing	
	SACVD CHAMBER IN TEOS TOOL		Existing	Fab		Existing	
	8" TOOLS TO BE RELOCATED						**Remarks**
1	ICMPS		New	6" Expansion Area		To be catered from 6" Expansion Panel /Vertical DB	Includes cabling and termination from source at 6" Expansion Area.
2	TH001		New	Subfab		To be catered from 6" Expansion Panel /Vertical DB	
3	THF01		New	6" Expansion Area		To be catered from 6" Expansion Panel /Vertical DB	Includes cabling and termination from source at 6"
4	CVP01		New	6" Expansion Area		To be catered from 6" Expansion Panel /Vertical DB	Includes cabling and termination from source at 6"
5	XRA01		New	Subfab		To be catered from PBU 81	
6	FSA01		New	6" Expansion Area		To be catered from 6" Expansion Panel /Vertical DB	Includes cabling and termination from source at 6"
7	ASH10		NA	Being abandonded			
8	THM01/TWI		New	6" Expansion Area		To be catered from 6" Expansion Panel /Vertical DB	Includes cabling and termination from source at 6"
9	Sorter (SRT01)		Existing	Fab Class-1 are		Existing POC	
	Note: One Panel and two vertical DBs are to be installed for catering POCs of new tools.						

	Utility Matrix & Availability/ Requirement of Chemicals (LDS)		
NEW 8" TOOLS	SP. GASES/Chemical	Location of POC	Existing/ New
ZETA TOOL (ZTA-10)	NH4OH (1/2"x 1 1/2"PFA) H2O2 (1/2"x 1 1/2"PFA) H2SO4 (1/2"x 1 1/2"PFA) HCl (1/2"x 1 1/2"PFA) HF(1/2"x 1 1/2"PFA)		
DVI TOOL (DVI-02)	H2O2 (1/2"/D32) H2SO4 (3/4"/D32) HF (1/2"/D32)		
8" TOOLS TO BE UPGRADED	SP. GASES/Chemical		
SACVD CHAMBER IN TEOS TOOL (CVA-01)	TEPO TEB (All 1/4" VCRF)	--- ---	New New
8" TOOLS TO BE RELOCATED	SP. GASES/Chemical	Location of POC	Existing/ New
QUARTZ CLEANER	HF Concentrate 10 lpm, HF dilute 68 lpm		

Annexure D : Schematic layout

Figure 1 : Level 2 Existing tool layout

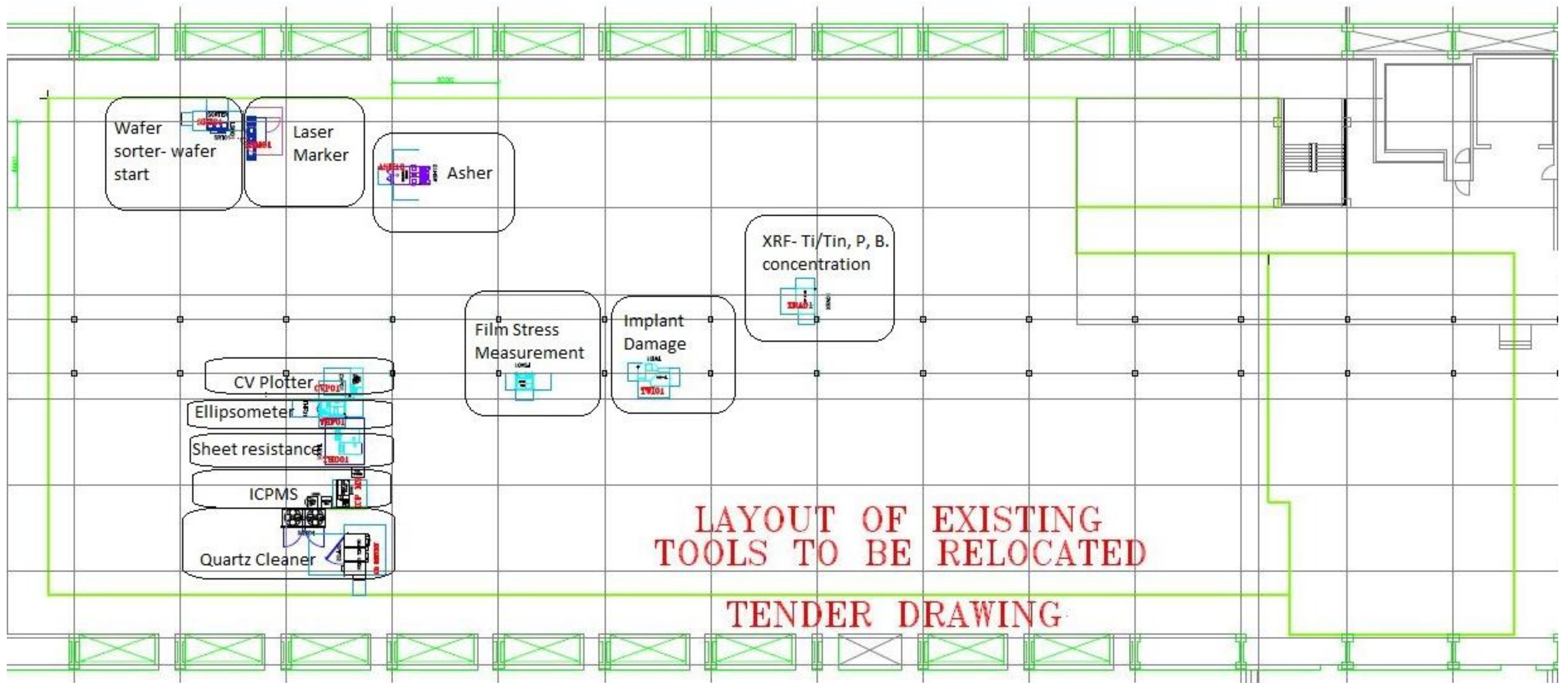


Figure 2 : Level 2 proposed layouts for new and relocated equipment

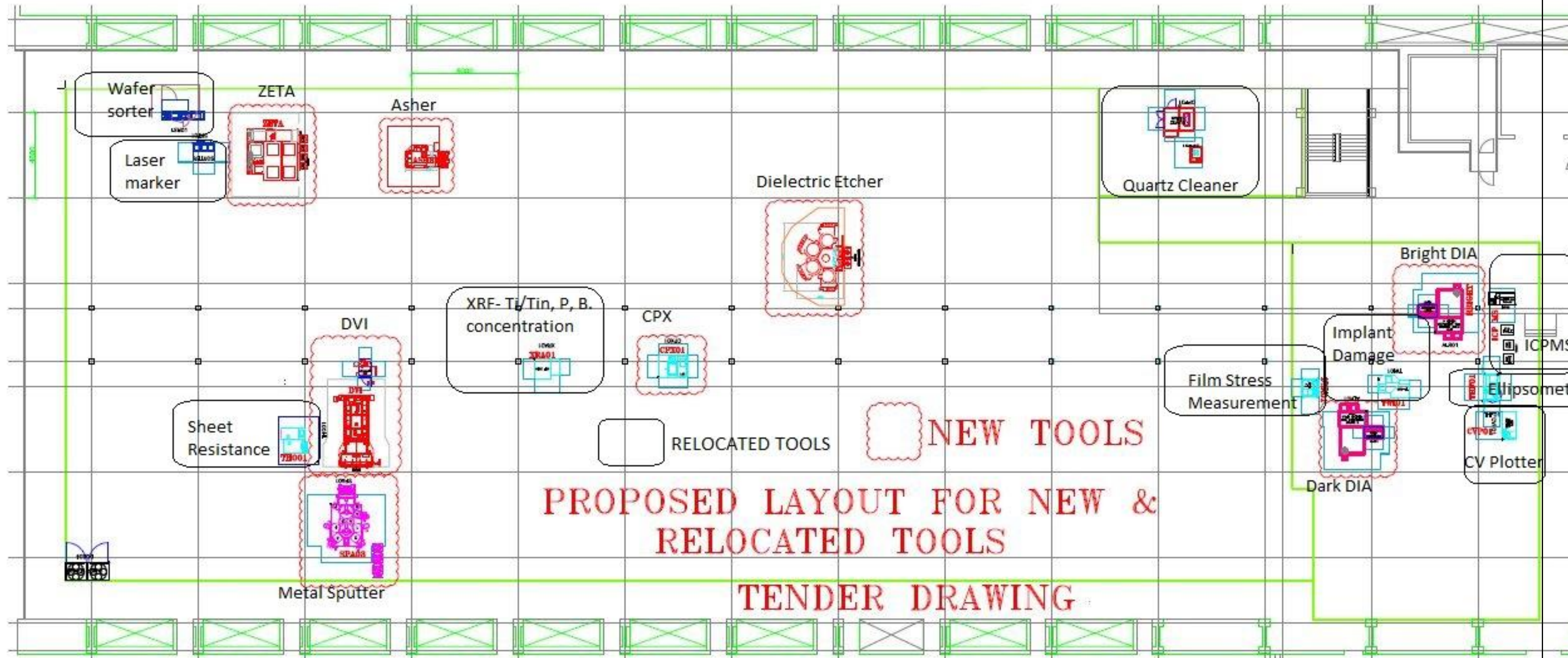
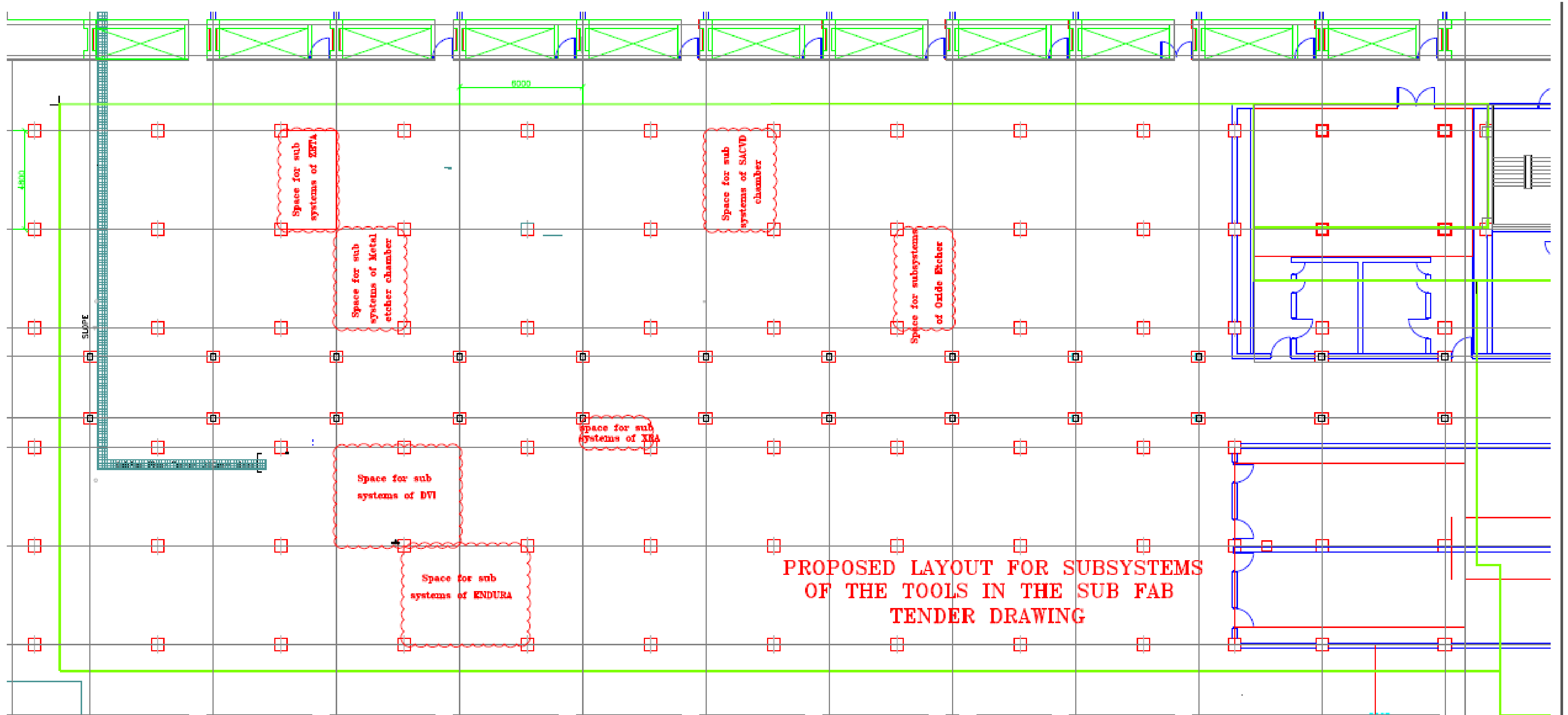


Figure 3 : Level 1 Sub-fab layout



Annexure E : Equipment Upgradation and acceptance procedure

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
1	CMOX1/ CMP Oxide AMAT MIRRA MESA	Process	1. In-situ end point system	1. Vendor to supply, install and commissioning of end point system for AA oxide CMP process. 2. Vendor to provide necessary software(s)/application required to operate the end-point detection system 3. Vendor to provide operation and recipe training to SCL engineers for end point detection system. 4. Vendor to demonstrate and provide training to SCL engineers for operation and implementation of this EPD system in the SCL existing Active area process. 5. Vendor to demonstrate the equipment acceptance as per the acceptance test provided by SCL 6. Its the responsibility of the vendor that the other parts of the equipment should not be affected by this EPD system installation	1. The Endpoint System must be able to detect the interface between Silicon Dioxide and Silicon Nitride layers 2. AA STI Oxide CMP Unit step development and verification. Establish Process window and over polish time for AA oxide CMP unit step 3. Smooth Integration with AMAT Mirra application software
			2. POU Filter Upgrade	1. Vendor to provide point of use filter for slurry delivery in Oxide CMP equipment 2. Vendor to provide all fitting, tubing, filter housing, etc for the POU filters.	1. QC verification (Removal Rate ~ 1900-2800A/min, RRNU<18%) 2. CP verification particle count (0.16 µm)<60

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			3. Upgradation of Slurry recirculation and delivery pump in MABAT (CDU 3000) Slurry Delivery System (from Pneumatic Diaphragm pump to Bearing less Magnetically Levitated Centrifugal Pump)	1. Vendor to remove the installed diaphragm pumps (2nos) and install MLC pumps (2nos) in their place. 2. The MLC pumps must be supplied by the vendor, along with all accessories like tubing, connectors etc. 3. Vendor to ensure that the suggested MLC pumps are good replacements for the diaphragm pumps (in terms of pressure head, maximum flow rate) 4. Vendor to update PLC for MLC pumps accordingly. 5. Vendor to ensure apt MLC pumps are selected (in terms of compatibility with the slurry/chemical to be recirculated) 6. Vendor to provide OEM manuals, maintenance training and procedures. 7. Vendor to provide recipe for drum circulation, slurry filling, slurry supply to equipment thru VMBs 8. Vendor to supply bigger day tank in slurry delivery system. The capacity of the new day tank must be selected after thorough assessment of load bearing capacity of the slurry delivery system. The MOC of day tank must be compatible with the slurry. All the fittings,	1. Slurry flow rate stability in recirculation loop at different flow rates (up to 20 LPM) 2. Slurry Flow rate and pressure at POU must be sufficient and stable. 3. QC verification (Removal Rate ~ 1900-2800A/min, RRNU<18%) 4. CP verification particle count (0.16 µm)<60 5. The installed pumps must be operated smoothly through GUI in both manual and automatic mode. 6. Physical verification of the installed bigger day tank. The level sensors/proximity switch must be height adjustable and properly calibrated. (only for CMOX1 CDS)

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				valves and level sensors should be installed as before. Vendor to make the necessary adjustments required (e.g. Stirrer length, level sensors mount etc)	
			4. Hard disk upgrade (from mechanical HDD to RAID SSD)	1. Vendor to supply, install and commission RAID SSD 2. Vendor to provide all accessories, driver, application for commissioning of RAID SSD	1. Data backup process 2. No loss of process recipes & sequence
			5. Upper Pneumatic Assembly (UPA) module upgrade	1. Vendor to supply, install and commission detachable UPA 2. Vendor to provide accessories, connectors, cables etc for the installation and commissioning of upgraded UPA	1. UPA Downforce verification with actual pressure 2. RRNU verification 3. Removal control with variable pressure in different pressure zones
			6. Upgrade from peristaltic pump to CLC for slurry loop	1. Vendor to supply , Install and commission CLC for slurry loop 2. Vendor to provide all accessories, tubing, plumb line, connectors for commissioning of CLC slurry loop. 3. Vendor to provide application, software required for the upgrade.	1. Slurry flow rate verification – flow rate 0-1000 ml/min The actual/real-time slurry flow should be accurately read by the system. 2. Slurry Flow stability check - The slurry flow must be stable and variation should not be more than ±10% of set point. 3. QC verification (Removal Rate ~ 1900-2800A/min,

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
					RRNU<18%) 4. CP verification particle count (0.16 µm)<60
			7. Slurry Injection System (SIS)	1. Vendor to supply, install and commission Slurry injection system 2. Vendor to provide all accessories, connectors, tubing, etc. for commissioning of SIS.	1. QC verification (Removal Rate ~ 1900-2800A/min, RRNU<18%) 2. CP verification particle count (0.16 µm)<60 and (0.5 µm)<5
			8. Upgrade Slurry/DIW main valve from 1 line to 3 line	1. Supply and installation Slurry/DIW valve 2. Vendor to supply, tubing, connectors etc for commissioning of slurry/DIW valve	1. QC verification (Removal Rate ~ 1900-2800A/min, RRNU<18%) 2. CP verification particle count (0.16 µm)<60
2	CMWO1/ CMP Tungsten AMAT MIRRA MESA	Process	1. POU Filter Upgrade	1. Vendor to provide point of use filter for slurry delivery in Oxide CMP equipment 2. Vendor to provide all fitting, tubing, filter housing, etc for the POU filters.	1. Slurry flow rate verification - The actual/real-time slurry flow should be accurately read by the system. 2. Slurry Flow stability check - The slurry flow must be stable over time and need for flow rate calibration should be minimal. 3. QC verification (Removal Rate ~ 2000-3800A/min,

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
					RRNU<12%) 4. CP verification particle count (0.3 μm)<60
			2. Upgradation of Slurry recirulation and delivery pump in MABAT Slurry Delivery System (from Pneumatic Diaphragm pump to Bearingless Magnetically Levitated Centrifugal Pump)	1. Vendor to remove the installed diaphragm pumps (2nos) and install MLC pumps(2nos) in their place. 2. The MLC pumps must be supplied by the vendor, alongwith all accessories like tubing, connectors etc. 3. Vendor to ensure that the suggested MLC pumps are good replacements for the diaphragm pumps (in terms of pressure head, maximum flow rate) 4. Vendor to update PLC for MLC pumps accordingly. 5. Vendor to ensure apt MLC pumps are selected (in terms of compatibility with the slurry/chemical to be recirculated) 6. Vendor to provide OEM manuals, maintenance training and procedures. 7. Vendor to provide recipe for drum circulation, slurry filling, slurry supply to equipment thru VMBs	1. Slurry flow rate stability in recirculation loop at different flow rates (up to 20 LPM) 2. Slurry Flow rate and pressure at POU must be sufficient and stable. 3. QC verification (Removal Rate ~ 2000-3800A/min, RRNU<12%) 4. CP verification particle count (0.30 μm)<60 5. The installed pumps must be operated smoothly through GUI in both manual and automatic mode.
			3. Hard disk upgrade (from	1. Vendor to supply, install and commission RAID SSD 2. Vendor to provide all accessories, driver, application for	1. Data backup process

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			mechanical HDD to RAID SSD)	commissioning of RAID SSD	2. No loss of process recipes & sequence
			4. UPA (Upper Pneumatic Assembly) module upgrade	1. Vendor to supply, install and commission detachable UPA 2. Vendor to provide accessories, connectors, cables etc for the installation and commissioning of upgraded UPA	1. UPA Downforce verification with actual pressure 2. RRNU verification 3. Removal control with variable pressure in different pressure zones
			5. Upgrade from peristaltic pump to CLC for slurry loop	1. Vendor to supply , Install and commission CLC for slurry loop 2. Vendor to provide all accessories, tubing, plumb line, connectors for commissioning of CLC slurry loop. 3. Vendor to provide application, software required for the upgrade.	1. Slurry flow rate verification – flow rate 0-1000 ml/min The actual/real-time slurry flow should be accurately read by the system. 2. Slurry Flow stability check - The slurry flow must be stable and variation should not be more than ±10% of set point. 3. QC verification (Removal Rate ~ 2000-3800A/min, RRNU<12%) 4. CP verification particle count (0.30 µm)<60
			6. Slurry Injection System (SIS)	1. Vendor to supply, install and commission Slurry injection system 2. Vendor to provide all accessories, connectors, tubing,	1. Removal rate verification 2. QC verification (Removal Rate ~ 2000-3800A/min,

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				etc. for commissioning of SIS.	RRNU<12%) 3. CP verification particle count (0.30 µm)<60
			7. Upgrade Slurry/DIW main valve from 1 line to 3 line	1. Supply and installation Slurry/DIW valve 2. Vendor to supply, tubing, connectors etc for commissioning of slurry/DIW valve	1. QC verification (Removal Rate ~ 2000-3800A/min, RRNU<12%) 2. CP verification particle count (0.30 µm)<60
3	MTOP2/ Film Thickness & Reflectance Measurement KLA OPTIPROBE	Metrology	1. Install Mini environment	Vendor's scope of work shall cover supply, installation & commissioning of Filter Fan Unit (FFU) for Opti-probe). The scope of work should include the following: 1. Design, Detailed engineering, Fabrication and Installation of FFU 2. Supply of all support tools including Cabinet, Castor Wheels and Shutter Motor etc. 3. Installation of the FFU and isolation cabinet, including all utility connections	1. Thorough cleaning of the entire system to be done for intended use. 2. Air Flow check of Cabinet 3. Shutter operation verification. 4. Particle control verification. Mechanical CP should be less than 05. 5. Contaminating Particles (CP), refer to amount of particles > 0.20um added to 8" bare Si wafer 6. Filter integrity verification. 7. Fan Speed and operation verification

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				4. Commissioning of the FFU and demonstration of its functionality as per the required specifications 5. Interfacing with existing (Opti-probe) equipment at SCL 6. Training to concerned SCL personnel on Operations, Maintenance & Trouble shooting of the tool 7. Clean room compatible material SS304 or clean room compatible aluminum material for the construction of the cabinet	
			2. SMIF upgrade	1. Vendor to supply and install NEW/Refurbished SMIF type loader system with 2 load ports 2. Vendor to ensure and demonstrate smooth operation of related Optiprobe Subsystems, Modules, Hardware & Software with the installed SMIF type loader system. 3. Vendor need to supply all necessary hardware and software associated with SMIF upgrade.	1. Vendor to perform Transport test of entire transfer cycle (200 Nos of wafers in each Load port) without any failures, alarms, warnings, or human intervention except for loading during 200 wafers cycles. 2. Vendor to demonstrate Contaminating Particles should be < 5 @0.20um size on bare Si wafer during CP test on both Load ports of the Installed SMIF.

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				4. Vendor to bring along all necessary Jigs, Fixtures, Tool & Instruments etc. that are required for the successful installation and acceptance of SMIF type system with Optiprobe. 5. Vendor to hook/modify and supply all required electrical, communication cables, compatible connectors, interlocks etc. which are required for successful SMIF upgrade.	3. Vendor to demonstrate the smooth operation (all Wafer, QC & Tool operations) of Optiprobe Hardware and Software post SMIF Installation. 4. Vendor to provide detailed Installation report of the SMIF installation. This report shall include any maintenance activity performed during this Scope Of Work.
			3. Wedge Calibration wafer	1. Supply of Wedge Calibration wafer	1. Optiprobe Equipment calibration
4	REML1/ Metal Etcher (1 DPS chamber + 1 ASP chamber) AMAT	Process	1. chamber addition (1 DPS chamber and 1ASP chamber)	1. Fingerprinting of existing equipment (QC and M1 profile) 2. Supply and install one new DPS metal and one ASP chamber on empty slots of existing AMAT centura platform (slot B and D respectively) 3. Provide and install all MFC's, baratrons, other sensors vis-a- vis other working chambers on the equipment 4. Provide and install all the electrical cables/Signal cable/facility lines required to connect the chambers to	*Annexure-E 1 : Metal Etcher Chambers* upgrade

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	CENTURA-DPS (AI)			the SCL facilities. 5. Vendor to provide and connect all the RF/ Microwave Generators and match units, vacuum pumps, chillers etc. required for the smooth functioning of the chambers and hence the equipment. 6. Vendor to perform equipment acceptance and Unit step acceptance of the chambers as per the Acceptance document provided by the SCL. 7. Post chambers acceptance vendor to demonstrate the original fingerprints of the tool as performed before the installation work. 8. Its the responsibility of the vendor that new installation will not impact other operations of the equipment	
			2. Change the existing 4.2Mb hard disk to flash drive	1. Perform the backup of all the files (system, configuration, recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. vendor to perform the acceptance as per acceptance procedure	1. Transport test- 50 wfs with no equipment software related failure, alarms, and warnings 2. No lag in GUI 3. No loss of process recipes & sequence 4. Vendor to show all the recipes and logs to the SCL engineers

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				5. It's the responsibility of the Vendor that this installation should not impact other operations/parts of the equipment	
			3. Change the floppy drive to USB drive	1. Vendor to provide and install the USB drive on the equipment 2. Vendor to demonstrate and train the SCL engineers to load and unload of the files using newly installed USB drive 3. Its the responsibility of the installation Vendor that installed USB drive will not impact other operations of the equipment	1. Loading & unloading of System, configuration and recipe files using USB
			4. Existing Buffer CH Viewport window to be upgraded with sapphire glass	1. Provide and install the sapphire glass window in the buffer chamber of the tool. 2. Vendor to check the leak rate of the buffer chamber before installation as a fingerprint for this activity	1. Base pressure and leak check for buffer chamber 2. DPS chamber and ASP chamber CP QC 3. Delta CP Less than 20 particles (≥0.2 μ) for DPS chamber & Delta CP Less than 30 particles (≥ 0.2 μ) for ASP chamber. Test Wafer used are NOX1000. 4. Metal contamination check 5. Fe, Ni, Cu, Na, and Al < 10 13 cm-3
5	REPL1 / Poly	Process	1. Upgradation of existing Dome	1. Vendor to provide and install the state of the art DTCU units for both the chambers of the equipments. (Please	1. Transport test- 50 wfs per chamber with no equipment software related failure, alarms, and warnings

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Si / STI Etcher AMAT CENTURA DPS (poly)		Temp. Control Unit (DTCU) of both the Chambers (Including Source Rf match)	Note that the source RF match and other DTCU parts provided by the vendor should not be obsolete. 2. Vendor to demonstrate the temperature stability over the tool. 3. Vendor to perform the RF calibration in both the chambers. 4. Vendor to demonstrate the equipment acceptance as per the acceptance test provided by SCL.	2. RF verification at various RF values 3. Temperature stability check 4. Both chambers QC 5. Profile verification for both the chambers (GC profile and STI profile)
			2. Change the floppy drive to USB drive	1. Vendor to provide and install the USB drive on the equipment 2. Vendor to demonstrate and train the SCL engineers to load and unload of the files using newly installed USB drive 3. Its the responsibility of the installation Vendor that installed USB drive will not impact other operations of the equipment	1. Loading & unloading of System, configuration and recipe files using USB
			3. EPD system with EP monitoring at the top of dome for	1. Vendor to provide and install the state of the art Endpoint system for one chamber of the equipment (Active area etch). Please Note that the vendor should also provide dome and other parts required for the	1. Base pressure and leak check for AA etch chamber 2. Chamber CP QC 3. Metal contamination check 4. Trench profile verification

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			one chamber (AA Etch) only	installation of this EPD system. 2. Vendor should also provide One new spare dome and other additional consumable parts specific to this activity 3. Vendor to demonstrate and provide training to SCL engineers for operation and implementation of this EPD system in the SCL existing Active area process. 4. Vendor to demonstrate the equipment acceptance as per the acceptance test provided by SCL 5. Its the responsibility of the vendor that the other parts of the equipment should not be affected by this EPD system installation	
6	IMHE1/ High Energy Implanter Axcelis NV-GSD-HE	Process	1. Additional wafer Buffer Loader	1. Vendor shall supply and install an additional buffer loader. It has to perform the operation of buffer wafer holder for a simultaneous operation of more than one set of cassettes. It should be compatible with 200mm diameter wafers currently available. For installation of buffer loader if any additional part or spare is required, it needs to be taken care by the vendor. The final outcome requires smooth running of multiple cassettes operation simultaneously without any glitch in handling of wafers. .	The acceptance criterion is as follows: 1. Marathon run test for testing of mechanical performance of equipment (200 wafers continuous run). 2. Particle Contamination checks to be done for the end station and robot operation. (For particle size >= 0.2 micron == USL <= 90 nos) 3. Check wafer loading and unloading with multiple pods to check the handling capability.

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			2. Software Upgrade (SunSystem Upgrade and Night backup recorder installation.)	1. Upgrade from current software version of primary, secondary computer be SUN 3.7.2 with cell controller module Part No 11002540 (177 cell) to VM server with V6 Cell controller OR latest version. 2. The night backup recorder either SSD or HDD version needs to be installed or compatible. 3. A provision to use a pen drive is also required with the upgrade. In addition to this if any hardware inclusion is necessary e.g. Any equipment hardware, a new CPU or monitor or an up gradation of RAM or anything additional if required, are to be provided by the vendor.	The acceptance criteria are as follows: 1. Marathon run test for testing of mechanical performance of equipment (200 wafers continuous run). 2. Perform QC of the equipment includes Particle Contamination check, Rs(Sheet resistance) measurement and Rs Uniformity (with B+ implants using standard recipe with a dose of 3 x1014 ions/cm2 and energy 40 keV) 3. Unit Step Acceptance -- Trim factor needs to be tune in a way to match the Rs value which was before the upgrade of the equipment to the Rs value after upgrade for each Species i.e. B+, BF2+, P+, As+ with three verification run in successive days. Detail Acceptance as per *Annexure-E 2 : High Energy Implanter upgrades* acceptance
7	TRMU1/ Track MUV	Process	1. Additional - 1 Hot Plate (HHP)	1. Vendor shall supply and install Additional 1 high temperature Hot plates (HHP) in TRMU1 with all	1. Hot Plate Temperature uniformity: Set point = 350C Success criteria = 350+-2.5

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	TEL TEL ACT-8			necessary hardware and Software needed. 2. Vendor need to ensure overall functioning of track after HHP installation. Backup of all data and HDD in track should be taken before and after HHP installation. 3. Vendor should bring all support and special tool needed for installation and demonstration of upgrade as per acceptance.	Ave Range =< 5.0C 2. Demonstration of closed loop control from TRMU1 for additional modules. 3. Vendor to perform Transport test of entire transfer cycle (200 Nos of wafers in each Load port) without any failures, alarms, warnings, or human intervention except for loading during 200 wafers cycles. 4. Vendor to demonstrate Contaminating Particles- should be < 10 @0.20um size on bare Si wafer during CP test on all Load ports of the Installed SMIF. 5. vendor to ensure the full QC of track as per existing specification
			2. Temperature and Humidity Controller Upgrade	1. Vendor shall supply and installation of new Temperature and Humidity Controller compatible with TRMU1. Vendor need to provide all necessary hardware and software required. 2. Vendor need to ensure functioning of track after new T&H controller installation. Backup of all data and HDD in track should be taken before and after T&H controller installation.	1. Temperature and humidity control as per specification. Temperature: 22+-0.2 Degree C, Humidity: 40+-2 %RH 2. Demonstration of closed loop control from TRMU1 3. Vendor to perform Transport test of entire transfer cycle (200 Nos of wafers in each Load port) without any failures, alarms, warnings, or human intervention except for loading during 200 wafers cycles. 4. Vendor to demonstrate Contaminating Particles- should

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				3. Vendor should bring all support and special tool needed for installation and demonstration of upgrade as per acceptance. 4. Fingerprint data should be noted for all modules of track using T&H controller before new installation. 5. Unit need to be compatible with existing T&H controller	be < 10 @0.20um size on bare Si wafer during CP test on all Load ports of the Installed SMIF. 5. vendor should verify and demonstrate fingerprint data of track using T&H controller after new installation. 6. f. vendor to ensure the full QC of track as per existing specification
8	TRDU1/ Track DUV TEL TEL ACT-8	Process	1. Upgrade PLC on Developer LDS	1. Vendor shall Upgrade the PLC with all necessary functions compatible with existing chemical delivery system- MABAT CDU2500. Vendor need to provide all necessary hardware and software required.	1. Functional verification of PLC along with the control parameters and communication with all TRACKS should be demonstrated.
9	SNDU1/ Scanner DUV Nikon NSR-S204B	Process	1. Installation of Quadrpole Aperture (Resolution improvement)	1. Vendor to record ALL critical Scanner and KrF Laser parameters from logs/records stored during last known good condition of the Scanner and KrF Laser. Critical parameters such as Laser power, Wavelength, Bandwidth, Illumination Uniformity, Illumination Telecentricity and Projection lens parameters such as TFD, Astigmatism, Distortion, Coma etc. should be fingerprinted before the commencing of Quadrupole Aperture installation.	1. Vendor to demonstrate Resolution and Depth Of Focus capability of Installed Quadrupole Aperture. 2. Vendor to target and demonstrate the maximum achievable Illumination power, Uniformity and Illumination telecentricity that is achievable with Installed Quadrupole Aperture. 3. Vendor to match all recorded parameters of Scanner

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				2. Vendor to supply and install NEW Quadrupole aperture in the existing Illumination optics hardware. 3. Vendor to ensure and demonstrate smooth operation of related Scanner Subsystems, Modules, Hardware & Software with the installed Quadrupole Aperture. 4. Quadrupole aperture is to be replaced with unused aperture in the Illumination turret. 5. All aperture which are currently used in production IDs (ID4, ID5, ID7 & ID8) and test ID (ID1) shall not be modified. 6. Vendor need to supply all necessary hardware and software associated with successful installation of Quadrupole aperture. 7. Vendor to bring along all necessary Jigs, Fixtures, Tool	and KrF Laser as in point (a) of the Scope of Work. 4. Vendor to demonstrate the smooth operation (all Wafer, Reticle, Tool & KrF Laser operations) of Scanner Hardware and Software post Quadrupole Aperture Installation 5. Vendor to provide detailed Installation report of the Quadrupole Aperture installation. This report shall include any maintenance activity performed during this Scope Of Work.

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				& Instruments etc. that are required for the successful installation and acceptance of Quadrupole aperture 8. Vendor to install Quadrupole aperture with SCL Nikon Scanner successfully using existing OS, Application software MCSV: VER.S3.44B-1 & OCSV:VER.S3.44. 9. Vendor to hook/modify and supply all required electrical, communication cables, compatible connectors, interlocks etc. which are required for successful installation.	
10	MTCD1 / CD SEM Hitachi S-9300	Metrology	SMIF upgrade	1. Vendor to record all Critical parameters related to CD SEM performance such as Operating voltage, Probe current, magnification etc. and Tool parameters/modules such as Operator console, Vacuum integrity, Stage movement & Daily QC parameters (Beam alignment, ALP, STP mode) 2. Vendor to supply and install NEW/Refurbished SMIF type loader system with 2 load ports.	1. Vendor to perform Transport test of entire transfer cycle (500 Nos of wafers in each Load port) without any failures, alarms, warnings, or human intervention except for loading during 500 wafers cycles. 2. Vendor to demonstrate Contaminating Particles should be < 10 @0.20um size on bare Si wafer during CP test on both Load ports of the Installed SMIF. 3. Vendor to match all recorded parameters of CD SEM as

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				3. Vendor to ensure and demonstrate smooth operation of related CD SEM Subsystems, Modules, Hardware & Software with the installed SMIF type loader system. 4. Vendor need to supply all necessary hardware and software associated with SMIF upgrade. 5. Vendor to bring along all necessary Jigs, Fixtures, Tool & Instruments etc. that are required for the successful installation and acceptance of SMIF type system with CD SEM. 6. Vendor to install SMIF type loader system using existing OS and Application software of CD SEM. 7. Vendor to hook/modify and supply all required electrical, communication cables, compatible connectors, interlocks etc. which are required for successful SMIF upgrade.	in point (a) of the Scope of Work. 4. Vendor to demonstrate the smooth operation (all Wafer, QC & Tool operations) of CD SEM Hardware and Software post SMIF Installation. 5. Vendor to provide detailed Installation report of the Quadrupole Aperture installation. This report shall include any maintenance activity performed during this Scope Of Work.
11	CDHD1/ HDP Oxide CVD (3	Process	1.Replace ETO RF generator for	1. Vendor's scope of work shall cover De installation of Ch B and Ch C ETO RF generator Racks of AMAT C-5200	Annexure-E 3 : High Density Plasma Deposition (HDP) equipment Upgrade

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	chamber) AMAT AMAT C-5200 HDP Ultima Plus		two chambers with ENI RF generators	HDP Ultima Plus and Supply, Installation & Commissioning of new (Two No's) ENI RF generator racks for Ch B and Ch C. Each ENI RF generator rack shall have two NOVA-50A-10 (0190-19510) RF generator, one GHW50A-13DF3H0-10 (0190-19511) RF generator and 1No Seriplex PCB with power supply fittings. 2. Commissioning of these two ENI RF Generator racks and demonstration of its functionality as per the required specifications.	
			2. Change the existing 4.2Mb hard disk to flash drive	1. Perform the backup of all the files (system, configuration, recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. Vendor to show all the recipes and logs to the SCL engineers 5. Vendor to perform the acceptance as per acceptance procedure 6. Its the responsibility of the Vendor that this installation	1. Transport test- 50 wfs with no equipment & software related failure, alarms, and warnings 2. No lag in GUI 3. No loss of process recipes & sequence

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				should not impact other operations/parts of the equipment	
			3. Change the floppy drive to USB drive	1. Vendor to provide and install the USB drive on the equipment 2. Vendor to demonstrate and train the SCL engineers to load and unload of the files using newly installed USB drive 3. Its the responsibility of the installation Vendor that installed USB drive will not impact other operations of the equipment	1. Loading & unloading of System, configuration and recipe files using USB
12	CDTS1/ PECVD TEOS AMAT DCVD CENTURA 1.X	Process	1.Up-grade with RPS	1. Vendor to supply install and commission RPS system for DxZ Chambers (B and Chamber D) of Applied Centura platform. 2. Vendor to supply RPS and tune RPS process recipe to meet equal and better performance compared to existing In-situ clean. SCL will provide present CP QC performance of In-situ clean for vendor reference. 3. On completion of Installation Vendor to handover the Process chamber with RPS clean with 3 repeatable successful QC as per SCL standard QC procedure.	*Annexure-E 4 : TEOS Deposition Equipment (CDTS1)- 2 Nos*. **DxZ chambers equipment Upgrade**

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			2. SACVD chamber addition	1. Supply Install and commissioning of SACVD Gigafill Chamber with all its associated accessories like Vacuum pump, ozonator, chiller, MFC's etc. Install at Position A/C in the existing Centura Platform 2. Supply install and commissioning of RPS clean for SACVD chamber 3. Supply installation and commissioning of LDS for TEB & TEPO and draw line from existing TEOS LDS. Configuring/ Re-configuring GPLIS as per requirement for any additional LFM, MFC, filters valves etc. 4. Fingerprinting existing chamber B and D and returning them in same condition post SACVD commissioning.	*Annexure-E 4 : TEOS Deposition Equipment (CDTS1)- 2 Nos. DxZ chambers equipment Upgrade*
			3. Change the existing 4.2Mb hard disk to flash drive	1. Perform the backup of all the files (system, configuration, recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. Vendor to show all the recipes and logs to the SCL engineers 5. vendor to perform the acceptance as per acceptance	1. Transport test- 50 wfs with no equipment & software related failure, alarms, and warnings 2. No lag in GUI 3. No loss of process recipes & sequence

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				procedure 6. Its the responsibility of the Vendor that this installation should not impact other operations/parts of the equipment	
			4. Change the floppy drive to USB drive	1. Vendor to provide and install the USB drive on the equipment 2. Vendor to demonstrate and train the SCL engineers to load and unload of the files using newly installed USB drive 3. Its the responsibility of the installation Vendor that installed USB drive will not impact other operations of the equipment	1. Loading & unloading of System, configuration and recipe files using USB
13	SPCO1/ Silicide PVD Sputter AMAT AMAT Endura5500 Cobalt	Process	1.Upgradation of Conventional Ti Chamber for TiN capability	1. Drawing Line for N2 capability in Ti Chamber with all its accessories like MFC, valve, filter etc. 2. Supplying and tuning recipes for TiN layer depositing as per SCL acceptance procedure 3. Supplying and tuning recipe for De-poisoning as per SCL acceptance procedure. 4. Defining new Process kit life/clean cycle time.	1. TiN Sheet Resistance verification (Conv Ti standard as per Applied Materials BKM) and Ti Rs and success criteria verification as per SCL/ Applied-Materials BKM post de-poisoning of Target. 3 No's repeatability test
			2. Change the	1. Perform the backup of all the files (system, configuration,	1. Transport test- 50 wfs with no equipment & software

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	System		existing 4.2Mb hard disk to flash drive	recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. Vendor to show all the recipes and logs to the SCL engineers 5. Vendor to perform the acceptance as per acceptance procedure 6. Its the responsibility of the Vendor that this installation should not impact other operations/parts of the equipment	related failure, alarms, and warnings 2. No lag in GUI 3. No loss of process recipes & sequence
			3. Change the floppy drive to USB drive	1. Perform the backup of all the files (system, configuration, recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. Vendor to show all the recipes and logs to the SCL engineers 5. Vendor to perform the acceptance as per acceptance procedure	1. Loading & unloading of System, configuration and recipe files using USB

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				6. Its the responsibility of the Vendor that this installation should not impact other operations/parts of the equipment	
14	SPLR1/ Barrier Metal Deposition Amat AMAT Endura5500 MOCVD System	Process	1.High speed robot configuration	1. Supplying , installation and commissioning of 2 No's of VHP+ motor for Buffer and Transfer chamber robots.	1. High speed Robot preferably Buffer and Transfer chamber both with VHP+ motor . 200 wafers Transportation check without any error or human intervention.
			2. Change the existing 4.2Mb hard disk to flash drive	1. Perform the backup of all the files (system, configuration, recipes, equipment logs etc) 2. Provide and Install the state of the art compatible flash drive to the equipment 3. Upload all the original backup data file to the new drive 4. Vendor to show all the recipes and logs to the SCL engineers 5. Vendor to perform the acceptance as per acceptance procedure 6. Its the responsibility of the Vendor that this installation should not impact other operations/parts of the equipment	1. Transport test- 50 wfs with no equipment software related failure, alarms, and warnings 2. No lag in GUI 3. No loss of process recipes & sequence
			3. Change the	1. Vendor to provide and install the USB drive on the	1. Loading & unloading of System, configuration and recipe

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			floppy drive to USB drive	equipment 2. Vendor to demonstrate and train the SCL engineers to load and unload of the files using newly installed USB drive 3. Its the responsibility of the installation Vendor that installed USB drive will not impact other operations of the equipment	files using USB
15	MTFR1/ FTIR Spectroscopy Accent QS-2200ME	Metrology	Upgradation for B,P, and Si-OH bond measurement capability.	1. Providing software for Si-OH and B,P concentration software 2. Vendor to provide all necessary hardware required, if any. 3. Vendor to provide 3 separate golden wafer. Two for calibration and 3rd golden wafer for verification and quality check. This Methodology to follow for B & P and Si-OH 4. Fingerprinting existing tool before upgradation and demonstrating existing capabilities post upgrade.	1. B & P verification for accuracy and precision with SCL Golden wafer and spec. 2. Si-OH : Vendor to supply 3 different concentration golden wafer. Calibrate tool with 2 No's and show result verification with 3rd golden.
16	WTSE1 / Single Wafer Spin	Process	Chuck Upgrade in both module-Wafer edges can	1. Upgraded chuck for both PMA and PMB module. Existing chuck is "Chuck 200mm Standard Version 1"	1. Wafer Handling and Transport - 200wafers 2. Bevel should clean 3. Process Requirement in both module PMA and PMB-

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Processor SEZ RST-223 Spin Processor		be better handle with upgraded Chuck.		4. Etch rate & Uniformity check - should meet SCL baseline. 5. PMA – Silicon Di-Oxide layer Etch rate 950 to 1000 and uniformity <8%. 6. PMB – Silicon Nitride Etch Rate 1050 to 1700 CP should <30 @ 0.16micron for both the modules. 7. Already established recipe verification in both PMA and PMB – Recipe; NS Wet Etch – Oxide consumption baseline • 313 - 318 Å with 15 sec recipe – DICD & FICD close to SCL process. – SEM Cross-section profile similar to SCL baseline. 8. Process check after upgrade for back side of the wafer: NS back side recipe and check for front side. Wafer bevel and 1mm to 2mm front side material should clean 9. Metal Contamination Check- Should meet SCL base line. Al, Cu, Fe & Na < 5 E10 atoms/cm2
			Upgradation of CDS to handle	1. Upgrade the existing CDS to handle 200 Ltr drum. Current CDs handles only 24Ltr drum	1. Efficiently and safely Capable to handle one 200Ltr drum and integrate with existing equipment

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
			200 Ltr drum for catering increase chemical consumption with increase capacity		
			O3 generator upgrade	1. Vendor to Upgrade the existing Ozone generator integrated with WTSE1. Details of existing ozone generator: AsteX Ozone Generator Model: SEMOZON 090.2 HP Astex PN: 14-6006-01	1. Wafer Handling and Transport: Vendor has to demonstrate the Ozone system stability by running 200 Semi-Standard Silicon wafers with existing any DIO3 recipe. The Ozone should automatically generate and send to both Modules as DIO3 based on the process recipe requirement. Upgraded system should be handshake with equipment and shall be able to run 200 wafers without any failures, alarms, warnings or human intervention, except for cassette loading during 200 wafers cycles. 2. Process Parameter: - Ozone concentration check: 5 ppm during processing -Oxide growth check: ~7Å layer to grow on bare Si measurement tool may read ~10Å Non-uniformity should be better <3%

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
					3. CP (Contaminating Particle)Test: < 22 nos @ 0.16 µm on Bare Si 4. Metal Contamination Check: should meet SCL base line i.e. Al, Cu, Fe & Na < 5 E10 atoms/cm2 5. Tool Test: The tool shall clear the following checks after upgrade: • Actuation of all kind of valves and regulators like Solenoid valve, N2 valve, Di valve, PCW, regulator etc. • All sensors activation and feedback verification. • Exhaust verification. • Body and frame integrity verification. • Detailed leak check verification. • Ozone leak sensor verification
			Addition Heat exchanger for Med 2	1. Vendor to install the Heat exchanger in Med-2 (for chemical BOE/BHF) of WTSE1 for better temperature control. Required temperature range is 20 deg to 26 deg	1. Heat exchanger to be installed in Med-2 for better temperature control. 2. Success criteria- temperature should maintain selectively from 20deg to 26 deg with maximum +/- 0.2 variations from set temperature.
17	SBXC1/ Pod and Cassette	Support	PLC upgrade	1. Vendor to upgrade the existing PLC to develop the read - write capability along with Old program need to retain	2. Read Write capability of recipe/program - Vendor has to demonstrate that the upgraded system

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Cleaner Fluoroware HTC 8020			and reload. Equipment Model no HTC 8020 & Make Fluoroware	should have capability to read and write the program without any issue. - Old program need to retain and reload. - Verification of POD cleaning with upgraded system. 3. Tool Test - Actuation of all the moving parts. - Actuation of all kind of valves and regulators. - All sensors activation and feedback verification.
18	SSRT1/ Wafer Sorter - Wafer Start Brooks SCS 3000	Support	Upgrade to wafer Back side reading	1. Vendor to upgrade the equipment laser mark reading capability from the wafer front and back side.	1. Read Write capability of recipe/program: Vendor has to demonstrate that the upgraded system should have capability to read marking from the wafer back side.
19	SSRT2/ Wafer Sorter - Common Area	Support	Upgrade to wafer Back side reading	1. Vendor to upgrade the equipment laser mark reading capability from the wafer front and back side.	1. Read Write capability of recipe/program: Vendor has to demonstrate that the upgraded system should have capability to read marking from the wafer back side.

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Brooks SCS 3000				
20	WTPD1/ Pre-Diffusion Clean Batch processing SES SS-TECHNO200	Process	1.O3 generator	1. Vendor to Upgrade the existing Ozone generator integrated with WTPD101	1. Wafer Handling and Transport: Vendor has to demonstrate the Ozone system stability by running 200 Semi-Standard Silicon wafers with existing any DIO3 recipe. The Ozone should automatically generate and send to bath as DIO3 based on the process recipe requirement. Upgraded system should be handshake with equipment and shall be able to run 200 wafers without any failures, alarms, warnings or human intervention, except for cassette loading during 200 wafers cycles. 2. Process Parameter: - Ozone concentration check: 2.5 to 3 ppm in equipment process bath -Oxide growth check: ~7Å layer to grow on bare Si measurement tool may read ~10Å Non-uniformity should be better <3% 3. CP (Contaminating Particle)Test: < 22 nos @ 0.16 µm on Bare Si

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
					4. Metal Contamination Check: should meet SCL base line i.e. Cu, Na <5 E10 atoms/cm2 and Al, Cr, Fe & Ni < 10 E10 atoms/cm2 5. Tool Test: The tool shall clear the following checks • Actuation of all kind of valves and regulators like Solenoid valve, N2 valve, Di valve, PCW, regulator etc. • All sensors activation and feedback verification. • Exhaust verification. • Body and frame integrity verification. • EMO function verification. • All FFU verification. • Power line verification. • Detailed leak check verification. • Ozone leak sensor verification
			2. Magasonic generator	1. Vendor to upgrade the existing magasonic generator and vibrator attached with the DIW bath. Details of existing model is as follows: - Vibrator existing model "KOKUSAI DENKI ALPHA" Input 600W frequency 730KHz - Generator existing model "KOKUSAI DENKI ALPHA"	1. Equivalent model to following: - Vibrator existing model "KOKUSAI DENKI ALPHA" neet to upgrade: Input 600W frequency 730KHz - Generator existing model "KOKUSAI DENKI ALPHA" need to upgrade: input 600W frequency 730Khz 2. Need to integrate with mentioned equipment.

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
				input 600W frequency 730Khz Need to integrate with mentioned equipment i.e WTPD1 (SES make Model Techno200).	
			3. CD upgrade	1. Vendor to upgrade the CD (Centrifugal Dryer) with IPA dryer.	1. Handling check: NO alarm while running 200 wafers 2. No damage on wafer edge from slot 1 to 50
21	WTRS1/ Photo-resist Strip Batch processing SES SS-TECHNO200	Process	1. CD upgrade	1. Vendor to upgrade the CD (Centrifugal Dryer) with IPA dryer.	1. Handling check: NO alarm while running 200 wafers 2. No damage on wafer edge from slot 1 to 50
			2. Mega sonic generator	1. Vendor to upgrade the existing magasonic generator and vibrator attached with the DIW bath. Details of existing model is as follows: - Vibrator existing model "KOKUSAI DENKI ALPHA" Input 600W frequency 730KHz - Generator existing model "KOKUSAI DENKI ALPHA" input 600W frequency 730Khz Need to integrate with mentioned equipment i.e WTRS1 (SES make Model Techno200).	1. Equivalent model to following: - Vibrator existing model "KOKUSAI DENKI ALPHA" need to upgrade: Input 600W frequency 730KHz - Generator existing model "KOKUSAI DENKI ALPHA" need to upgrade: input 600W frequency 730Khz 2. Need to integrate with mentioned equipment.
22	YEDR1/ CP measurement	Metrology	Existing equipment needs	1. Vendor to upgrade existing computer system/CPU card supporting SATA HDD of minimum 250 GB Capacity and latest compatible processor. It should support USB	1. System should be able to run existing recipes and results should match the current baseline. System should be able to run existing recipes and results should

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Un-patterned wafer scan system KLA SP1 TBI		to be upgraded for Computer hardware, Windows Operating System & Hard Disk Storage	drive for data backup. 2. Match the performance & recipe with Similar equipment being procured 3. Vendor to provide MX4.2 Application Software. Match the performance & recipe with Similar equipment being procured 4. Vendor to provide latest windows operating system supporting MX4.2 Application Software. Match the equipment with similar equipment being procured	match the current baseline. 2. System should be able to run existing recipes and results should match the current baseline.
23	YEOI1/ Optical Inspection Station Zeiss	Metrology	Upgrade YEOI1 for Bevel Inspection	1. Vendor to provide , integrate and install the additional module for both front & back wafer edge inspection 2. Vendor to demonstrate the functionality of the bevel inspection	1. Wafer Handling Check for 250 wafers without fail 2. Inspection & image storage for bevel (front & back)
			Optics needs to be upgraded for existing system	1. Vendor to supply the new optics module along with lenses and replace existing Optics module with this new optics module along with lenses. 2. Vendor to demonstrate the functionality of the new integrated optics modules .	1. Wafer Handling Check for 250 wafers without fail 2. Verify manual as well as auto focus at all magnification levels 3. Inspection & image storage for bevel (front & back)
24	YESR1/ SEM	Metrology	1. IP computer	1. Image processing computers with highest compatible	1. System should be able to review and Store the defect

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Review Station AMAT AXIOSPRINT			configuration to be supplied and installed by vendor.	review images as per given recipe
			2. HDD higher capacity for all computers	1. Vendor to supply and install the High Capacity (Minimum 250 GB) SATA HDD & USB for backup	NA
			3. EDX software & computer	1. Vender to supply and install the EDX computer hardware for supporting latest EDX capturing and analysis software. 2. Vendor to supply and install the latest software with feature of auto capturing and saving EDX image and data file to be provided.	1. System should be able to automatically capture the EDX image and store the compositional analysis data file as well as image
			4. Optical Microscope replacement	1. Vendor to supply the new optical module and replace existing Optics module with this new optical module. 2. Vendor to demonstrate the functionality of the new integrated optical modules .	1. Wafer Handling Check for 250 wafers without fail 2. Verify manual as well as auto focus at all magnification levels
			5. OS system upgrade (O2)	1. vendor to supply and install the latest compatible Operating system (Solaris/Linux)	1. Wafer Handling check for 250 wafers without fail 2. System should be able to run all the existing recipe, review and store images as per given KLARF file for the sample wafer
25	YEOR1/ Optical	Metrology	1. Optical module needs to be	1. Vendor to supply the new optics module along with lenses and replace existing Optics module with this new	1. Handling check for 250 wafers without fail 2. Verify manual as well as auto focus at all magnification

SNO	SCL Equip ID/ Description Make and Model No.	Type of Equipment	Upgradation Required	Scope of Work	Acceptance Procedure
	Review Station Zeiss SEMVISION		upgraded.	optics module along with lenses 2. Vendor to demonstrate the functionality of the new integrated optics modules	levels
			2. ADR software needs to be upgraded	1. Vendor to supply, integrate and install the ADR software and demonstrate the functionality. 2. Vendor to demonstrate automatic review of defects on given wafer having sampled Klarf File and automatic saving of same. 3. Vendor to demonstrate that more than 90% images are captured and images saved.	1. System should be able to align, focus, review and store images on a defect inspection KLARF file for a given sample wafer at various critical review layers in SCL process flow.
			3. Upgrade YEOR1 for Bevel Inspection	1. Vendor to supply additional module for both front & back wafer edge inspections 2. Vendor to integrate and install the modules and demonstrate the functionality	1. Wafer Handling check for 250 wafers without fail 2. Inspection & image storage for bevel region of wafer for both front side and back side

Annexure-E 1 : **Metal Etcher Chambers upgrade**

I. Scope

Metal etcher chamber up-gradation (01 DPS chamber + 01 ASP chamber)

II. Metal etcher Configuration

Make – Applied Materials (AMAT)

Equipment platform- 8” AMAT CENTURA 5200

Equipment type- Centura - DPS (Al) -1 + 1 ASP chamber

III. Up-gradation recommended

2 chamber addition -1 no. of Decoupled Plasma chamber (DPS) at ‘B’ chamber slot of Centura platform and 1 Advanced Strip passivation (ASP) chamber at ‘D’ chamber slot of Centura platform

Note: Existing DPS Chamber is at ‘A’ Slot and ASP Ch is at ‘C’ Slot of 8” centura platform in SCL

Up-gradation Acceptance

A. Equipment Acceptance test

Configuration check

(a) One DPS Metal chamber (b) one ASP chamber (c) vacuum pumps for both the chambers (d) chillers for both chambers (e) RF generator/ microwave generator for respective chambers (f) All Gas MFC's & LFC’s for both the chambers (g) EPD for DPS chamber etc.

Note: configuration of both the chambers shall match with respective chambers existing in SCL.

Transport test

To perform 200 wafers entire transfer cycle. The procedure will be with 10sec plasma for each wafer individually in both the newly installed chambers & using both SMIF loaders. No failure, alarms, warnings or human intervention except for cassette loading and un-loading during 200wafers cycle.

Result: ___________PASS/FAIL

Particles test

Delta CP Less than 20 particles (≥0.2 µ) for DPS chamber & Delta CP Less than 30 particles (≥ 0.2 µ) for ASP chamber. Test Wafer used are NOX1000.

Delta CP= Post CP- Pre CP

Result: Delta CP DPS Chamber =________**(PASS/FAIL)**

Delta CP ASP Chamber =_________ **(PASS/FAIL)**

Process gas MFC verification

In both chamber (DPS & ASP chambers), all MFC's and LFC's should have flow variation not greater than the 5% of the set value (10%, 25%, 50%,75% and 90% of MFC Max. flow).

Result: _______PASS/FAIL

RF Power verification (Source RF and Bias RF)-

Perform RF power verification at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% of Max Generator Power. Delivered power will be within 10% of all set values.

Base pressure check & Leak rate check (Both chambers, buffer chamber and Load locks) with and without gas lines open.

Chamber	**Requirement (mT/min)**	**Result (mT/min)**	**Remarks (Pass/Fail)**
Transfer/Buffer Chamber	<10		
Process chamber (DPS)	<1		
Process chamber (ASP)	<10		

Heat exchanger Temperature Stabilization

Method

Check Temperature Stabilization on screen for all heat exchangers

Requirement- Set point ± 1^0C

Chamber	**Heat Exchanger**	**Requirement**	**Result**	**Remarks**
DPS chamber cathode		40^0C		
DPS chamber Dome		15^0C		
DPS chamber wall		85^0C		
ASP chamber wall		65^0C		

Result:_______ PASS/FAIL

B. Process test-

Chamber	**Process**	**Gases**	**Test wafer**	**Parameter to monitor**	**ER unif. (%)**	**Remarks**
DPS chamber	Metal etch	Cl2, BCl3,Ar, CHF3	1.M1 SLE(patterned wafer) 2.Metal wafer (unpatterned metal wafer)	1.70-100s (time to EP), Well defined EP trace 2.Etch rate 2800 Ǻ/min or more	<5	
ASP chamber	PR Ash Rate	O2,N2,H2O	Pad PR (30K PR on bare Si wafer)	Mean Ash rate 38000 Ǻ/min or more	<10	

C. Process Acceptance test

ASP chamber:

QC Parameter	**Method**	**Success Criteria**
ASP CP	KLA Surfscan SP1 TBI (CPX) inspection	<30 (> 0.2 μ)
PR ASH RATE	Optiprobe	38000 Ǻ/min or more
PR ASH RATE Uniformity	Optiprobe	<10%
Metal contamination	ICPMS	–Fe, Ni, Cu, Na, and Al < 10^{13} cm-3

DPS chamber:

SLE/Production Parameter	**Method**	**Success Criteria**	**Results**
DPS METAL CP	KLA Surfscan SP1 TBI (CPX) inspection	<20 (> 0.2 μ)	
M1 FI CDs (Dense) *	CD SEM	310nm ±25nm	
M1 FI CDs 3σ (Dense)	CD SEM	<30nm	
DI_FI Bias	CD SEM	Preferred bias= 50nm	
Side wall slope	X-SEM	87 ± 3^0	
Oxide penetration	X-SEM	(500-1200)Å	
PR budget	X-SEM	>1000Å	
Metal contamination	ICPMS	Fe, Ni, Cu, Na, and Al < 10^{13} cm-3	
Side wall attack	X-SEM	No	

*M1 (Al: 450nm, Stack: Ti/TiN/Al-Cu/Ti/TiN, Thickness: ~550nm, DR L/S=230nm/230nm)

IV. Acceptance Approval:

Title	**Date**	**Name**	**Signature**
Vendor representative			
SCL representative			
Final approval authority			

Annexure-E 2 : High Energy Implanter upgrades acceptance

I. Scope

IMHE1/HEI01 – High Energy Implanter (NV - GSD-HE)

1. Up gradation of the software (Sun system) of equipment with latest version of the same inclusive of all the pre-requisite items for this improvement.
2. Installation of the night backup recorder for timely backup of the data.
3. Installation of an additional wafer buffer loader required to reduce the loading time and to increase the wafer handling capacity.

II. Acceptance procedure

Up gradation of the software (Sun system) of equipment with latest version of the same inclusive of all the pre-requisite items for this improvement.

Acceptance Criteria

(a) Marathon run test for testing of mechanical performance of equipment (200 wafers continuous run without any hardware and software error).

(b) Perform QC of the equipment IMHE1 (with B+ implants using standard recipe with a dose of 3 x10^{14} ions/cm^2 and energy 40 keV)

Species	Parameter	Lower specifications limit	Upper specifications limit
B+	Particle count (>= 0.2 micron)	0	90
	Sheet resistance(Rs)	281	305
	Rs uniformity	0	1.5

Result:_______ PASS/FAIL

III. Unit step acceptance

(a) To tune TRIM FACTOR of each species i.e. B+, BF2+, P+, As+

Species	Amu	Current Trim factor
B+	11	1.00
As+	75	1.05
P+	31	1.03
BF_2+	49	1.04

The trim factor needs to be tuned in a way to match the Rs value which was before the upgrade to the Rs value after upgrade.

(b) Installation of the night backup recorder for timely backup of the data

The acceptance criterion is as follows:

i. To perform the night backup for three consecutive days.

(c) Installation of an additional wafer buffer loader required to reduce the loading time and to increase the wafer handling capacity.

The acceptance criterion is as follows:

i. Marathon run test for testing of mechanical performance of equipment (200 wafers continuous run).
ii. Particle Contamination checks to be done for the end station and robot operation. (For particle size >= 0.2 micron == USL <= 90 nos).
iii. Check wafer loading unloading with multiple pods to check the handling capability.

V. Acceptance Approval:

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Annexure-E 3 : High Density Plasma Deposition (HDP) equipment Upgrade

I. Scope

This section of the document outlines the procedures and criteria used by SCL for acceptance of upgrades carried out in High Density Plasma Deposition equipment (CDHD1) as per RFP. It includes equipment and process requirements for acceptance in order to meet SCL's current 200mm, 180nm Fab-line's stringent process specs.

II. List of Upgrades

Replace ETO RF generator for chamber B & Chamber C with ENI RF generators

III. Upgrade No 1

Acceptance for Replacement ETO RF generator for chamber B & Chamber C with ENI RF generators

Note: Existing HDP Chamber is at 'A', 'B' & 'C' Slot with RPS cleaning of 8" HDP centura platform in SCL

IV. Acceptance Procedure

Vendor to supply the details of acceptance test procedure to SCL. RF GENERATORS will be accepted as per SCL acceptance test procedures. The proposed acceptance plan by the vendor will also be submitted along with the bid. Vendor shall demonstrate, at site, the functionality as per the SCL acceptance test procedure. Acceptance procedure as given below:

RF GENERATOR Calibration

Forward Power Set point(W)	TOP RF	SIDE RF	BIAS RF	LIMIT
1500				±10 W
2000				±10 W
2500				±10 W
3000				±10 W
3500				±10 W
4000				±10 W
4500				±10 W

5000			NA	±10 W

Marathon Run

Marathon run with 25 wafers (each chamber) shall perform per processing chamber at SCL without any error related to RF generator.

V. Acceptance Approval:

Title	**Date**	**Name**	**Signature**
Vendor representative			
SCL representative			
Final approval authority			

Annexure-E 4 : TEOS Deposition Equipment (CDTS1)- 2 Nos. DxZ chambers equipment Upgrade

I. Scope:

This section of the document outlines the procedures and criteria used by SCL for acceptance of upgrades carried out in TEOS Deposition Equipment (CDTS1) as per RFP upgrades. It includes equipment and process requirements for acceptance in order to meet SCL's current 200mm, 180nm Fab-line's stringent process specs.

II. List of Upgrades

A. Up-grade with RPS clean

B. SACVD chamber addition

Upgrade A. Installation of RPS Clean for Ch B & D

Note: Existing DXZ Chamber is at 'B' & 'D' Slot with in-situ cleaning of 8" centura platform in SCL

Acceptance Procedure

Acceptance of RPS clean upgrade will be based on CP success criteria as given below.

CP test

3 No's successive CP QC pass with SCL's current Process recipe and vendor provided RPS clean setting and recipe on DxZ chamber. SCL CP recipe on KLA Surfscan SP1 TBI. Success criteria for CP test are as given below.

Data Item	Tool	Window Name	Test Wafer Name	QC Sequence Name	Measurement Tool	Control Limit
NS-TEOS-Particles	CDTS1-D	NS-TEOS CP	New Bare Si or Regrind	D:NS-TEOS-5	CPX (Surfscan)	0.20 µm particle count<40
TEOS-CS-Particles	CDTS1-B	CS CP	New Bare Si or	B:TEOS DEP D1	CPX (Surfscan)	0.20 µm particle count<40

			Regrind			

Marathon

Marathon run with 25 wafers (each chamber with Clean running after every wafer) shall perform per processing chamber at SCL without any cleaning recipe related error. CP check of marathon wafers should be trend free (i.e. no trend from 1st to 25th wafer).

Upgrade B. SACVD chamber installation with RPS Clean

I. EQUIPMENT REQUIREMENTS

(a) Transport

Definition: Test of handling system.

Method: 200 wafers to perform entire transfer cycle.

Requirements: No failures, alarms, warnings or human intervention, except for cassette loading during 200 wafers cycles.

Result: __________PASS / FAIL

Particles

Definition: "CP": Contaminating Particles, refer to amount of particles > 0.2um added to 8" bare Si wafer as measured using calibrated KLA Surfscan SP1 TBI. Measurements will be performed using SCL standard CP tests.

Method: Measure Cp on wafer before run, than insert 1 wafer to the chamber w/o deposition, measure after and calculate the Delta (added Cp).

Mechanical CP (delta) - Less than 20 particles (>0.2 um) per wafer. Use Bare Si wafer.

(b) Tool Test

Vacuum integrity:

Chamber		Allowable ROR	Measured ROR	Check
Position	Type			

Chamber A/C (SACVD)	Process	1.0E-6		
Transfer	Passthrough	6.0E-5		

Recipe

SCL Production recipe for particle check with KLA Surfscan SP1 TBI

Chamber (position)	Chamber Description	Transport CP Value	Result Pass/Fail
Chamber A/C			

(c) Base Pressure and Leak Rate

Definition: Base pressure is the final pressure achieved in the chamber/load lock when using maximum pumping force and no gases flow. Leak rate is the pressure raise from base pressure divided by time. Leak rate will be measured on a clean chamber.

Method: SCL procedures will be used.

Requirements:

i. **Base Vacuum Check:**

SECTION	DETAILS	SET-UP Result	REMARK (ROR)
	SPEC	ACTUAL	
SACVD Chamber	As per BKM		

ii. **Gas Line Vacuum Check:**

Item				SET-UP Result	Remark
		DETAILS			
		SPEC	ACTUAL		
CH:A/C	1st				

	2nd				
	3rd				
	4th				

iii. LFM test

Definition: Difference between set point and actual flow rate.

Requirements: All LFM/MFCs should have a deviation of < ±5% in full scale.

iv. LFM FLOW TEST

Test LFM flow for full range at 10% intervals

SECTION	**DETAILS**		**SET-UP Result**	**Remark**
	ITEM	Test Result		
SACVD Chamber	TEB			
	TEPO			
	TEOS			

II. PROCESS REQUIREMENTS

General: Vendor to provide process recipe for Unit step qualification. Success Criteria as per SCL process spec is given below**.**

Process Tests

Process: BPSG

Process	**Test**	**Measurement recipe name**	**Result**	**Check**
BPSG-1 BPSG-1000	Conc B%: 3.8-4.2 Conc P%:3.8-4.2 Thickness: 6300-6500 A Uniformity<3% RI: 1.445-1.461 CP<35 bin size above 0.2 um (added) %B DELTA: 0-0.45 B% 1000X3: 0-4.2%	**KLA Surfscan SP1 TBI:** Pre: Z_YTS_BM_PreSilicon Post: Z_YTS_BM_BPSG500 0 (use only DCO) **XRF:** BPSG CVC (Center point) **Opti-probe:** TF-CVD/BPSG/ 9 RI **XRF:** BPSG CVC (Center point)		

BPSG 2	Thickness: 2325-2475 A Uniformity < 3.5% within wafer Uniformity	**Opti-probe:** TF-CVD/BPSG/9 RI		

Calculations:

%B delta=% B (BPSG-1000)-%B (BPSG-1)

Uniformity (unif= (max-min)*100/(max+min))

Notes: Use Regrind or New Bare Si Test Wafers

III. Acceptance Approval:

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 1. Bright Field Inspection equipment -Model KLA2367 PRO

I. Scope

The section of the document (*Annexure F : Equipment Acceptance Procedure*: Equipment 1) outlines the procedure and criteria used by SCL for acceptance of ***Bright field Inspection equipment***, including equipment and process requirements. It also defines technical acceptance.

II. Equipment Requirement

A. Transport

S.No.	Parameter	Success Criteria	Result	Remarks
1	Test of Handling systems	Method: 200 wafers to perform entire transfer cycle. Requirements: No failures, alarms, warnings or human intervention, except for cassette loading during 200 wafer cycles		
2	Wafer Handling & Alignment	200 consecutive repeats with <1% wafer alignment failures.		

B. Particles

Definition:-"CP": Contaminating Particles refer to amount of particles > 0.20µm added to 8" bare Si wafer. Measurements will be performed using standard CP tests.

Method: Measure CP on wafer before run, than run 1 wafer and measure after 10 cycles &calculate the Delta (added Cp).

Requirements: CP (Added)-Less than10 particles per wafer.

Recipe: As per required

Result:__________**PASS /FAIL**(USL <10)

C. Functionality

S.No.	Parameter	Success Criteria	Result	Remarks
1	Operator Console	Main system and any EMO hub connected peripherals power off.	Pass/Fail	
2	System Power UP	Main tool and all Peripheral components Power Up Properly.	Pass/Fail	
3	Operator Interface	Operator Console functions correctly, S/W Interface and recipe load properly	Pass/Fail	

D. Initialization PASS

S.No.	Parameter	Success Criteria	Result	Remarks
1	Stage	Initialize Pass or Fail	Pass/Fail	
2	Optics	Initialize Pass or Fail	Pass/Fail	
3	Robot	Initialize Pass or Fail	Pass/Fail	

E. Process Requirement

S.No.	Parameter	Success Criteria	Result	Remarks
1	Capability	Create recipes in applicable modes for both patterned and un-patterned wafer	Pass/Fail	
2	Sensitivity	Detection of >95% of defects on OEM standard wafer for consecutive 10 runs	Pass/Fail	
3	Repeatability	{Repeatability = (1-Sigma/Mean)*100%, Wafer is scanned 10 times and defect count's Sigma and Mean is measured}.	Pass/Fail	95 % or better
4	Capture rate	1. Capture rate of 95% or higher on average 2. Minimum Value of capture rate: >85% for each run. 3. Capture rate to be performed on one SCL wafer (20 times). 4. OEM to perform capture rate on OEM standard wafer.	Pass/Fail	All the captured defects have to be real.
5	Defect sensitivity	To demonstrate minimum defect sensitivity of 90 nm or less on DSW calibration wafer	Pass/Fail	
6	Coordinate accuracy	Compare coordinates of defects w.r.t 10 runs. Coordinate accuracy to be <4micron or better.	Pass/Fail	

III. Acceptance Approval:

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 2. Un-patterned Wafer Surfscan

I. Scope

The section of the document (*Annexure F : Equipment Acceptance Procedure*: Equipment 2) outlines the procedure and criteria used by SCL for acceptance of **Unpatterned Wafer *Surfscan*** , including equipment and process requirements. It also defines technical acceptance.

II. Equipment Requirement

A. Transport

S.No.	Parameter	Success Criteria	Result	Remarks
1	Test of Handling systems	Method: 200 wafers to perform entire transfer cycle. Requirements: No failures, alarms, warnings or human intervention, except for cassette loading during 200 wafer cycles.		
2	Wafer Handling & Alignment	200 consecutive repeats with <1% wafer alignment failures.		

B. Particles

Definition:-"CP”: Contaminating Particles refer to amount of particles > 0.20μm added to 8" bare Si wafer. Measurements will be performed using standard CP tests.

Method: Measure CP on wafer before run, than run 1 wafer and measure after 10 cycles &calculate the Delta (added Cp).

Requirements: CP (Added)-Less than10 particles per wafer.

Recipe: As per required

Result:____________PASS /FAIL(USL <10)

C. Functionality

S.No.	Parameter	Success Criteria	Result	Remarks
1	Operator Console	Main system and any EMO hub connected peripherals power off.	Pass/Fail	
2	System Power UP	Main tool and all Peripheral components Power Up Properly.	Pass/Fail	

3	Operator Interface	Operator Console functions correctly, S/W Interface and recipe load properly	Pass/Fail	

D. Initialization PASS

S.No.	Parameter	Success Criteria	Result	Remarks
1	Stage	Initialize Pass or Fail	Pass/Fail	
2	Optics	Initialize Pass or Fail	Pass/Fail	
3	Laser system	Initialize Pass or Fail	Pass/Fail	

E. Process Requirement

(a) Vendor to demonstrate (*0.060*µ*m sensitivity for oblique mode & 0.083um sensitivity for Normal mode using poly styrene latex (PSL) spheres on prime grade, bare, silicon substrates. 0.25um for other films types*)

(b) PSL wafer (calibration wafer) Test performance

Wafer		**LSL**	**USL**	**Unit**	**1st Value**	**2nd Value**	**3rd Value**	**Result**
8" ,(200mm) PSL 0.06Âµm (60nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" ,(200mm) PSL 0.083Âµm (83nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" ,(200mm) PSL 0.102Âµm (102nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" ,(200mm) PSL 0.126Âµm (126nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" ,(200mm) PSL 0.155Âµm (155nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" ,(200mm) PSL 0.204Âµm (204nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" (200mm) PSL 0.304Âµm (304nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" (200mm) PSL 0.360Âµm (360nm),	Count	Vendor to Specify	Vendor to Specify					

	Size	Vendor to Specify	Vendor to Specify					
8" (200mm) PSL 1.112Âµm, (1112 nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					
8" (200mm) PSL 3.04Âµm(3040 nm)	Count	Vendor to Specify	Vendor to Specify					
	Size	Vendor to Specify	Vendor to Specify					

III. Acceptance Approval:

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 3. Dark field Patterned wafer Defect Inspection Station.

I. Scope

The section of the document (*Annexure F : Equipment Acceptance Procedure*: Equipment 3) outlines the procedure and criteria used by SCL for acceptance of **Dark field Patterned wafer** ***Defect Inspection Station***, including equipment and process requirements. It also defines technical acceptance.

II. Equipment Requirements

A. Transport

S.No.	Parameter	Success Criteria	Result	Remarks
1	Test of Handling systems	Method: 200 wafers to perform entire transfer cycle. Requirements: No failures, alarms, warnings or human intervention, except for cassette loading during 200 wafer cycles		
2	Wafer Handling & Alignment	200 consecutive repeats with <1% wafer alignment failures.		

B. Particles

Definition:-"CP": Contaminating Particles refer to amount of particles > 0.20μm added to 8" bare Si wafer. Measurements will be performed using standard CP tests.

Method: Measure CP on wafer before run, than run 1 wafer and measure after 10 cycles &calculate the Delta (added Cp).

Requirements: CP(Added)-Less than10 particles per wafer.

Recipe: As per required

Result:____________PASS /FAIL(USL <10)

C. Functionality

S.No.	Parameter	Success Criteria	Result	Remarks
1	Operator Console	Main system and any EMO hub connected peripherals power off.	Pass/Fail	
2	System Power UP	Main tool and all Peripheral components Power Up Properly.	Pass/Fail	
3	Operator Interface	Operator Console functions correctly, S/W Interface and recipe load properly	Pass/Fail	

D. Initialization PASS

S.No.	Parameter	Success Criteria	Result	Remarks
1	Stage	Initialize Pass or Fail	Pass/Fail	
2	Optics	Initialize Pass or Fail	Pass/Fail	
3	Robot	Initialize Pass or Fail	Pass/Fail	

E. Process Requirement

S.No.	Parameter	Success Criteria	Result	Remarks
1	Capability	Create recipes in applicable modes for both patterned and un-patterned wafer	Pass/Fail	
2	Sensitivity	Detection of >95% of defects on OEM standard wafer for consecutive 10 runs	Pass/Fail	
3	Repeatability	{Repeatability = (1-Sigma/Mean)*100%, Wafer is scanned 10 times and defect count's Sigma and Mean is measured}.	Pass/Fail	95 % or better
4	Capture rate	1. Capture rate of 95% or higher on average 2. Minimum Value of capture rate: >85% for each run. 3. Capture rate to be performed on one SCL wafer (20 times). 4. OEM to perform capture rate on OEM standard wafer.	Pass/Fail	All the captured defects have to be real.
5	Defect sensitivity	To demonstrate minimum defect sensitivity of 90 nm or less on DSW calibration wafer	Pass/Fail	

6	Coordinate accuracy	Compare coordinates of defects w.r.t 10 runs. Coordinate accuracy to be <4micron or better.	Pass/Fail	

III. Acceptance Approval:

The acceptance document should be fully signed to approve tool Acceptance.

Title	**Date**	**Name**	**Signature**
Vendor representative			
SCL representative			
Final approval authority			

Equipment 4. Metal Sputter- Endura Equipment

I. Scope

This section of document (*Annexure F : Equipment Acceptance Procedure*: Equipment 4) outlines the procedures and criteria used by SCL for acceptance of Applied Material Endura Equipment for Metal deposition. It includes equipment and process requirements for acceptance in order to meet SCL's current 200mm, 180nm Fab-line's stringent process requirements.

II. Pre Acceptance Verification

Before starting Equipment Acceptance Engineer to confirm following activities are successfully completed and equipment is ready for Power On and Acceptance.

Sl No	Type	Description	Document reference no and date of Signing
1	SLE	Electrical Connection Procedure	
2	SL0	Safety Level 0	
3	SL1	Safety Level 1 (All gas lines, exhaust lines, PCW, DIW etc proof pressure testing)	
4	Equipment Power ON	Equipment Powering and no alarm/ malfunction verification	

III. Configuration Verification

Description	Final Configuration
2 No's of SMIF loaders and all its accessories	
Buffer Chamber with robots, vacuum pump, Load locks, slit Valve, SMIF interface and all other associated accessories and parts for proper functioning	
Transfer Chamber with robots, vacuum pump, slit Valve, and all other associated accessories and parts for proper functioning	
Chamber A Pass chamber	
Chamber B Cool Down chamber	
Chamber 1 Ti (SIP TTN) with its cryo pump, cryo compressor, 2 process kits (1No for installation and 1 no for standby), Target, MFC and all the other associated accessories and parts for proper functioning.	

Chamber 2 (TTN DURASOURCE TTN) with its cryo pump, cryo compressor, 2 process kits (1No for installation and 1 no for standby), Target, MFC and all the other associated accessories and parts for proper functioning	
Chamber 3 (TTN DURASOURCE TTN) with its cryo pump, cryo compressor, 2 process kits (1No for installation and 1 no for standby), Target, MFC and all the other associated accessories and parts for proper functioning	
Chamber 4 Aluminum (AL A TYPE)) with its cryo pump, cryo compressor, 2 process kits (1No for installation and 1 no for standby), Target, MFC and all the other associated accessories and parts for proper functioning	
Chamber C Preclean II	
Chamber D Cobalt A type) with its cryo pump, cryo compressor, 2 process kits (1No for installation and 1 no for standby), Target, MFC and all the other associated accessories and parts for proper functioning	
Chamber E Orienter	
Chamber F Orienter	
• Modules • Slit Valve Bellows • Power Supply • Cryo Pumps • Cryo Compressor • Turbo Pump • Heat Exchanger • MFC • Gate Valve • Control Panel	

IV. Equipment Requirements

A. Transport

Definition: Test of handling system.

Method: 200 wafers to perform entire transfer cycle.

Requirements: No failures, alarms, warnings or human intervention, except

for cassette loading during 200 wafers cycles.

Result: __________**PASS / FAIL**

B. Particles

Definition: - "CP": Contaminating Particles, refer to amount of particles > 0.2um added to 8" bare Si wafer as measured using calibrated KLA Surfscan SP1 TBI or equivalent. Measurements will be performed using SCL standard CP tests.

Method: Measure Cp on wafer before run, than insert 1 wafer to the chamber w/o deposition, measure after and calculate the Delta (added CP).

C. Tool Test

a) Basic Functionality Test

Test parameter Utility Service verification	**Compliance Condition All connected utilities comply with tool facilities requirements**	**Check**
System power up	Main tool and all peripheral components power up properly	
Operator Interface	Operations console functions correctly, software interface and recipe commands load properly	

b) EMO verification:

EMO location	**Compliance Condition**	**Check**
Operator Console	EMO Button shutdown of connected components	
Mainframe	EMO Button shutdown of connected components	
Mainframe	EMO Button shutdown of connected components	
System Controller	EMO Button shutdown of connected components	
Main AC	EMO Button shutdown of connected components	

c) Vacuum integrity:

Chamber		**Allowable ROR**	**Measured ROR**	**Check**
Position	**Type**			
Load lock	Load lock	6.0E-5		

Chamber 1	Process	1.0E-6		
Chamber 2	Process	1.0E-6		
Chamber 3	Process	1.0E-6		
Chamber 4	Process	1.0E-6		
Chamber 5	Process	1.0E-6		
Chamber C	Process	1.0E-6		
Chamber D	Process	1.0E-6		
Transfer	Pass through	6.0E-5		
Buffer	Pass through	6.0E-5		

V. Requirements

For All Process chambers (with Degas): Mechanical CP (delta) - Less than 20 particles per wafer. Use Bare Si wafer.

Recipe: At KLA Surfscan SP1 TBI: SCL / AMAT BKM for particle check or SCL production recipe

Chamber (position)	**Chamber Description**	**Transport CP Value**	**Result Pass/Fail**
Chamber 1			
Chamber 2			
Chamber 3			
Chamber 4			
Chamber 5			
Chamber C			
Chamber D			

VI. Base Pressure and Leak Rate

Definition: Base pressure is the final pressure achieved in the chamber/load lock when using maximum pumping force and no gases flow. Leak rate is the pressure raise from base pressure divided by time. Leak rate will be measured on a clean chamber.

Method: SCL procedures will be used.

Requirements:

VII. Vacuum Integrity Check:

	BASE PRESSURE (Torr)		Rate of rise (Torr/sec)		Pump Down speed (Torr/sec)		HE leak check	
CHAMBER	**SPEC**	**ACTUAL**	**SPEC**	**ACTUAL**	**SPEC**	**ACTUAL**	**SPEC**	**ACTUAL**
LLA			5mTorr/min		N/A		NO LEAK	
LLB			5mTorr/min		N/A		NO LEAK	
TRANSFER	5.00E-08		3.30E-06		N/A		NO LEAK	
BUFFER	5.00E-07		3.30E-06		N/A		NO LEAK	
TTN	1.00E-08		8.33E-08		N/A		NO LEAK	
TTN	1.00E-08		8.33E-08		N/A		NO LEAK	
AL	1.00E-08		8.33E-08		N/A		NO LEAK	
Co	1.00E-08		8.33E-08		N/A		NO LEAK	
PC	5.00E-07		8.33E-08		N/A		NO LEAK	
SIP Ch	5.00E-08		8.33E-08		N/A		NO LEAK	

VIII. Gas Line Vacuum Check

Item				SET-UP Result	Remark
		DETAILS			
		SPEC	ACTUAL		
CH:1	P-Ar	3.0E-7 TORR			
CH:2	P-Ar	3.0E-7 TORR			
CH:3	P-Ar	3.0E-7 TORR			

CH:4	P-Ar	3.0E-7 TORR			
CH:5	P-Ar	3.0E-7 TORR			
CH:C	P-Ar	3.0E-7 TORR			
CH:D	P-Ar	3.0E-7 TORR			
Vent	P-Ar	7.0E-7 TORR			

IX. MFC

Definition: Difference between set point and actual flow rate.

Requirements: All MFCs should have a deviation of < ±5% in full scale.

MFC Flow test – RF Etch Chamber

A. MFC FLOW TEST

Ar Heater, Ar Process and N2 process MFC's

SECTION	DETAILS		SET-UP	Remark
	ITEM	ACTUAL		
PVD CHAMBER 1-5 & DF P-AR (100SCCM)	20 Sccm			
	40 Sccm			
	60 Sccm			
	80 Sccm			
	100 Sccm			
	120 Sccm			
	140 Sccm			
	160 Sccm			
	180 Sccm			
	200 Sccm			

Section	DETAILS		SET-UP Result	Remark
	ITEM	ACTUAL		
RF Etch Chamber	20 Sccm			
	40 Sccm			
	60 Sccm			
	80 Sccm			

RF ETCH CH#C P-AR (50SCCM)	100 Sccm			
	120 Sccm			
	140 Sccm			
	160 Sccm			
	180 Sccm			
	200 Sccm			

B. Chamber Power Check

Section	DETAILS			SET-UP Result	Remark
	FIRST/SECOND	FIRST (FWD/REF)	SECOND (FWD/REF)		
CHAMBER C (RF ETCH) RF Generator	100W / 50 W				
	200W /150W				
	300W / 150W				
	400W / 150W				
	400W / 200W				
	500W / 200W				
	500W / 300W				
	600W / 300W				

Section	DETAILS		Refer (V/A)	SET-UP Result	Remark
	ITEM	ACTUAL			
CHAMBER 1	1000W				
	1500W				
	2000W				
	2500W				
CHAMBER 2	1000W				
	1500W				
	2000W				
	2500W				
CHAMBER 3	1000W				
	1500W				
	2000W				
	2500W				
CHAMBER 4	1000W				
	1500W				

	2000W				
	2500W				
CHAMBER 5	1000W				
	1500W				
	2000W				
	2500W				
CHAMBER D	1000W				
	1500W				
	2000W				
	2500W				

C. Heater Temp Check

SECTION	DETAILS		SET-UP Result	REMARK
	Set point	ACTUAL		
PVD CHAMBER 1	200°C	200		
PVD CHAMBER 2				
PVD CHAMBER 3				
PVD CHAMBER 4				
PVD CHAMBER 5				
PVD CHAMBER D				

X. Process Tests

Definition: Dep. Rate, Deposition layer as function of time.

Method: All measurement according SCL Procedures.

Requirements: The system must have the required Specification.

Process	Test	Measurement recipe name	Result	Check
AL	CP<30, bin size>0.2um (added) D/R : Vendor to specify RS: 79-84 mohms/sq RS 1 sigma<3% Thickness:360-375 nm	Surfscan SP1 TBI: Pre: Z_YTS_BM_PreOx500 Post: Z_YTS_BM_AlCu1000 RS-100: Metal 9 EE=5mm no align XRF: Recipe Al-Cu XRA		

Process	Test	Measurement recipe name	Result	Check
SIP Ti	CP<30, bin size>0.2um (added) D/R: Vendor to specify RS: 23.3-29.7 ohms/sq RS 1 sigma<7 Thickness:28-32 nm	RS-100: Metal 9 points EE=3mm XRF: Recipe Ti-XRA Surfscan SP1 TBI: Pre:Z_YTS_BM_PreOx500 Post: Z_YTS_BM_TiT iN200		
TTN 1 TiN	CP<30, bin size>0.2um (added) D/R: Vendor to specify RS: 38-43 ohms/sq RS 1 sigma<9 Thickness:28.5-31 nm	RS-100: Metal 9 points EE=3mm XRF: Recipe TiN- XRA1, Surfscan SP1 TBI: Pre:Z_YTS_BM_P reOx500 Post: Z_YTS_BM_TiT iN200		
TTN 2 Ti	CP<30, bin size>0.2um (added) D/R: Vendor to specify RS: 19.3-23.2 ohms/sq RS 1 sigma<10 Thickness:32-36 nm	Surfscan SP1 TBI: Pre:Z_YTS_BM_P reOx500 Post: Z_YTS_BM_TiT iN200 Rs-100: Metal 9 points EE=5mm XRF: Recipe Ti-XRA		

Process	Test	Measurement recipe name	Result	Check
TTN 2 TiN	CP<30, bin size>0.2um (added) D/R: Vendor to specify RS: 50-57 ohms/sq RS 1 sigma<8 Thickness:29.5-31 nm	Surfscan SP1 TBI: Pre:Z_YTS_BM_Pre Ox500 Post:Z_YTS_BM_TiT iN200 Rs-100: Metal 9 points EE=5mm XRF: Recipe TiN-XRA1		
Cobalt	CP<30, bin size>0.2um (added) RS(10nm): 16-23 ohms/sq RS std dev(10nm)<7	Surfscan SP1 TBI : Pre: Z_YTS_BM_PreOx500 Post:Z_YTS_BM_Cobalt RS-100: Metal 9 points EE=5mm XRF: Recipe Co-XRA		
Pre clean II	CP<30, bin size>0.2um (added) PC etch: 35-45A PC etch Unif<5%	Surfscan SP1 TBI: Pre Z_:M_METALS_R F_PRE Post:Z_M_METALS_R F_POST Opti-probe: TF-CVD\ TEOS\ TOX9P6MM		

XI. Acceptance Approval:

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 5. Asher

I. Scope

This section of document (*Annexure F : Equipment Acceptance Procedure*: Equipment 5) outlines the procedures and criteria used by Semi-Conductor Laboratory (SCL) for acceptance of 8” MATTSON ASPEN ASHER with 02 chamber configuration (ICP and DIODE respectively), including equipment and process requirements. It also defines the technical acceptance.

II. Equipment requirements

A. Transport

Definition: Test of handling system.

Method: 200 wafers to perform entire transfer cycle with Recipe ‘Equipment baseline recipe with RF on’.

Requirements: No failures, alarms, warnings or human intervention, except for cassette loading/unloading during 200 wafers cycles.

Result: _________PASS / FAIL

B. Recipes

Vendor to provide equipment BKM recipes for (a) Chamber seasoning based on the process to be performed in the chamber (b) Etch rate & etch rate monitoring QC recipes for the respective chamber (c) CP check recipes for the both chambers (d) recipe for checking metal contamination check

C. Particles

Definition: - "CP”: Contaminating Particles, refer to amount of particles added (≥0.16um for ICP chamber & ≥0.2um for Diode chamber) to 8" bare Si wafer/ NOX1000Å measured using calibrated KLA Surf Scan SP1 TBI

Method: Measure Cp on wafer before run, than run 1 wafer in each chamber and measure Cp after running and calculate the Delta (added CP) in both the chambers

Delta CP= Post CP- Pre CP

Requirements: CP (Added) - **Less than 50 particles (≥0.16um) for ICP chamber and Less than 30 particles (≥0.2um) for Diode chamber** per wafer.

Recipe: Vendor to provide tool BKM recipe (with plasma on recipe) & demonstrate the results

Result: _________PASS / FAIL

III. Tool Test

A. Basic functionality check:

#	Test Parameter	Description	CHECK	REMARK
1	Utility Service verification	All connected utilities comply with tool facilities requirements		
2	System Power UP	Main tool and all Peripheral components Power Up Properly		
3	Operator Interface	Operator Console functions correctly, S/W Interface and recipe load properly		

B. EMO Verification

Vendor to demonstrate the functionality of all the EMO's installed on the main equipment and sub systems of the equipment.

C. Vacuum integrity

Base pressure & Leak rate check (all chambers and Load locks) with and without gas lines open

Chamber	Requirement (mT/min)	Result (mT/min)	Remarks (Pass/Fail)
Load lock	<20		
Transfer/Buffer Chamber	<20		
Process chamber#1	<20		

Process chamber#2	<20		

D. **MFC calibration**

In both chambers, all MFC's (O_2, N_2, CF_4) should have flow variation not greater than the 5% of the set value (10%, 25%, 50%, 75% and 90% of MFC Max. flow)

Result: _________PASS / FAIL

E. **RF Power verification (Both Diode and ICP Chambers)-**

Perform RF power verification at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% of Max Generator Power. Delivered power will be within 10% of all set values.

Result: _________PASS / FAIL

F. **Heat exchanger Temperature Stabilization**

(a) **Method-** Check Temperature Stabilization on screen for all heat exchangers Requirement- Set point ± 5°C

Result: _________PASS / FAIL

G. **Ground fault current interrupt check**

Result: _________PASS / FAIL

H. **Water leak alarm and smoke detector (If installed) test**

Result: _________PASS / FAIL

I. **Equipment interlock (all) check**

Vendor to demonstrate the functionality of all interlocks on the equipment.

Result: _________PASS / FAIL

IV. Process requirements

1. Diode Source

Parameter	Etch rate	Uniformity	Result	Remark
Mean Ash Rate (Diode)	38000 Ǻ/min or more	≤20%		

2. ICP Source

Parameter	Etch rate	Uniformity	Result	Remark
Mean Ash Rate (ICP)	11000 Ǻ/min or more	≤5.5%		

% uniformity = (max Ash rate –min ash rate)/(max Ash rate + min ash rate)*100

3. High dose implant strip (HDIS) test

Test will require wafers with 30,000 Å photo resist (PAD PR BE/FE).

The formula for calculating uniformity:

Uniformity =(max-min)/(max+min)*100

Film characteristics	Within wafer	Result	Remark
Mean Ash Rate	14400+/-1200 Å/min		

A. High dose implant strip (HDIS) test

Test will require wafers with high dose implant (a) $5.14E^{15}$ ions/cm^2,As75, 65KeV (b) $5E^{15}$ ions/cm^2 , B11, 7KeV

Perform cleaning in wet Etch and SEM SRS review for any residues present

Requirement: No residue/few residues as per SCL baseline process.

Result: __________ **PASS / FAIL**

V. Acceptance Approval

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 6. Dielectric Etcher Equipment acceptance

I. Scope

This section of document (*Annexure F : Equipment Acceptance Procedure*: Equipment 6) outlines the procedure and criteria used by SCL for acceptance of Dielectric etcher.

Configuration Check: (a) 04 no's of process chambers (b) Vacuum pumps for all process chambers, transfer chamber and load locks (c) SMIF loaders (d) chillers for all four chambers (e) controller (f) MFC's (g) Equipment maintenance terminal (h) Endpoint system & algorithm for spacer etch chamber etc.

II. Equipment requirements:

A. Transport:

(a) Definition-Test of Handling

(b) Method- 200 wafers to perform entire transfer cycle. The procedure will be with 10sec plasma for each wafer individually in all the four chambers & using both SMIF loaders.

(c) Requirement- No failure, alarms, warnings or human intervention except for cassette loading and un-loading during 200wafers cycle.

Result: __________PASS/FAIL

B. Recipes:

Vendor to provide equipment BKM recipes for (a) Chamber seasoning based on the process to be performed in the chamber (b) Etch rate & etch rate monitoring QC recipes for the respective chamber (c) CP check recipes for the respective chamber based on the process to be performed in the chamber (d) recipe for checking metal contamination check

C. Particles

(a) **Definition-** 'CP' contaminating particles refers to the amount of particles added to the 8" bare Silicon wafer as measured using KLA Surfscan SP1 TBI.

(b) **Method-** Measure CP on Bare Silicon wafer before run, then run the same wafer in the equipment using equipment BKM recipe (with plasma on) and measure the CP after running. Calculate the Delta CP (Added CP) in each chamber respectively.

Delta CP= Post CP- Pre CP

(c) **Requirement-** Delta CP Less than (a) Chamber #1 less than 50 particles (≥0.16μm) (b) Chamber #2 less than 30 particles (≥0.16μm) (c) Chamber #3 less than 40 particles (≥0.2μm) (d) Chamber #4 less than 50 particles (≥0.16μm)

(d) Vendor to provide tool BKM recipe & demonstrate the results

Result: Delta CP Chamber1 =.......... (PASS/FAIL), Delta CP Chamber2 =.......... (PASS/FAIL), Delta CP Chamber3 =.......... (PASS/FAIL), Delta CP Chamber4 =.......... (PASS/FAIL)

D. Equipment Test

(a) **Process gas MFC verification**- In all the four chambers, all MFC's should have flow variation not greater than the 5% of the set value (10%, 50% and 90% of MFC Max. flow)

Result:_________ PASS/FAIL

(b) **RF Power verification (All Chamber)** - Perform RF power verification at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% of Max Generator Power. Delivered power will be within 10% of all set values.

Result: ___________PASS/FAIL

Leak rate check (All chambers and Load locks) with and without gas lines open

Chamber	Requirement (mT/min)	Result (mT/min)	Remarks (Pass/Fail)

Load lock	<15		
Transfer/Buffer Chamber	<10		
Process chamber	<1		

E. Heat exchanger Temperature Stabilization

(a) **Method**- Check Temperature Stabilization on screen for all heat exchangers

(b) **Requirement**- Set point ± 1^0C

Result: ___________PASS/FAIL

F. EMO check

(a) **Method**- Check functionality of all the EMO's installed on the main equipment and sub systems of the equipment.

Result: ___________PASS/FAIL

G. Ground fault current interrupt check

Result: ___________PASS/FAIL

H. Water leak alarm and smoke detector (If installed) test

Result: ___________PASS/FAIL

I. Equipment interlock (all) check

Result: ___________PASS/FAIL

III. Process Requirement

Etch rate & etch rate uniformity (%) requirements:

Chamber	Process	Type of wafer	Avg. Etch rate requirements (Ǻ/Min)	Etch rate uniformity (%)
Chamber #1	Spacer etch	Si3N4 2800 (unpatterned wafer)	700 or more	<10

Chamber #2	Reverse active area etch	TEOS 7K (patterned wafer)	3300 or more	<5
Chamber #3	Passivation etch	(a) TEOS 7K (patterned wafer) (b) Si3N4 2800 (patterned wafer)	(a) 5500 or more (b) 7000 or more	<5
Chamber #4	BARC etch	BARC 1800 (unpatterned wafer)	2000 or more	<5

Chamber	**Process**	**Etch rate (Å/Min)**	**Etch rate uniformity (%)**	**Results (Pass/Fail)**
Chamber 1				
Chamber 2				
Chamber 3				
Chamber 4				

Unit Process Acceptance-

1. Chamber 1 acceptance:

(a) Unit step description- Spacer etch

(b) Layers to be etched- Silicon Nitride 770A0 on TEOS

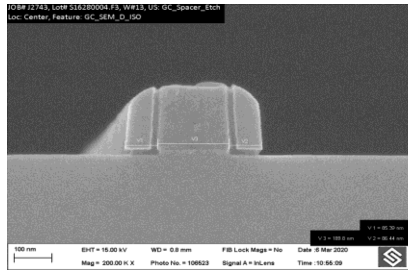
(c) Unit step success criteria-

Parameter	**Method**	**Success Criteria**
CP Test	KLA (CPX) inspection (≥0.16μm)	<50
Spacer nitride Endpoint	Equipment EPD	Well defined EP trace
Selectivity	Etch rate SiN /Etch rate TEOS	>3
TEOS ER Uniformity	Optiprobe (Max-Min)/(Max+Min)*100	<10%
SiN ER Uniformity	Optiprobe (Max-Min)/(Max+Min)*100	<10%
ROX (Remaining Oxide after spacer etch)	Optiprobe	130-185Å
ROX Uniformity	Optiprobe	<10%
Metal contamination	ICPMS	–Fe, Ni, Cu, Na, and Al < 10^{13} cm^{-3}

SEM X-sec:

a. No footing, no undercut

b. Profile



FICD Mean	79.4nm
FICD 3 sigma	5.5nm

2. Chamber 2 acceptance:

(a) Unit step description- Reverse active area etch

(b) Layer Stack to be etched- BARC 750A/ oxide 6100A+ penetration to SiN

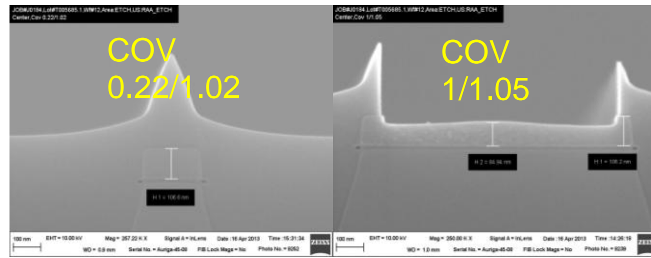
(c) Design rule structure – 0.22/0.56 line/space (micron)

(d) Unit step success criteria-

Parameter	Method	QC/Product	Success Criteria
Particles	KLA (CPX) inspection (≥0.16µm)	QC	<30
ARC ER	Optiprobe	QC	2900A^{0}/min or more
ARC ER Non-Uniformity	Optiprobe: (max-min)*100/(max+min)	QC	<7%
TEOS ER	Optiprobe	QC	3300A^{0}/min or more
TEOS ER Non-Uniformity	Optiprobe: (max-min)*100/(max+min)	QC	<7%
Remaining PR (wafer centre and edge)*	XSEM	Product/SLE	>1000Å
Remaining SiN*	Optiprobe/XSEM	Product/SLE	850-1050Å
RAA FI CDs (ISO Space)	CD SEM	Product/SLE	250 ± 25nm
RAA FI CDs (ISO Space) - 3σ	CD SEM	Product/SLE	<30nm
Metal Contamination	ICPMS	QC	Fe, Ni, Cu, Na and Al $<10^{13}cm^{-3}$

*Structures to be included are COV 0.22/1.02 (No RAA region), COV 0.51/1.02, COV 0.51/2, COV 1/4.4, COV 1/1.05, COV 10/2 (center & edge of wafer)

Reference profile –



3. Chamber 3 acceptance:

(a) Unit step description- Passivation etch

(b) Layer Stack to be etched- Silicon Nitride 3000Å /USG 10000Å /TiN600Å

(c) Design rule structure – 55*55/7 line/space (micron)

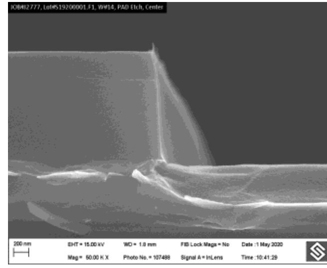
(d) Unit step success criteria-

Parameter	Method	Success Criteria
CP Test	KLA (CPX) inspection (≥0.2µm)	<40
TEOS ER	Optiprobe	5500 (Å/Min)or more
TEOS ER Uniformity	Optiprobe (Max-Min)/(Max+Min)*100	<10%
SiN ER	Optiprobe	7000 (Å/Min)or more
SiN ER Uniformity	Optiprobe (Max-Min)/(Max+Min)*100	<10%
Remaining PR (PR budget) Remaining PR (PR budget) (a) Abve ML on pad (b) Not above ML near pad (c) Above wide metal lines (d) Above iso metal lines	X-SEM	>1000Å
TV shape	X-SEM	well defined pads
Reflectance on pad	Optiprobe	>2
Metal contamination *	ICPMS	–Fe, Ni, Cu, Na, and Al < 10^{13} cm^{-3}

SEM X-sec:

a. Well defined pads at center as well as on wafer edge

b. Reference profile (wafer center and wafer edge) -



4. Chamber 4:

(a) Unit step description- BARC etch

(b) Layer to be etched- BARC 650Å over Metal stack (TiN/Ti/Al-Cu/TiN/Ti)

(c) Design rule structure – 0.23/0.23 line/space (micron)

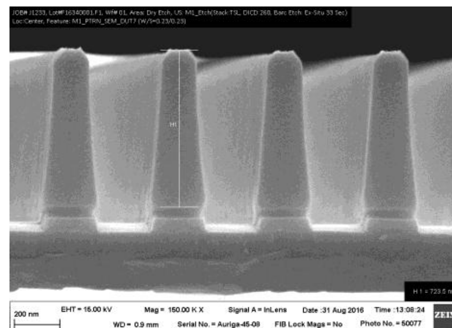
(d) Unit step success criteria-

Parameter	Method	QC/SLE	Success Criteria
Particles	KLA (CPX) inspection (≥0.16µm)	QC	<50
BARC ER	Optiprobe	QC	Vendor to provide
BARC ER Non-Uniformity	Optiprobe: (max-min)*100/(max+min)	QC	<5%
TiN penetration	X-SEM	SLE	No or minimum penetration
Metal Contamination	ICPMS	QC	Fe, Ni, Cu, Na and Al $<10^{13}cm^{-3}$

Reference X SEM profile –

BARC etch

Uniform profile at centre as well as on wafer edge, No BARC residue in field regions & narrow space between lines



IV. Acceptance Approval

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 7. Acceptance Procedure for DV24

I. Scope

This section of document (*Annexure F : Equipment Acceptance Procedure*: *Equipment 7*) outlines the procedures and criteria used by SCL for acceptance of DVI / DV24, including equipment and process requirements. It is also defines the technical acceptance.

Tool will be accepted on the basis of process requirement / test procedures as mentioned in this document. Vendor has to provide baseline process (BKM). Typical values mentioned in the table are indicative.

II. Configuration check:

Vendor to provide configuration document with quotation and equipment check will be done, on site, at the time of acceptance as per configuration document. General / basic configuration is as follows: minimum 4chamber -2 in each side, separate chemical tank for each side, Chemical Blend Module,

Result:

1. **Wafer Handling and Transport**:

Vendor has to demonstrate the wafer handler capabilities by running 200 Semi-Standard Silicon wafers (with no process condition) for each wafer handler. The handler shall be able to run 200 wafers without any failures, alarms, warnings or human intervention, except for cassette loading during 200 wafers cycles. Equipment should capable to handle wafer picking and placement from SMIF automatically.

Result: ____________Pass / Fail

III. Process Requirement

The tool shall maintain the following etch rate uniformity across the wafer, wafer to wafer.

S. No.	**Etch Rate Check** (Recipe need to provided by vendor – Process Dry-in & Dry-out)	**Wafer Type**	**Success criteria** (three times for repeatability)
1.	Etch rate check on vendor BKM recipe with chemical	NOX 500	Vendor to provide ER data
2	Uniformity check on vendor BKM recipe with chemical	NOX 500	Base line recipe to be provided by vendor with non-uniformity 5% or better
3	Post Metal etch Polymer cleaning Vendor to provide Recipe	Pattern wafer (M1, Mi, ML)	1. No polymer leftover 2. No damage to backend of line layers – Al, Ti, TiN, All backend Oxide and Nitride layers.
4	Post Via, MiM,	Pattern wafer (V1, Vx, VL, MiM)	1. No polymer leftover 2. No damage to backend of line layers – Al, Ti, TiN, All backend Oxide and Nitride layers.

S. No.	Uniformity Check	Uniformity
1.	Across the wafer	>95%
2.	Wafer to wafer in single run repeatability with 3 wafers	>95%
3.	Run to Run repeatability for 3 Runs and 3 wafers in each Run	>95%

Result: __________Pass / Fail

CP (Contaminating Particle) Test:

"CP" Contaminating Particles refer to amount of particles > 0.16um added to Bare Si test wafer as measured using KLA SP1 TBI or equivalent.

S. No.	**CP Check** (three times for repeatability)	**Wafer Type**	**Specs for added particles after process**
1	Vendor BKM recipe with chemical	NOX500 / Bare Si	< 50 nos @ 0.16 μm
2	Repeatability three times	NOX500 / Bare Si	< 50 nos @ 0.16 μm

Result: __________Pass / Fail

Metal Contamination Check

S. No.	Metal contamination check (one time)	Wafer Type	Specs after processing the wafer
1.	Vendor BKM recipe with chemical	NOX500 / Bare Si	Al, Cr, Ni, Mg, Fe, Na, Cu < 5 E10 atoms/cm2

Result: ___________Pass / Fail

Tool Test

The tool shall clear the following checks

- Actuation of all the moving parts like robot, lifter shutter, carrier, conveyer & SMIF etc. as applicable.
- Actuation of all kind of valves and regulators like Solenoid valve, N2 valve, Di valve, PCW, regulator etc.
- All Chemical Bath Operations with DI and chemical in both manual and auto mode.
- Chemical Mixing ratio control verification and calibration as applicable.
- All sensors activation and feedback verification.
- Exhaust verification.
- Body and frame integrity verification.
- EMO function verification.
- All FFU verification.
- Power line verification.
- Detailed leak check verification.

Result:____________ Pass / Fail

Utility Test

S. No	Item	Check	Specification
1.	All Valves and Regulator	N_2, Air Leak	No Leak
		DI Leak	No Leak
		Chemical Leak	No Leak
		regulator	No Leak and regulator OK

2.	Exhaust		Normal (As per specifications)
3	Frame and Covering		Intact and no disrepute

Result:___________ Pass / Fail

NOTE:

1. Wafer Type:
    a. Bare Si: New P Type test wafer, particle < 50@ 0.16 μm
    b. NOX 500: 500 Å Silicon oxide wafer on Si
    c. Pattern wafer Metal, Via and MIM levels
2. Vendor has to supply all best known and process recipes.

IV. Acceptance Approval

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Equipment 8. Acceptance Procedure for Zeta Viper

I. Scope

This section of document (*Annexure F : Equipment Acceptance Procedure*: Equipment 8) outlines the procedures and criteria used by SCL for acceptance of Zeta Viper, including equipment and process requirements. It also defines technical acceptance.

Tool will be accepted on the basis of process requirement /test procedures as mentioned in this document. Vendor has to provide baseline process (BKM). Typical values mentioned in the table are indicative.

II. Configuration check

Vendor to provide configuration document with quotation and equipment check will be done, on site, at the time of acceptance as per configuration document.

Result:

Wafer Handling and Transport:

Vendor has to demonstrate the wafer handler capabilities by running 200 Semi-Standard Silicon wafers (with no process condition) for each wafer handler. The handler shall be able to run 200 wafers without any failures, alarms, warnings or human intervention, except for cassette loading during 200 wafers cycles. Equipment should capable to handle wafer picking and placement from SMIF automatically.

Result: ____________Pass / Fail

Process Requirement: The tool shall maintain the following etch rate uniformity across the wafer, wafer to wafer (in a single run), and run to run. All measurement according to SCL procedures.

S. No.	Etch Rate Check (Recipe to developed or provided by vendor – Process Dry-in & Dry-out and complete sequence need to provide by vendor which include DIW step etc.)	Wafer Type	Specs for Etch Rate (three times for repeatability)
1.	SPM+SC1+ Dry	NOX 500	Typically - 1 to 5 Å with SPM time 10min and SC1 time 300 Sec Or Similar process result with vendor recipe
2.	HF (1:200) + SC2 + Dry	NOX 1700	SCL layer consumption is 50 Å +/- 3Å Base line recipe to be provided by vendor to meet SCL baseline
3	HF (1:200) + SC1 + SC2+Dry	NOX 1700	Base line recipe to be provided by vendor
4	SPM+SC1+Dry	Pattern wafer (XP/XN implanted and WN implanted)	1. No PR leftovers. 2. No PR residue leftover. 3. No damage to exposed layer. 4. No wafer edge damage
5	HF (1:200) +SC2+Dry 1. Recipe need for layer consumption with SC2 clean (25Å, 50 Å, 100 Å, 125 Å, 200 Å). 2. Active Area etch wafer clean	1. Blanket wafer check. 2. Pattern wafer check (AA etch wafer)	1. Should meet uniformity specs. 2. - No residue in Post AA etch clean wafers with 25 Å recipe. 3. - No wafer edge damage

S. No.	Etch Rate Check	Uniformity
1.	Across the wafer	>94%
2.	Wafer to wafer in single run with 12 wafers distributed in 4 cassettes i.e. 3 wfs/cassette at slot 1, 12 and 25	>94%
3.	Repeatability of S.No. 2. three times	>94%

Result: ____________Pass / Fail

CP (Contaminating Particle) Test:

"CP": Contaminating Particles refer to amount of particles > 0.16um added to Bare Si test wafer as measured using KLA SP1 TBI or equivalent.

S. No.	CP Check (three times for repeatability)	Wafer Type	Specs for added particles
1.	SPM+ SC1+ Dry	Bare Si	< 30 nos @ 0.16 µm
2.	HF (1:200) + SC2 + Dry	Bare Si	< 50 nos @ 0.16 µm

Result: ___________Pass / Fail

Metal Contamination Check:

<table>
<tr><th>S. No.</th><th>Metal contamination check
(one time)</th><th>Wafer Type</th><th>Specs</th></tr>
<tr><td>1.</td><td>SPM+SC1+ Dry</td><td>Bare Si</td><td rowspan="2">Al, Cr, Ni, Mg, Fe, Na, Cu < 5 E10 atoms/cm^2</td></tr>
<tr><td>2.</td><td>HF (1:200) + SC2 + Dry</td><td>Bare Si</td></tr>
</table>

Result:___________ Pass / Fail

Tool Test:

The tool shall clear the following checks

- Actuation of all the moving parts like robot, lifter shutter, carrier, conveyer & SMIF etc. as applicable
    - Actuation of all kind of valves and regulators like Solenoid valve, N2 valve, Di valve, PCW, regulator etc.
    - All Chemical Bath Operations with DI and chemical in both manual and auto mode.
    - Chemical Mixing ratio control verification and calibration.
    - All sensors activation and feedback verification.
    - Exhaust verification.
    - Body and frame integrity verification.
    - EMO function verification.
    - All FFU verification.
    - Power line verification.

- Detailed leak check verification.

Utility Test

S. N	Item	Check	Specification
1.	All Valves and Regulator	N_2, Air Leak	No Leak
		DI Leak	No Leak
		Chemical Leak	No Leak
		Sink Leak	No Leak
		regulator	No Leak and regulator OK
2.	Exhaust		Normal (As per specifications)
3	Frame and Covering		Intact and no disrepute

Note:

1. Wafer Type
    a. Bare Si: New P Type test wafer, particle < 50@ 0.16 µm
    b. NOX 500: 500 Å Silicon oxide wafer on Si
    c. NOX 1700: 1700 Å Silicon oxide wafer on Si
    d. Pattern wafer XP/XN and Active Area levels
2. Vendor has to supply all best known recipes.

III. Acceptance Approval:

The acceptance document should be fully signed to approve tool Acceptance.

Title	Date	Name	Signature
Vendor representative			
SCL representative			
Final approval authority			

Annexure G : MES Specification

1. Basic Manufacturing Execution System- MES

MES should be a customizable module based software system that is supposed to help in achieving and maintaining paperless fab operations by allowing engineers to run lot as per predefined process flow in software, incorporate run time changes in lot flow in software, collect, correlate, analyze and share critical data including defect, inline parametric, inline, review, and WIP tracking. Scheduling of lots, Maintaining QC & Maintenance records and back trace the same to timeline of Lots running in fab.

MES has to support end to end (Design, Fab, Electrical Testing, SORT, RNQA and Package & Assembly) process flow, tracking and tracing.

MES should be having a user friendly GUI for modelling the process, making any run time changes, incorporating splits & joins, incorporating and tracking reworks etc.

It should have Open Database supporting Structures Query Language (SQL) so that user can create his own queries and fetch the data in user required format from one or more tables from database.

1. FAB Modeling

Ability to define:

- Location definition: FAB, ET, SORT, Assembly, Work Area, WIP location, Stocker etc.
- Work Area definition: Litho, Diffu, Dry Etch, Wet etch, thin Film, Implant etc.
- Equipment Modeling: provide 3 Level definition, include: Main EQP, Chamber/Load port, sub chamber etc.

- Stocker definition: Carrier Stocker, Reticle Stocker etc.
- EQP State definition (according to the standard E10 status): provides transition rules between EQP states
- Reason Code definition: Hold, Release, Scrap, Terminate
- Carrier types: SMIF Pods etc.
- Durable material type: Reticle, Probe Card etc.
- Material Type: Photo Resist, slurry, chemicals, gases etc.
- Product definition: Production wafers, Non production wafers (monitor, seasoning, dummy), Engineering wafers, Test Wafers etc.
- Specify product and process (Technology) association
- Process flow of the specified product in production
- Raw material code (raw wafer product) correspondence that can be used when wafer start
- Raw material code (raw wafer product) information includes vendor and vendor qualification status management
- Configure Flow Spec according to Product+ Sub Plan+ Step (Recipe, Reticle, EDC Plan, Process Location, etc.). Spec settings shall be maintained by using either "fixed value" or “variable" ($parameter) "
- Configure "parameter" according to the product. This shall be done through a variable conversion mechanism. Capability to adjust the "value" that the flow spec uses in the lot runtime
- Lots classification into different types; e.g., production, dummy, monitor, engineering etc.
- Process flow definition:
  - Process Flow level, include: Top Plan, Sub Plan, Path, Step
  - Process Flow type, include: Production, NPW, Rework, Ad hoc Plan
- Step Type definition: Process, Measurement, YE Step, Dummy, Inspection
- Adjust manufacturing resources of a process flow according to the product:

- Limit the running EQP by the previous step processed EQP
- Limit the running Recipe by the previous step processed EQP
- Limit the running EDC Plan by the previous step processed EQP
- Determine which path to go after step post rule by the Product parameter
- Determine which Recipe to use by the previous step's lot measurement result
- Determine which path to go after step post rule by the previous step's lot measurement result"

- EQP Type :
    - Support the management of all equipment required by the fab. The equipment can include process EQP, measurement EQP, load port, storage EQP, test EQP, OHB, NTB, Reticle storage EQP, Reticle inspection EQP, sorter, N2 purge, and other related EQPs
    - In addition to the general EQP, the definition of Main EQP shall also be able to meet the needs of some specific EQPs, such as non-buffer EQP / internal buffer EQP (furnace, WET, etc.), inline EQP (the combination of litho's Scanner + track, process + Metrology), sorter, etc.
    - The definition of Child EQP also needs to support different types such as chamber, furnace, slot, etc.
    - Support multi-level structure of EQP, including Main EQP, Sub EQP(Chamber/Tank/Port), Sub Chamber
    - Equipment properties, include: type, state, contamination level, area, owner, construct type, process type
- EQP State :
    - Ability to define Auto1, Auto2, Auto3 by Load port
    - Support the state management of process EQP (including child EQP)

- Support E10 main state defined by SEMI standard and provide sub-state
- Provide EQP state change diagram and corresponding events
- EQP state will be changed according to the preset state diagram in runtime
- The EQP state can be automatically changed by an event or manually switched from the IUI
- The manual switch of EQP state shall be user-restricted access and it shall be changed according to the EQP state change diagram
- The user can define the available status of EQP / chamber by EQP state
- Support status change at the same time to the same EQP's multiple chambers
- EQP state can be related to Chamber's state. EQP state changes to down if the key chamber is down

o EQP Capability:
  - Provide EQP capacity management
  - Provide EQP capability management
  - Provide equipment batch size management
  - EQP internal buffer capacity management

o Engineering Data Collection definition：
  - Data Collection shall include process information (Lot ID, Process EQP/Chamber, Process Recipe/PPID), test data
  - Data Collection shall provide Manual and auto-collect mode
  - Data Collection items shall support Lot, Wafer, Site level configuration
  - DC Item data type shall include float/integer/string, etc.
  - Support EDC Spec configuration, support SPC configuration

o Version update：
  - Version control includes Product, process flow, step etc.

- Version control shall support Active version configuration; each Object can only have one Active version. The engineer can specify the active version from the multiple versions
- Version number will automatically increase when updating the next version
- When Active new version Flow, it will not take effect on the lots original version
- Ability to version up manually by selecting multiple lots according to the lot list; Support to show the updated result
- Support Lot can be manually versioned at the current step, or do plan version up in future steps
- Flow version up shall inherit the original Q-Time definition; The Q-time which is already triggered shall be kept when the lot version up

- User and Security Modeling :
  - User Group/User definition
  - User/User Group security definition with each function
  - User/User Group security definition with Eqp Type, Technology, EQP State Transition, Equipment
- Integrating modeling tools
  - Support the following Objects import/export by Excel:
    - Product/Parameter Family/Plan (Top, Sub, Step)/EQP/EQP Constrain etc.
    - Product/Parameter Family/ Rework Plan.
    - Support Query, ability to export the result to excel file to modify and import the Excel File to Loader for Submit
- Modeling tool operation
- Support standard functions like Load/ Query/ Modify/ Compare/ Copy, etc.

- Provide Interactive User Interface for the user to maintain and view all process information
- The creation of a new process can be done by copying an existing process and then modifying it partly
- The existing product / process information can be completely copied to the new product / process through Excel

2. Process Flow & Process Flow Management

- Process structure:
    - Ability to define the rework steps and instructions. The rework process can be called by multiple main processes
    - Multiple Products can use the same process Top Plan
- Process Maintenance:
    - Users with specific permissions can modify product information according to technology and users can batch load / modify product information (including parameters)
    - Users with specific permissions can modify flow information individually or in batches according to technology
- Non Product Wafer (NPW) process modeling:
    - Support define NPW flow settings such as monitor/season/furnace monitor/dummy, etc.
    - Support define NPW route
    - NPW Attribute definition: Configure Max Usage Count, Max Recycle Count on Product and support maintain Downgrade Mapping

3. Queue Time Management

- Queue Time Definition
    - Queue Time include two types: Max and Min
    - Queue Time start and end can be defined (Track in/out, Lot process start/end, wafer process start/end)

    - Support Lot Queue Time and wafer Queue Time
    - Support multiple Queue Time. Queue Time interval support Nesting and Overlay
    - Support Queue Time across main flow and branch flow, such as Rework and Alternative Flow
    - Queue Time can include multiple time levels (customizable), and corresponding actions can be customized, including email, hold lot, speed up
  - Queue Time Execution
    - Provide RQT (Remaining Queue Time) as the priority of dispatch
    - Child lot shall inherit the parent lot's Queue Time after split
    - Check the Queue Time of the child lot and parent lot, and automatically bring back the shorter Queue Time of the child lot to the parent lot when merging lots
    - Queue Time needs to be inherited if the action of Cancel tracking or Reposition rule occurs when lot is at the end step of Queue Time
    - Ability to trigger hold lot action after track out if lot is over Queue Time during processing
    - Queue Time shall be supported in Split Run Card
    - Need to support Cancel Queue Time function

4. **Engineering Data Collection (EDC)**
  - Data collection execution:
    - It shall be able to support the data collection
    - Data coordinate information needs to be collected and stored
    - Data collection shall be able to support spec check and chart check
    - When OOC/OOS is not out of date, it shall be able to support the relevant resource restrictions, such as limiting the number of cells, limiting the number of equipment, chamber, batch/lot, etc.

- When OOC occurs, the system shall automatically hold lot and trigger ocap (or not)
- When offline OOC occurs, the system can hold the equipment according to the setting and trigger ocap
- Special case processing: If the number of wafers in a lot is less than the number of samples defined by the data collection, the number of wafers allowed to collect data shall be less than the number of samples defined
- Engineers can input and collect data manually through the interface
- Historical query: Data collection shall have historical data and query function

5. WIP management

- Create / Cancel Create lot:
    - Users need to provide naming rules for the lot ID. Different lot types shall have different naming rules which shall not be duplicated. The extensibility of naming rules for subsequent use shall be considered, so that the system can generate lot ID automatically.
    - The naming rules of wafer Id need to be included in the naming rules of lot ID and defined at the same time. For example, the baseline number of wafer ID shall be consistent with the slot ID of Carrier when wafer start.
    - When creating a lot, users can select product, lot type, cost center, and wafer number. The lot ID and wafer ID are generated automatically
    - Ability to define multiple types of Lot priority
    - Allows the user to cancel a created lot before starting lot.
- Wafer Start Management:
    - Provide manual and automatic operation modes of wafer start
    - Start lot must follow the rules, such as:

- Product and Source Product mapping
- Source Product and Material Number and Vendor mapping
- Lot Type and material cost center mapping
- After starting lot, need to record the relationship between Lot and Wafer ID.

- Lot Split/Merge：
  - Need to support logical/physical split
  - After physical split, shall trigger Split sorter action automatically, using the sorter step standard operation in the future.
  - Need to support logical/physical merge
  - After the physical merge, it shall trigger the Merge sorter action automatically using the sorter step standard operation in the future.
  - When split child lot, child lot shall inherit parent lot attribute, e.g., Queue time, wafer pre-measurement data etc.
  - Shall support future merge after the split at the current step
  - The changes in the process plan's version shall have no effect for future split
  - Parent lot shall inherit child lot future action when child lot merge to parent lot.
  - Shall support set future merge action.
  - The changes in the process plan's version has no effect for the future merge.
  - Split Run Card: Shall support automatic adjustment of the resources needed by each step according to the wafer (such as: recipe, recipe parameter, data collection, EQP)
  - Split Run Card (SRC)：
    - Support using SRC for rework or reposition step
    - Support creating future Split Run Card

- For the same lot in a step, it shall support different wafers to do different experiments
- For the same lot in multiple steps, it shall support different wafers to do different experiments
- Shall support Split Run Card support copy function
- Different split run card services shall be customized according to different services of module
- Shall Support Split Run Card EDC Data, when sent to SPC Chart
- Shall Support define process flow, EQP Capability, EQPID, Chamber ID, Process Location, EDC SPEC, Recipe, Reticle, Probe Card, support set split/merge step
- When the Run Card settings are submitted, the process shall check the compliance of the run card spec (such as process location, recipe, EQP)

- SRC execution：
  - For a lot that already has split run card, after setting the trigger split action, the child lot performs the WIP according to the flow and spec of the split run card
  - After the Child lot run card flow completed, it can merge to parent lot at the future merge step.

- Lot Hold & Release：
  - Different reason codes can be used to hold the same lot at the same time
  - Support Batch Hold
  - Hold and Release need record history, can clearly track the release action, corresponding to the hold action, and can query the history.
  - Release hold must select the corresponding hold code and release comment

- Have privilege Control of hold/release action according to work area and reason code
- In case single Lot has multiple Hold Code, capability shall be there to select multiple hold and release using the same “release hold” at the same time.
- Hold a running Lot Capability to Hold running lot due to EQP failure (generation of recovery run card to deal with the situation).

- Future Hold：
  - Shall support “set future hold” at the current step.
  - According to the effective time, future hold can be divided into pre-future hold and post-future hold
  - Lot's future hold shall support the setting of multi-future hold. The setting of future hold can be changed or deleted
  - After lot future hold takes effect, it has nothing to do with the version (future hold shall be inherited after version upgrade)
- Reassign：
  - Support lot to perform product, version upgrade of the plan, or change product, plan on the current step.

- Bank in/Out:
  - Single lot or multiple lots can do ban kin / bank out action at the same time

- Rework:
  - Max rework count can be set according to the stage and rework count can be controlled according to the wafer level.
  - Support dynamic rework (can be planned rework or ad hoc rework)
  - When the child lot routes to rework flow, it shall hold the parent lot automatically and wait at the secure step

    - When the lot routes to rework flow, it shall display rework information from lot detail information.
    - Shall support lot ad hoc routes to rework flow to add process step dynamically

- Recovery Due to Misprocessing/Abrupt Equipment Breakdown

  Whenever lot processing is interrupted due to abrupt equipment breakdown or any misprocessing Facility to generate Recovery Run Card (RRC) shall be there

    - It shall trigger recovery run card when running hold occurs during processing
    - Recovery Run Card (RRC) needs to support single and batch
    - Shall provide facility for manual trigger recovery run card generation
    - Different modules shall facilitate customizable rework flows
    - After the recovery run card is triggered, the processed wafers shall be selected and processed in batches
    - shall support split unprocessed wafer and cancel track in
    - shall support split processed wafer and track out
    - shall support split processing wafer and routes to rework flow.
    - Shall support Nested Run Card. When WIP is in split run card/recover run card short flow, users shall open a recover run card for a lot

- Lot/wafer query:
    - Query condition: Lot ID, Lot Type, Lot Priority, Location, Process Location, Work Area, Carrier ID, Lot State, Lot Status, Technology, Product, Plan, Stage, EQP Capability, EQP ID, Lot Owner, Customer Lot ID, Vendor Lot ID, Production/NPW/Engineer, Normal/Run Card/All

    - Highlight the special lot, such as hold, Queue time, high priority, etc.
    - Query Lot future action: may select to view the Q-time triggered by lot, Future hold, available EQP information
- Lot/Wafer History query:
    - The operation of lot/wafer will record history and provide a detailed and convenient history search function. The query of lot/wafer history can't affect the production
    - Lot Comment:
        - Can mark a lot comment for each step.
- Scrap/Terminate:
    - Support full lot scrap and un-scrap
    - Support terminate or un-terminate lot
- Flow View: View flow information by lot
- "Batch/Cancel Batch:
- Provide the capability to form batch process, and allow to cancel batch
- Support lot Ship/Un Ship
- Lot Reposition：
    - Support reposition at current step, future reposition, reposition to previous and future steps.
- Lot Skip：
    - Support skip to next step.
- Other queries:
    - Lot Detail including wafer information
    - Full Lot Report: Query the history of the lot manufacturing process
    - Wafer Chamber Tracking History: Query the event history related to the chamber location / process of the wafer in a specific EQP
    - Wafer History: Query wafer manufacturing process history

- Wafer Slot History: Query the history of wafer, Carrier and slot position changes
- Inventory Info Query
- Bank Information Query
- Production Lot Information Query
- NPW Lot Information Query
- Engineer Lot Information Query

6. **OCAP (Out of Control Action Plan)**
   - Discrepancy Management
     - Ability to record discrepancies/dispositions / comments
     - Ability to attach documents to discrepancies / dispositions
   - Trigger OCAP
     - Ocap needs a graphical interface and a convenient work flow
     - Users can customize ocap Flow
     - OCAP need to support re-measure/add-measure/change measurement EQP
     - Different types may have the different actions; the action is configurable
     - The OOC of the SPC chart triggers ocap and then enters the ocap flow
   - Trigger point：
     - Single EDC triggers single OCAP
     - Current and historical query: After the ocap occurs, the system shall be able to display the specific reason for the ocap triggering, the current status, and the processing history information"
     - Special closing: under special circumstances, ocap can be specially closed
   - Re-measure/Add-measure：
     - If the user selects Re-measure or Add-measure, the system will automatically set lot to the appropriate state

    - The user can select the wafer that has not been measured to add measure
- OCAP Action :
    - Release Lot and Track Out
    - Lot Hold
    - Lot Hold to Scrap
    - Lot Rework
    - Lot Terminate
    - Process EQP Release
    - Process EQP Hold
- Integrated with SPC : Ocap needs to provide SPC link to view chart information
- Ocap processing needs to be defined according to the predefined reason / action / disposition principle, and the system shall provide the specified format fields

7. General Basic Feature

- Lot Movement & Flow management (GUI based)
    - Monitor Wafer Management and data collection with in product lot w.r.t. Monitor wafer.
    - Automatic/Manual as well as programmable Rework based upon real time data from equipment. Tracking, reporting and correlation of reworks. Facility of automatic/Manual Split / Join & Hold options in lot flow.
    - Ability to make dynamic/ on the fly changes and tracking these. Real time Non Conformance & DMR initialization, execution, tracking and reporting.
    - Facility with user friendly GUI where in user can fetch data of all sorts from database, analyze as per need in real time and generate reports

- Process Flow architecture.
- Lot Tracking and Equipment Tracking
- Production and Engineering Data Extraction/Analysis.
- Equipment QC & maintenance scheduling, tracking and generation of reports.
- Real-Time Production Monitor (RPM). Tool/WIP Status.
- Standard Production Reporting. Historical and Current.
- Reporting capabilities covering WIP, Equipment, Cycle-Time, Activity, dispatch summary and Yield.
- Configurable user security (user authorization by function, location, process, or any combination thereof)
- Lot in-line change capability.
- Full lot history and archiving.
- Paperless lot tracking.
- FAB status reporting that includes- Lot Status, Equipment Status, rework, scarp, WIP, relation between WIP quantity and Run WIP quantity etc.
- All other standard reports
- Special Work Requests
- Instructions on lot at defined process (Area/Stage/Recipe)
- Discrepancy Material Report (DMR)
- Reporting and Handling any deviations/events
- Set lot actions (rework, scrap, high risk etc.)
- Set corrective actions, owner, status, defects
- Add files, pictures, comments etc.
- Status of DMR (Open/Close)

o Traceability:(GUI Based)

- In built Raw material, consumables management and back tracing up to lot & unit step level w.r.t. batch id. GUI for analysis & reporting of same
- Batch, Lot, Wafer, Die-level Tracking and Management

        - Complete Wafer-level traceability from Raw Material Batch.
    - Data Analytic Capabilities (GUI Based)
        - Inbuilt Basic SPC software with automatic Cp, Cpk calculations, generation of various charts and plots.
        - Generation of QC parameter charts, Defect Density charts
        - Monitoring process variation over time, so that the process can be adjusted to reduce variations
        - Maintaining process stability
        - Providing information about process capability
        - Detect any deviation in the process
        - Graphical representation of data
    - Work floor Management & Planning (GUI Based)
        - Real time lot scheduling and planning in automatic as well as manual mode.
        - Defining lot priority and facility to change the same in real time
        - Real time alarms, notification and feedback mechanism
        - Reports & alarms to be sent directly through email to users

8. **Communication**

   Shall have capability to integrate with standard communication buses like TIBCO, Apache Pulsar etc.

9. **Integration with CIM module**

   Shall have capability to seamlessly integrate with other CIM modules like

   - Maintenance management
   - Statistical process control (SPC)
   - Advanced process control (APC/R2R)
   - Real time scheduling/decision making with ability to dynamically change the decision rules
   - Real-time and scheduled reporting
   - Planning and Production Control solutions
   - Automated data collection
   - Equipment automation

- Yield management
- Defect management
- Inventory Management
- ERPs

2. Hardware /Software Required for running MES

Vendor to provide Hardware (Application Servers, Database Server, Backup Server) required for installing and running the MES. Configuration should also include required database and application backup management system.

Vendor to provide Required Operating systems for Application & Database servers, Required Database (e.g. Oracle 12c, SQL Server, DB2, KDM etc.) and any additional third party software required to be installed on servers and clients.

3. Data Capturing & Interface

I. Automatic Interface with Yield Management system(YMS), Inventory Management System, Facility Control Management System (FCMS), Air Borne Particulate Measurement system etc.

II. Vendor to provide all of the required Hardware & Software for capturing/parsing equipment & process data from metrology and process equipment mentioned below. Equipment details are as below:

Sr. No.	Tool ID	Area	Description	Make	Type of Equipment (Process/Metrology)
Metrology Tools					
1	MTOP1	CMP	Film Thickness Reflectance	KLA	Metrology
2	MTOP2	CMP	Film Thickness Reflectance Lithography	KLA	Metrology
3	MTHR1	CMP	STI Step height and Depth measurement	KL-Tencor	Metrology
4	MTCD1	PHOTO	Critical Dimension Scanning Electron Microscope	Hitachi	Metrology
5	MTAG1	PHOTO	Overlay Measurement	KLA	Metrology
6	STMU1	PHOTO	Exposure MUV Stepper	Nikon Corporation	Process
7	SNDU1	PHOTO	Exposure DUV Scanner	Nikon Corporation	Process

Additional Requirements:

A. Licensing:	
a. The software along with all modules requiring separate licenses must have perpetual, floating licenses.	
B. License Re-hosting:	
a. In the event the host-ID / server hosting the licenses becomes unusable due to failure or obsolescence or in case of upgradation of hardware infrastructure, re-hosting of licenses of all products on a new host-ID should be provided free of cost during the period covered by the maintenance contract. b. Vendor to mention post-maintenance contract re-hosting policy.	
C. Training:	
a. On-site training on operation and maintenance for SCL engineers free of cost. The duration of the training shall be specified by the vendor.	
D. Annual Maintenance:	
a. The vendor must provide free software updates and maintenance releases for two years from the date of acceptance at SCL. b. As an option, the vendor must also quote for software updates and maintenance releases for three years and five years.	
E. Acceptance Procedure:	

a. Vendor to demonstrate full process flow creation for SCL process in MES b. Vendor to run 3 dummy lots in MES without any bugs c. Vendor to demonstrate Data Capturing/Parsing from equipment selected by SCL for automatic data capturing in accepted bid. d. Vendor to demonstrate data fetching and analysis capability of said 3 dummy lots e. Vendor to demonstrate generation of all reports mentioned in RFP f. Vendor to demonstrate Equipment Management and Equipment Maintenance modules by generating dummy QC/ Maintenance Schedule. Vendor to demonstrate generation of emails/alerts and auto equipment down in MES in case of QC/Maintenance due or fail. g. Vendor to demonstrate Track in not available in case of equipment is down h. Vendor to demonstrate various QC & Process parameter charts generation i. Vendor to demonstrate automatic/manual split, join & reworks through dummy lot runs j. Additional acceptance criteria jointly decided by SCL and the vendor.	

Annexure H : Recommended Consumable for PM

S.N.	Equipment	Item Description	OEM/ Vendor	OEM Part No	PM Type : Quarterly/ half-yearly/ annually/ usage based	Quantity required for PM	Annual Quantity required	Remark

Annexure I : Recommended Spares and special tools

S.N.	Equipment	Item Description	OEM/ Vendor	OEM p/n	Type: Consumable/ Back up spare/ Special Tools	Annual Quantity required	Remark

Annexure J : Approved Manufacturers for Support/ Sub-Modules

SN	ITEM	Recommended Makes
A	Vacuum Pumps	Edwards Make
B	Mass Flow Controllers (Digital)	Vendor to specify
C	Cryo Pumps	Brooks (CTI Cryo Pumps)
D	Turbo Molecular pump (TMP)	Edwards/Leybold/Varian/Pfeiffer
E	**GAS PANEL COMPONENTS**	
1	Tubes (SS 316L EP Ra < 10 micro inches)	Valex / Dockweiler
2	Valves: *Valve seat type shall be determined by vendor to meet application requirements.*	Aptech / Nupro.
3	Fittings	Cajon/HTC
4	Gaskets: *Nickel VS type*	Cajon
5	Filters: *Absolute metal filter 0.003μ*	Pall / Mott filters /Millipore
6	Pressure Regulator	Tescom /Aptech.
7	Pressure transducer- *with 9-pin type "D" connector.*	Only MKS mini baratron transducers
8	Pressure Gauges and switches	Tescom/Span.
9	Check Valves	Nupro CW series.
10	GENERAL: a) All pipes/ tubing, valves and components (in all paths – process, vent, purge etc.) shall be Stainless Steel 316L Electro polished 10 RA max. b) Valves, pipes and components connection shall be either welded or with VCR fittings only. c) Compressed fittings are not allowed in any of the Gas systems.	

QUOTE FORMAT (Un-priced)

Vendors are required to submit their Un-priced quote in the following Quote format:

Activity/ Item Description	Quoted (Yes/No)	Remarks, if any
Supply, Installation, testing and commissioning of Cleanroom modifications & Utilities tool-hook-up, for supplied equipment, replaced equipment, relocate equipment, and equipment upgradation, as per the detailed engineering by the vendor and as per the approved detailed engineering drawings and the specifications given in the tender.		
De-hook, Move out and Crate 2 old 8” Equipment (i.e. Asher and BPSG Dep equipment) and re-locate of old 8" Equipment (as per layout drawings given in the tender)		
Supply & installation of MES, as per SOW given in the tender		
Supply of IPs for NVM (Single Poly non-volatile memory, as per SOW and specifications given in the tender		

Supply & Installation of equipment, as per SOW and configuration given in RFP:

S.N.	Equipment name/description	**Quoted (Yes/No)** for OEM refurbished equipment	Lead time for OEM refurbished equipment (months)	Remarks- OEM Refurbished Equipment, Vintage for Refurbished Equipment
1	Dark field defect inspection equipment – KLA PUMA			
2	Surfscan- KLA SP1 TBI			
3	Asher- Mattson Aspen II			
4	Polymer strip equipment after VIA and metal etch, LAM DVI (DV24)			
5	Metal Sputter equipment, AMAT Endura			
6	Bright Field defect inspection equipment, KLA 2367 PRO			

Supply & Installation of refurbished equipment, as per SOW and configuration given in RFP:

S.N.	Equipment name/ description	**Quoted (Yes/No)** for refurbished equipment	Lead time for refurbished equipment (months)	Vintage for Refurbished Equipment
1	Photoresist strip & Pre-diffusion clean, ZETA VIPER			
2	Oxide etcher, LAM EXELAN 2300/TEL UNITY ME			

Supply & Installation of 25 existing 8-inch equipment upgrades, as per SOW and configuration given in RFP

Sno.	SCL Equip ID	Equipment Description	Vendor	Equipment Model No	Upgradation Required	Quoted (Yes/No)
1	CMOX1	CMP Oxide	AMAT	MIRRA MESA	1. In-situ end point system	
					2. POU Filter Upgrade	
					3. Upgradation of Slurry recirculation and delivery pump in MABAT (CDU 3000) Slurry Delivery System (from Pneumatic Diaphragm pump to Bearing less Magnetically Levitated Centrifugal Pump)	
					4. Hard disk upgrade (from mechanical HDD to RAID SSD)	
					5. Upper Pneumatic Assembly (UPA) module upgrade	
					6. Upgrade from peristaltic pump to CLC for slurry loop	
					7. Slurry Injection System (SIS)	
					8. Upgrade Slurry/DIW main valve from 1 line to 3 line	
2	CMWO1	CMP Tungsten	AMAT	MIRRA MESA	1. POU Filter Upgrade	
					2. Upgradation of Slurry recirulation and delivery pump in MABAT Slurry Delivery System (from Pneumatic Diaphragm pump to Bearingless Magnetically Levitated Centrifugal Pump)	
					3. Hard disk upgrade (from mechanical HDD to RAID SSD)	
					4. UPA (Upper Pneumatic Assembly) module upgrade	
					5. Upgrade from peristaltic pump to CLC for slurry loop	
					6. Slurry Injection System (SIS)	
					7. Upgrade Slurry/DIW main valve from 1 line to 3 line	
3	MTOP2	Film Thickness & Reflectance Measurement	KLA	OPTIPROBE	1. Install Mini environment	
					2. SMIF upgrade	
					3. Wedge Calibration wafer	
4	REML1	Metal Etcher	AMAT	CENTU	1. chamber addition (1 DPS chamber and 1ASP chamber)	

Sno.	SCL Equip ID	Equipment Description	Vendor	Equipment Model No	Upgradation Required	Quoted (Yes/No)
		(1 DPS ch + 1 ASP ch)		RA-DPS (AI)	2. Change the existing 4.2Mb hard disk to flash drive	
					3. Change the floppy drive to USB drive	
					4. Existing Buffer CH Viewport window to be upgraded with sapphire glass	
5	REPL1	Poly Si / STI Etcher	AMAT	CENTURA DPS (CLN)	1. Upgradation of existing Dome Temp. Control Unit (DTCU) of both the Chambers (Including Source Rf match)	
					2. Change the floppy drive to USB drive	
					3. EPD system with EP monitoring at the top of dome for one chamber (AA Etch) only	
6	IMHE1	High Energy Implanter	Axcelis	NV-GSD-HE	1. Additional wafer Buffer Loader	
					2. Software Upgrade (SunSystem Upgrade and Night backup recorder installation.)	
7	TRMU1	Track MUV	TEL	TEL ACT-8	1. Additional - 1 Hot Plate (HHP)	
					2. Temperature and Humidity Controller Upgrade	
8	TRDU1	Track DUV	TEL	TEL ACT-8	1. Upgrade PLC on Developer LDS	
9	SNDU1	Scanner DUV	Nikon	NSR-S204B	1. Installation of Quadrpole Aperture (Resolution improvement)	
10	MTCD1	CD SEM	Hitachi	S-9300	SMIF upgrade	
11	CDHD1	HDP Oxide CVD (3 ch)	AMAT	AMAT C-5200 HDP Ultima Plus	1.Replace ETO RF generator for two chambers with ENI RF generators	
					2. Change the existing 4.2Mb hard disk to flash drive	
					3. Change the floppy drive to USB drive	
12	CDTS1	PECVD TEOS	AMAT	DCVD CENTURA 1.X	1.Up-grade with RPS	
					2. SACVD chamber addition	
					3. Change the existing 4.2Mb hard disk to flash drive	
					4. Change the floppy drive to USB drive	
13	SPCO1	Silicide PVD Sputter	AMAT	AMAT Endura5	1.Upgradation of Conventional Ti Chamber for TiN capability	

Sno.	SCL Equip ID	Equipment Description	Vendor	Equipment Model No	Upgradation Required	Quoted (Yes/No)
				500 Cobalt System	2. Change the existing 4.2Mb hard disk to flash drive	
					3. Change the floppy drive to USB drive	
14	SPLR1	Barrier Metal Deposition	Amat	AMAT Endura5 500 MOCVD System	1.High speed robot configuration	
					2. Change the existing 4.2Mb hard disk to flash drive	
					3. Change the floppy drive to USB drive	
15	MTFR1	FTIR Spectroscopy	Accent	QS-2200ME	Upgradation for B,P, and Si-OH bond measurement capability.	
16	WTSE1	Single Wafer Spin Processor	SEZ	RST-223 Spin Processor	Chuck Upgrade in both module- Wafer edges can be better handle with upgraded Chuck.	
					Upgradation of CDS to handle 200 Ltr drum for catering increase chemical consumption with increase capacity	
					O3 generator upgrade	
					Addition Heat exchanger for Med 2	
17	SBXC1	Pod and Cassette Cleaner	Fluoroware	HTC 8020	PLC upgrade	
18	SSRT1	Wafer Sorter - Wafer Start	Brooks	SCS 3000	Upgrade to wafer Back side reading	
19	SSRT2	Wafer Sorter - Common Area	Brooks	SCS 3000	Upgrade to wafer Back side reading	
20	WTPD1	Batch processing	SES	SS-TECHNO200	1.O3 generator	
					2. Mega sonic generator	
					3. CD upgrade	
21	WTRS1	Batch processing	SES	SS-TECHNO200	1. CD upgrade	
					2. Mega sonic generator	
22	YEDR1	CP measurement Un-patterned wafer scan system	KLA	SP1 TBI	Existing equipment needs to be upgraded for Computer hardware, Windows Operating System & Hard Disk Storage	

Sno.	SCL Equip ID	Equipment Description	Vendor	Equipment Model No	Upgradation Required	Quoted (Yes/No)
23	YEOI1	Optical Inspection Station	Zeiss		1. Upgrade YEOI1 for Bevel Inspection	
					2. Optics needs to be upgraded for existing system	
24	YESR1	SEM Review Station	AMAT	AXIOSPRINT	1. IP computer	
					2. HDD higher capacity for all computers	
					3. EDX software & computer	
					4. Optical Microscope replacement	
					5. OS system upgrade (O2)	
25	YEOR1	Optical Review Station	Zeiss	SEMVISION	1. Optical module needs to be upgraded.	
					2. ADR software needs to be upgraded	
					3. Upgrade YEOR1 for Bevel Inspection	

NOTE:

1. **SCL reserves the rights to exclude/ drop any item/equipment/ equipment upgrade, based on detailed engineering or specifications of the offered item/ equipment/upgrade. The bid/offer , however, will be evaluated for Cost comparison on Overall L1 basis.**
2. **The sole responsibility of successful completion of the project lies with the Prime bidder.**
3. **New as well as OEM refurbished equipment are acceptable and shall be evaluated on same platform. No additional weightage shall be given to New equipment.**
4. **If some Non-critical Item(s) in Equipment Upgrade is Not quoted by any bidder, their bid will be loaded by the highest Bid of any bidder for those item(s), for Bid evaluation. Quote**

for two major equipment upgrades namely (a) Metal etch and ASP chamber in Metal Etcher and (b) SACVD BPSG Deposition chamber in TEOS Equipment are MUST.