



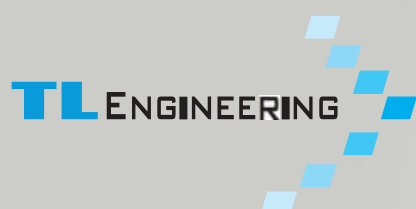
TOTAL FACILITY SOLUTION

State of the Art Cleanroom Technology

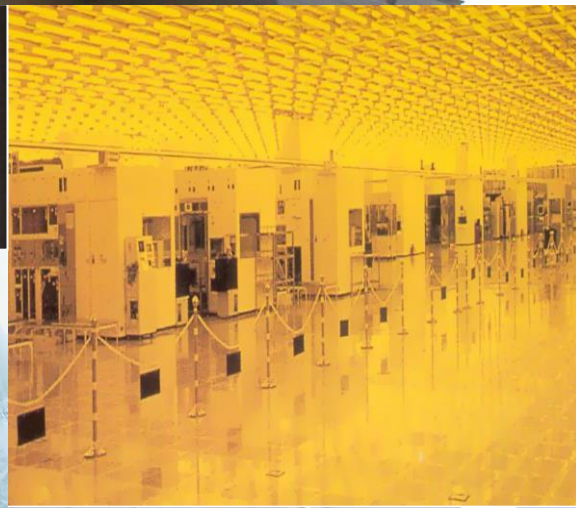
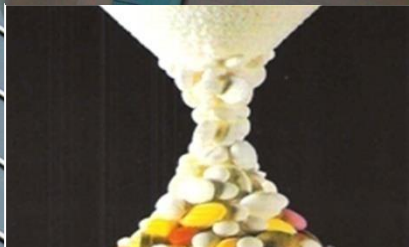
## 會社指命願

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*Company Profile*



## HVAC & Cleanroom Technology





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01

## CEO Message

### "Systematic Construction Management"

Trust our Leading Engineering Inc.,

Is a total facility engineering provider which succeeds to M+W Group ([www.mwgroup.net](http://www.mwgroup.net)) , worldwide cleanroom company.

We have been engaged in the development of cleanroom technologies in the area of IT, BT and Communication etc.

We are supplying "Total Facility Solution" such as Cleanroom, General HVAC, Utilities, Fire-Fighting, Electric and Plumbing.

We will try to realize "Low Cost, High Performance"

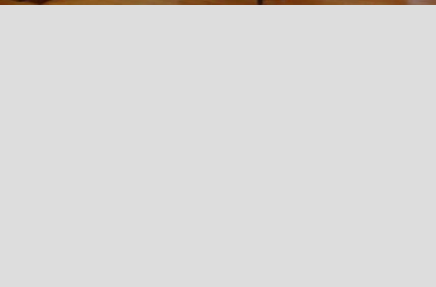
For more detailed information on our company, please contact us at any time

CEO Chris Seo



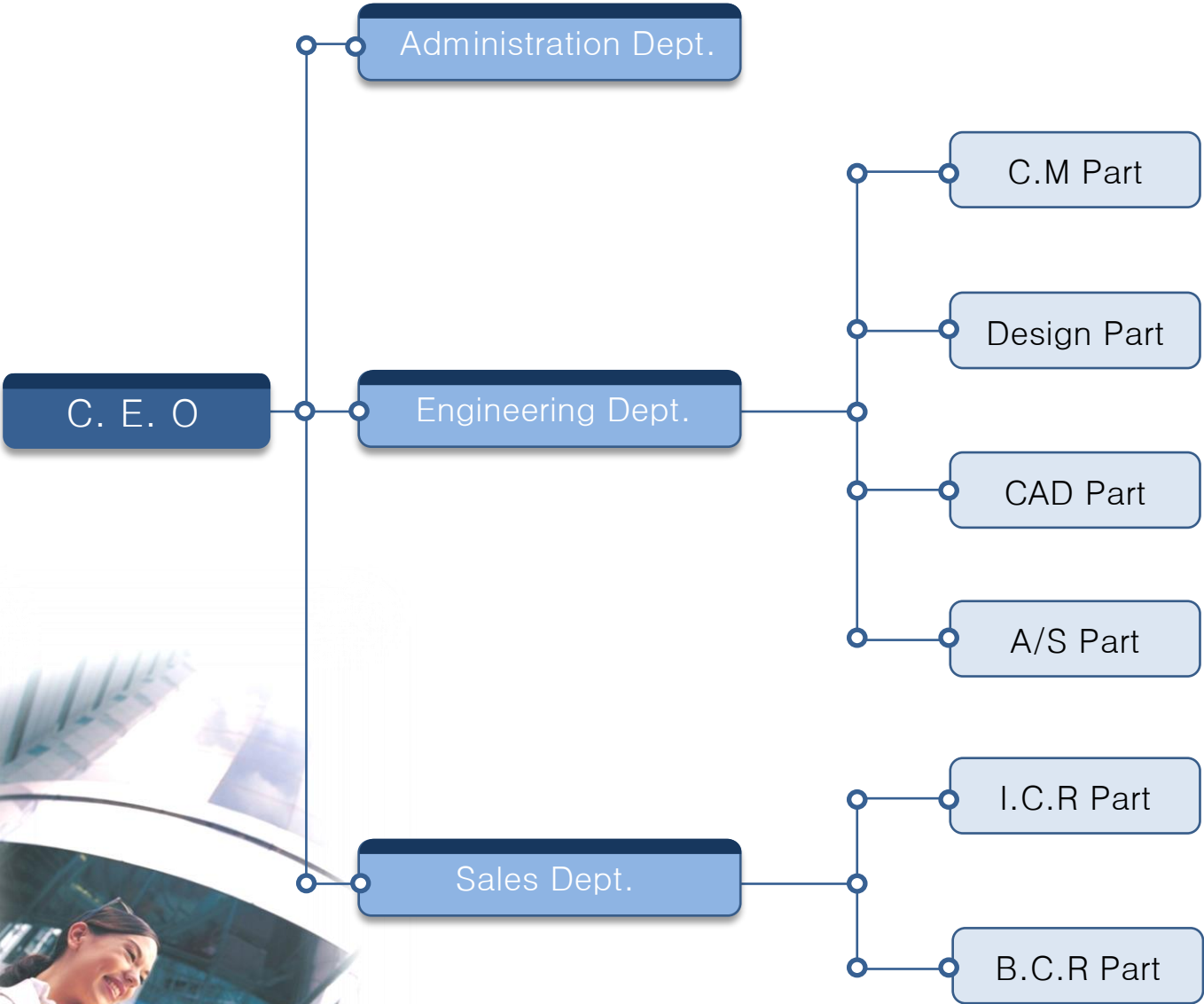
## 02

### Company Introduction



- **Founded In** : Dec. 09. 2002
- **Company Name** : TL Engineering Inc.
- **Location** : Wongwangmyeong-ro 37beongil 22,  
Gwangmyeong-si, Gyeonggi-do Korea  
(zip code :14283)
- **C. E. O** : Chris Seo
- **Gross Capital** : 600 Million KRW
- **Sales Amount** : 10.6 Billion KRW (2020)
- **Trading Bank** : IBK (Industrial Bank of Korea)
- **Home Page** : [www.tleng.kr](http://www.tleng.kr)
- **E-mail Address** : [tleng@tleng.kr](mailto:tleng@tleng.kr)
- **Chief Clients** : Dongbu Semiconductor  
Samsung Biologics  
Daewoong Pharmaceutical  
LG Chemical  
Asahi KASEI (Japanese)  
Denso Automotive (Japanese)  
Merck Korea (German)

# Organization





## 03 Business Area



### Total Facility Engineering Service

#### Cleanroom Design & Build

- + Semiconductor / LCD / Communication
- + Pharmaceutical (GMP) / Cosmetics
- + Low Humidity (Film, Coating)
- + Food (HACCP) / Hospital / Bio Hazard
- + Solar / Battery / Computer
- + Constant Temperature & Humidity



#### Clean Equipments

- + Air Handling Unit (AHU, ACU)
- + Blower Filter Unit / HEPA BOX
- + Clean Booth / Clean Bench
- + Air Shower / Pass Box
- + Clean Locker / Hand Washer





### Utility System & Piping

- + CDA(Compressed Dry Air)
- + DI Water(UPW & WFI)
- + PCW(Process Cooling Water)
- + Vacuum, Gas(N<sub>2</sub>, Ar, O<sub>2</sub>)
- + Exhaust, Sanitary, Drain
- + Waste Water Treatment
- + Scrubber, AC Tower



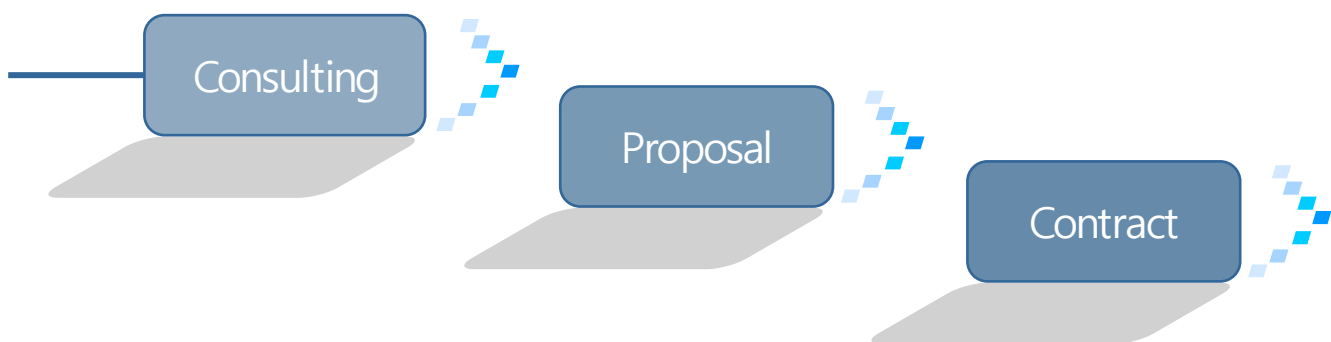
### Plant & Building Facilities

- + Fire-Fighting
- + HVAC (Duct & Piping)
- + Air Conditioner (EHP)
- + Sanitary Plumbing
- + Ventilation
- + Labortary





## 04 Business Flow



### Applied Industries

- Semiconductor / LCD / LED / SOLAR Plant
- BLU / Mobile Phone / PCB / Battery Plant
- Pharmaceutical / Hospital / Food / Cosmetics Plant
- Animal Laboratory / Bio-Hazard
- Film / Coating Plant



## Applied Cleanroom

- ICR
- BCR (GMP/GLP)
- BIO HAZARD (BSL)
- HACCP / SPF

Design

Build

A/S

05

## Competitiveness

### Our Competitiveness

Faster Response



#### HIGH QUALITY

- Optimum Indoor Conditions
- Cleanliness
- Stable Utilities Supply
- Easy Maintenance



#### LOW COST

- Minimize Initial Investment
- Save Maintenance Cost
- Energy Saving



Excellent Engineering Technology



## QUICK SERVICE

- Satisfactory Before Service
- Delivery in time
- Quick After Service

The Best -  
QUALITY  
COST  
SERVICE

06

## Business Certificate

### ■ General Information Sheet



## 사업자등록증

( 법인사업자 )

등록번호 : 107-86-27639

법인명 ( 단 체 명 ) : (주) 티엘엔지니어링

대 표 자 : 서충욱

개업연월일 : 2002년 12월 09일      법인등록번호 : 110111-2669260

사업장소재지 : 경기도 광명시 원광명로37번길 32(광명동)

본점소재지 : 경기도 광명시 원광명로37번길 32(광명동)

<p>사업의종류 : <span style="border: 1px solid black; padding: 2px;">업태</span> 서비스</p> <p>제조업</p> <p>건설업</p> <p>도매업</p> <p>부동산업</p>	<p><span style="border: 1px solid black; padding: 2px;">종목</span> 기타엔지니어링</p> <p>클린룸장비제작</p> <p>기계설비공사업</p> <p>클린룸설계및시공사업</p> <p>무역</p> <p>임대</p>
--	---

발급사유 : 정정

담당 : 전수경 과장

전화 : 02-1668-6804

팩스 : 0505-055-1669

이메일 : tax@tleng.kr

사업자 단위 과세 적용사업자 여부 : 여( ) 부(✓)

전자세금계산서 전용 전자우편주소 :

2020년 11월 10일

## 광명세무서장







## 인증서 및 등록증

## ■ Construction License

[별지 제3호 서식]

(앞 쪽)

## 건 설 업 등 록 증

업 종: 기계설비공사업 등록 번호: 영등포04-12-10

상 호: (주)트림이앤씨 대 표 자: 이문삼

주된영업소 소재지: 경기 광명시 소하동 1345 광명테크노파크 비동 1108호

법인(주인)등록번호 110111-2669260

국 적 또 는  
소 속 국 가 명: 대한민국 등록 일자: 2004.10.27

위 자는 건설산업기본법 제9조의 규정에 의한 건설업자임을 증명합니다.

2011년 1월 20일

경기도 광명시청



## 변 경 사 항

변 경 연 월	변 경 구 분	변 경 내 용	기록일 및 기록자 (서명 또는 인)
2005.09.26	소재지이전	(前)서울 양천구 양천동2가 98-2 3층 (後)서울 금천구 가산동 345-30 남성트러지아파트5층 706호	
2008.05.20	소재지이전	(前)서울 금천구 가산동 345-30 남성트러지아파트5층 706호 (後)경기 안양시 동안구 복선동 9017-38 아사아파트4층	
2009.02.27	대표자변경	(前)조영택 (後)이문삼	
2010.12.13	소재지이전	(前)경기 안양시 동안구 복선동 9017-38 아사아파트4층 (後)경기 광명시 소하동 1345 광명테크노파크 비동 1108호	
		경기도 광명시 하안로 60 광명테크노파크 8동 1108호 (소하동)	
2019.11.3	대표자	이문삼 서명	2019.03.05 이문삼
2019.10.4	주최자	경기도 광명시 원광명으로 37번길 32 (광명원)	2019.1.13 김성현
2020.11.3	관호 대용자	(주)리얼엔지니어링 서명록	2019.10.18.김 2020.11.12 김희영



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## Business Certificate

### ▪ SEC Registration (Philippine Joint Venture)

	<p>REPUBLIC OF THE PHILIPPINES  <b>SECURITIES AND EXCHANGE COMMISSION</b>          SEC Building, EDSA, Greenhills          City of Mandaluyong, Metro Manila</p>
<p>COMPANY REG. NO. CS201321897          COMPANY TIN 008-658-778</p>	
<p><b>CERTIFICATE OF INCORPORATION</b></p>	
<p>KNOW ALL PERSONS BY THESE PRESENTS:</p>	
<p>This is to certify that the Articles of Incorporation and By-Laws of</p>	
<p><b>CLEAN AIR-TECH INDUSTRIAL BUILDERS INC.</b></p>	
<p>were duly approved by the Commission on this date upon the issuance of this Certificate of Incorporation in accordance with the Corporation Code of the Philippines (Batas Pambansa Blg.68), and copies of said Articles and By-Laws are hereto attached.</p>	
<p>This Certificate grants juridical personality to the corporation but does not authorize it to undertake business activities requiring a Secondary License from this Commission such as, but not limited to acting as: broker or dealer in securities, government securities eligible dealer (GSED), investment adviser of an investment company, close-end or open-end investment company, investment house, transfer agent, commodity/financial futures exchange/broker/merchant, financing company, pre-need plan issuer, general agent in pre-need plans and time shares/club shares/membership certificates issuers or selling agents thereof. Neither does this Certificate constitute as permit to undertake activities for which other government agencies require a license or permit.</p>	
<p>As a registered corporation, it shall submit annually to this Commission the reports indicated at the back of this certificate.</p>	
<p>IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of this Commission to be affixed at Mandaluyong City, Metro Manila, Philippines, this <u>14<sup>th</sup></u> day of November, Twenty Thirteen.</p>	
	<p>  <b>FERDINAND B. SALES</b>          Acting Director          Company Registration and Monitoring Department</p>

- Joint Venture with Philippine ‘Clean Air Tech ‘

PCAB Grade <B>

Republic of the Philippines  
Department of Trade and Industry  
CONSTRUCTION INDUSTRY AUTHORITY OF THE PHILIPPINES  
PHILIPPINE CONTRACTORS ACCREDITATION BOARD  
Makati City, Metro Manila  
ISO 9001:2008, Cert. No. CIP/4474/11/05/766

**CONTRACTOR'S LICENSE**  
FORM NO. 15- 09844

This certifies that

**CLEAN AIR-TECH INDUSTRIAL BUILDERS INC.**

having complied with all the requirements for licensure pursuant to Republic Act No. 4566 (as amended) and its implementing rules and regulations, is hereby authorized to engage in the construction contracting business in the Philippines, subject to herein limitations of license validity period, classification and category as prescribed under License Particulars in the box to the right and to the terms and conditions annotated at the back hereof.

2015-2016

This further certifies that said licensee, subject to the limitations of the above-prescribed license validity period and registration validity period, kind/s of project and size range/s as indicated under Registration Particulars in the box to the right hereof, is a PCAB registered contractor for government projects.

Given at Metro Manila, Philippines, on  
April 7, 2016

**FILOMENO H. CASTILLO, JR.**  
Board Member

**ALEJANDRIA G. GOMEZ**  
Officer-in-Charge

**SERGE T. RETOME**  
Board Secretary

DOCUMENTARY STAMP TAX PAID  
(Php 15.00)

IMPORTANT NOTICE: Filing schedule for license renewal application - April 1-15, 2016

**CONTRACTOR'S PARTICULARS**

Authorized Managing Officer (name and signature)	NOT VALID w/o SIGNATURE
<b>Marites Contemprate Cardinez</b>	
Box: Proprietorship/Partnership/Corporation	Head Office Location (Region)
<b>Corporation</b>	<b>REGION 4A</b>
Taxpayer Identification Number (TIN)	
<b>908-658-778</b>	

**LICENSE PARTICULARS**

License First Issue Date and Number	No.
<b>April 25, 2014</b>	<b>37844</b>
Validity Period of this License/Renewal	
<b>April 07, 2016</b>	<b>to June 30, 2016</b>
Principal Classification and Category	
<b>General Building</b>	<b>B</b>
Other Classification/s	
<b>Electrical Work Mechanical Work</b>	

**REGISTRATION PARTICULARS**

Registration Date and Number	No.
Validity Period of this Registration	
	<b>to</b>
Kind/s of Project and Respective Size Range/s	

**NOT REGISTERED FOR GOVERNMENT PROJECTS**



Semiconductor



Bicycle



Semiconductor



Solar Panels



OPU & Camera Module



Semiconductor



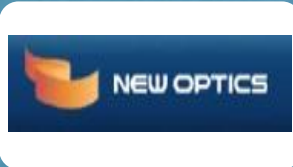
Semiconductor Packaging



Pharmaceutical



# 07 Clients



BLU, LGP



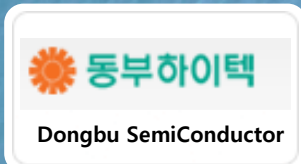
Liquid Crystal



Battery Separator



FCCL Film



Flash Memory



Optical Film



Pizza Dough



Automobile Parts



Automobile Muffler



Iljin Display  
Touch Screen Panel



OLED Annealing Equipment



Semicon CVD Equipment



Back Light Unit



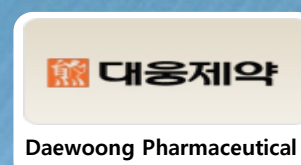
Film & Tape



Semicon Tester



Bio Sensor (Blood Sugar)



Pharmaceutical



Dairy Goods



Hodogaya (SFC)  
OLED Material



LCD Equipments



Mass Flow Controller





## Viatron

- OLED Annealing Equip.
- Kosdaq Company
- Cleanroom : 4,000m<sup>2</sup>
- H: 9M(1F) + 8M(2F)



## Asahi-KASEI

- Battery Film (Separator)
- Japanese Company
- 1st & 2nd Plant
- Coating & Slitting



## Thuringen Korea

- Cosmetics
- In Daegu
- CGMP Certified
- Skin Care

## 08

## Business References

### ▪ Overseas Project References

#### Singapore

1. 2009 / 'PWG' SPF Mini-Pig Cleanroom Design & Build
2. 2009 / 'PWG' Primates Breeding Room Panel work
3. 2009 / 'Si-Pro' Solar-related Cleanroom Design & Build
4. 2010 / 'DSO (Defense Ministry)' Germ Laboratory Design & Build

#### Norway

1. 2008 / 'Scan Crucible' Solar-related Cleanroom Design & Build
2. 2011 / 'Si-Pro' Solar-related Cleanroom Design & Build

#### Mexico

1. 2014.11 'New Optics' LCD TV Cleanroom Design & Build
2. 2017.11 'New Optics' Cleanroom Expansion Design & Build

### ▪ Design References

1. 'Amkor Technology' Cleanroom & Utility Design (Korea)
2. 'NUS (Singapore University)' Solar Laboratory Cleanroom Design
3. 'Hanwha' Rocket Propellant HVAC 및 Utility Design (Korea)
4. 'Qatar Solar Technologies' Cleanroom HVAC Design (Qatar)
5. 'Natural Solution' Cosmetics CGMP Cleanroom Design (Korea)
6. 'Dong-A ST Pharmaceutical' HVAC & Utility Design (Korea)
7. 'ASM R&D Center' Cleanroom (Class 10) Design (Korea)

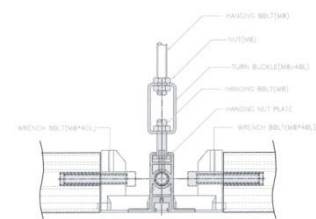
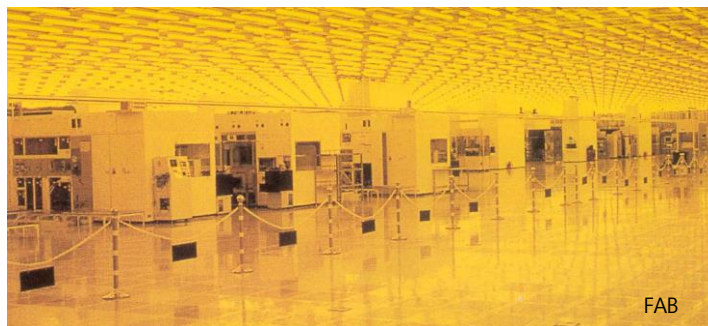
▪ Tolim E&C’s References

(Foreign Companies in Korea)		
No.	Project Name	When
1	HORIBA ESTEK Korea (Japanese) Cleanroom	2003.06
2	ULVAC Korea (Japanese) Cleanroom	2003.08
3	CKD Korea (Japanese) 1층 Cleanroom	2006.06
4	MERCK Korea (German) Cleanroom Revamp	2006.07
5	FUSSO Korea (Japanese) Cleanroom	2007.03
6	UCT Korea (KITS, Japanese) Cleanroom	2007.06
7	FAURECIA (French) Utility & Duct , Hook-Up	2008.06
8	A1 ENGINEERING Korea (American) HVAC	2008.08
9	DANON Korea (French) Mechanical Facility	2008.11
10	MERCK Korea (German) PLS Lab Design	2008.11
11	FAURECIA (French) Muffler Lab Facility	2009.04
12	BUSCH Korea (German) Mechanical Facility	2010.04
13	MERCK Korea (German) TC Building Renovation	2010.09
14	CKD Korea (Japanese) 2F Cleanroom	2010.12
15	Asahi KASEI (Japanese) 1st Cleanroom	2011.02
16	ATMI (American) Lab Revamp	2011.04
17	Asahi KASEI (Japanese) 2nd Cleanroom	2012.10
18	DENSO Automotive Cleanroom	2012.09
19	SFC / Hodogaya (Japanese) 1st OLED Cleanroom	2013.06
20	SCAPA Korea (English) Film & Tape Cleanroom	2015.12



## 09 Products

### ■ FFU & Ceiling Grid

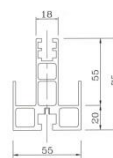
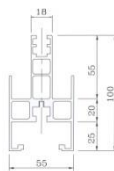


Ceiling Grid

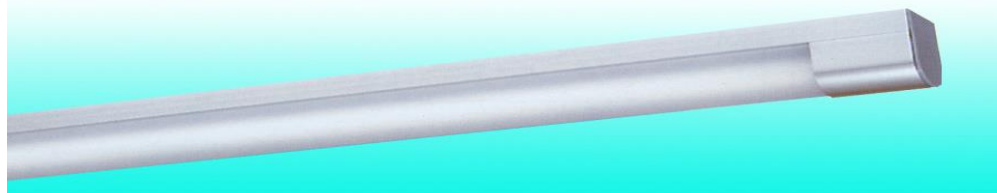
FFU(Fan Filter Unit)



Super Cleanroom (Class 10)



Tear Drop Lighting (LED Option)



▪ FFU Specification



Model : TLF-S

Dimension(mm)	1176W×576D×271H			
Power	1ph×220V×60Hz(AC)			
Air Velocity(m/s)	0.25	0.35	0.45	±15%
RPM	841	936	1025	
Power Consumption(w)	105	123	145	
Speed Controller	3 Step Controller			
Static Pressure(mmAq)	9			Without Filter
Noise Level(dB)	51	52	53	
Fan Type	Aluminum(or PVC) Backward Curved Fan			
Motor Type	External Rotor type Motor(or In-Motor)			
Weight(Kg)	22			Without Filter
Vibration Level(μm/s)	Below 3			On Grid
Filter Dimension	1172×572×75(mm)			
Filter Efficiency	99.99995 % at 0.12μm			ULPA Filter
Pressure Loss at Filter	9.5 mmAq			
Filter Media	Fine Fibered Micro Glass Fiber			
Sealant	Self Extinguish Urethane Resin			
Filter Frame	Aluminum			
Gasket	Neo-sponge / Air in – 8mm, Air out – 5mm			

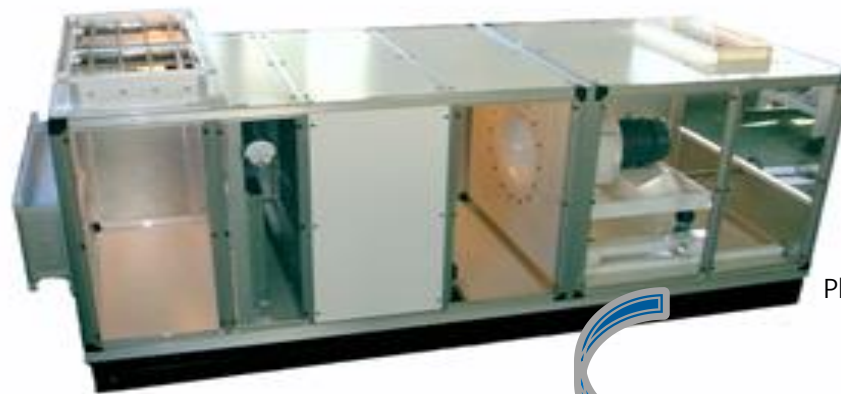
\* Options : 50Hz / 60Hz , 3PH 380V, DC Motor, 1,200\*1,200 Size

# 09

## Products

### ▪ Air Handling Unit with Plenum Fan

1. Low Noise & Low Vibration
2. No Sound Chamber
3. Compact Size → Save Space of Machine room
4. Easy Maintenance (No Grease, No Fan Belt)
5. Easy Installation (Aluminum Modular type Assembly)



Plenum Fan (Inside)



- \* AMCA Seal Certified Air Foil Fan driven with direct motor
- \* Isolator : Spring Mount Type
- \* Air Tight Door
- \* Drain Pan : 1.5T STS 304
- \* Users : Hospital, University, Mall, Factory

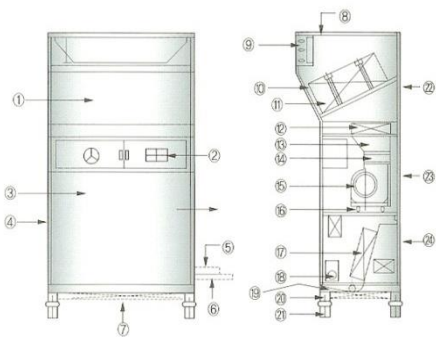
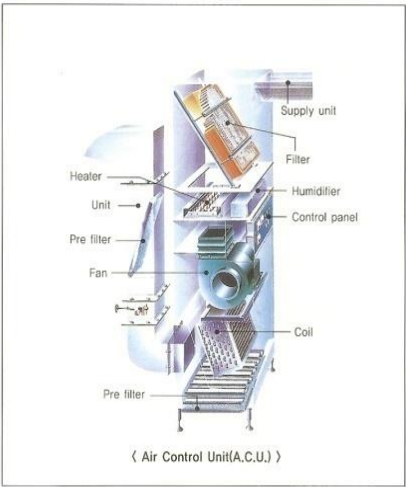


■ Air Control Unit (ACU)

ACU Cleanroom System can guarantee Class 10,000 without gratings on the floor.

ACU provides constant, very stabilized air flow by the line type punching duct beneath the ceiling.

It can be also used for better clean air circulation with CU (Circulation Fan Unit) on the opposite side.



NO	Particulars	Maf's	Q.TY	Description	NO	Particulars	Maf's	Q.TY	Description
1	Front(Upper)panel	SBC	1	1.6t	14	Neoprene packing			40t×300w
2	Control box		1	1.2t	15	Fan & Motor		1	
3	Front(Bottom)panel		1	1.2t	16	Rubber isolator		4	YA-2035
4	Side panel		2	1.2t	17	Cooling coil	AL CU	1	
5	Fresh air duct		1	1.2t	18	Humidifier	SUS	1	1.2t
6	Pipe connection			1.2t	19	Drain-Pan		1	1.2t
7	Pre-filter		1		20	Pre-Filter case	SBC	1	3.2t
8	Top panel	SBC	1	1.6t	21	Leg		1	φ 25
9	Grille	AL	1		22	Back(Top) panel		1	1.2t
10	Filter bracket	SBC	2	3.2t	23	Back(Upper)		1	1.2t
11	Hepa filter	SUS	1	200×15×102	24	Panel		1	1.2t
12	Heater	SBC	1			Back(Bottom)			
13	Hopper	SBC	1	1.2t		Panel			

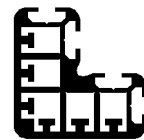
■ Specification

Model No.		TLCU-30	TLCU-50	TLCU-75
Air volume,	CMM	30	50	75
Fan size	#×EA	1½(S.S)×2	1½(S.S)×2	1½(D.S)×2
Fan motor	KW	0.75	1.5	2.2
Cooling cap.	kcal/h	8,400	14,300	21,500
Heating cap.	kcal/h	6,400	10,750	15,480
Elec. Heater	kw×Step	1.85×4	3.2×4	4.5×4
Humidifier cap.	kg/h	2.4	3.6	4.8
Pan type	KW	2	3	4
Hepa filter eff.	%	D.O.P 99.97% 0.3µm		
Pre filter eff.	%	50t N.B.S 85%		
Control		Humidistat, Heating, Cooling, Solenoid Valve, Expansion Valve		
Main N.F.B	A	50A	75A	125A
Full load	KW	10.65	18.15	26.3
Dimension	mm	1,050×570×2,300	1,250×715×2,300	1,400×715×2,300
Sound level	dB	50~60		
Power source		3φ×220V×60Hz		

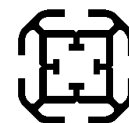
# 09

## Products

### ▪ Mini-Environment System (Clean Booth)



Al Profile



\* Option : Aluminum or Steel



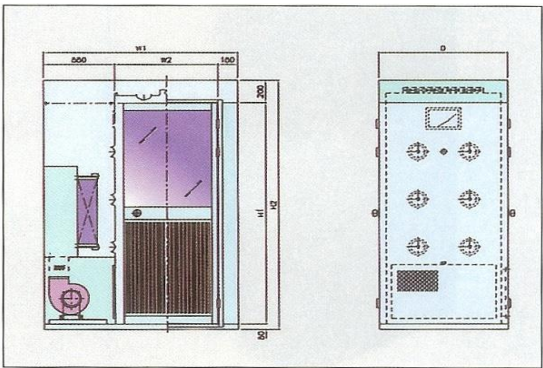
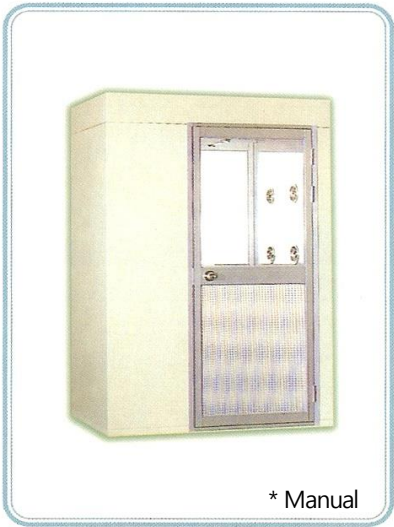
Steel + Anti-Static Vinyl Wall



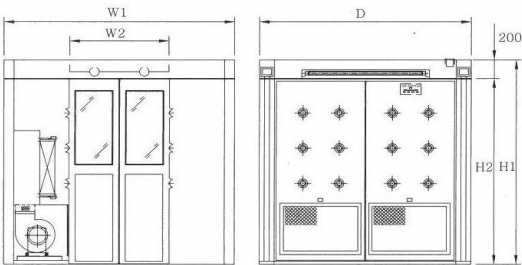
Al Profile + Anti-Static Poly-Carbonate Wall

■ Air Shower

The air shower removes surface tint and dust from garments of workers entering the cleanroom without time consuming.  
It is able to remove particles on the surface speedy and powerfully.



TYPE	W1	W2	H1	H2	D
DIAS-A	1500	800	1950	2200	1000
DIAS-B	1500	800	1950	2200	1500
DIAS-C	1500	800	1950	2200	2000



Dimensions

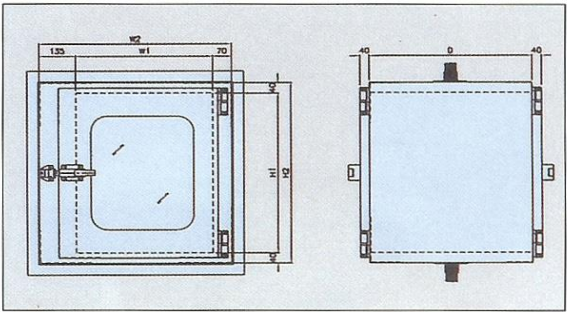
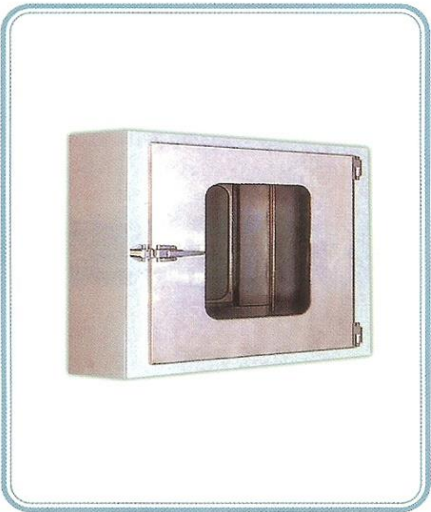
Model	W1	W2	H1	H2	D
SHAS-AD	2600	1200	2200	2000	2000



09  
Products

▪ Pass Box

The pass box minimizes entry of contaminants into Cleanroom by providing a means for pick-up and delivery of products or parts without personnel entry.



▪ DIMENSION

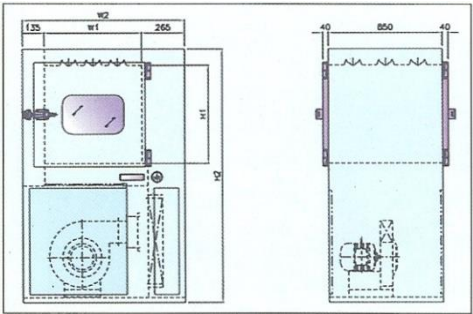
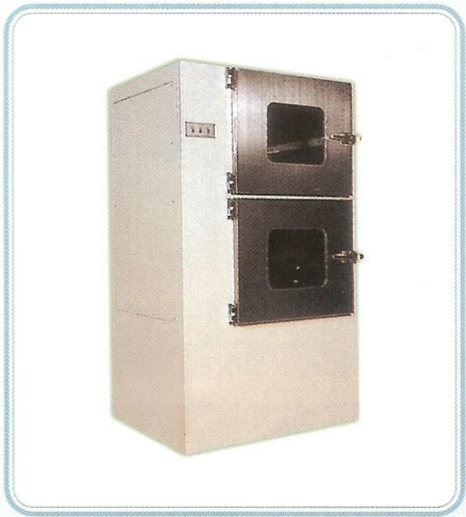
TYPE	W1	W2	H1	H2	D
TLPB-A1	305	510	420	500	400
TLPB-A2	405	610	520	600	500
TLPB-A3	505	710	620	700	600

▪ SPECIFICATION

TYPE	Standard Type	UV Lamp Type
EXTERIOR	Oven backed melamine coated finish	
INTERIOR	STS(304)	
WINDOW	Safety Glass 5t	
INTER LOCK	Mechanical	
OTHERS	U.V Lamp off when Door Open	

▪ Pass Box (Showering type)

This type of pass box design consists of interlocking system. HEPA filter, fan and roller conveyor(optional) transportation of materials can be done by these units with maximum protection from contamination.



▪ DIMENSION

TYPE	W1	W2	H1	H2
TLPB-B	500	850	500	1,500
TLPB-C	750	1,100	500	1,500
TLPB-D	500	850	750	1,750

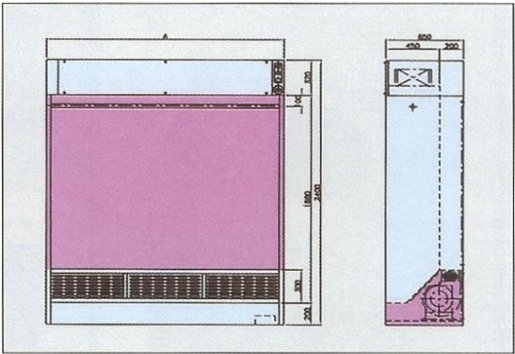
▪ SPECIFICATION

TYPE	TLPB-B	TLPB-C	TLPB-D
AIR VELOCITY(m/s)	25		
AIR VOLOME(CMM)	8.5		
NOISE dB(A)	< 65		
FILTERING(A)	0.3µm D.O.P 99.97% over or 0.1µm 99.999% over 선택		
POWER	ø3x380/220Vx50/60Hz		
POWER(W)	375W		
WEIGHT(kg)	≈250		

09  
Products

▪ Clean Locker

These specially designed clean lockers prevent deposits of dust and other particles on Cleanroom garments when not in use.



▪ DIMENSION

TYPE	TLCL(A-D)			
W	900	1,200	1,500	2,000

▪ SPECIFICATION

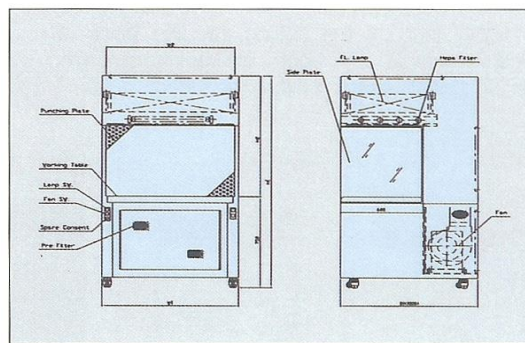
TYPE	TLCL-A	TLCL-B	TLCL-C	TLCL-D
AIR VELOCITY(m/s)	0.3m/s ± 10%			
AIR VOLUME(CMM)	6	8	10	13.3
VIBRATION(μm)	X, Y, Z Axis <3			
FILTERING EFFICIENCY(%)	0.3μm D.O.P 99.9% over or 0.1μm 99.999% over			
POWER	ø3x380/220Vx50/60Hz			
POWER CONSUMPTION(W)	220W			

\* Option : Doors



## ■ Clean Bench

This unit provides a comfortable, work-efficient sitting position for manufacturing, inspection and assembly procedures requiring local protection from particles.



### ■ DIMENSION

	TLCB			
	1,000	1,300	1,600	1,900
TYPE	1,000	1,300	1,600	1,900
D	1,500	1,500	1,600	1,540
H	680	680	720	720

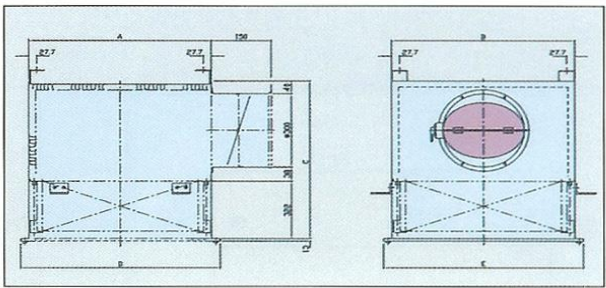
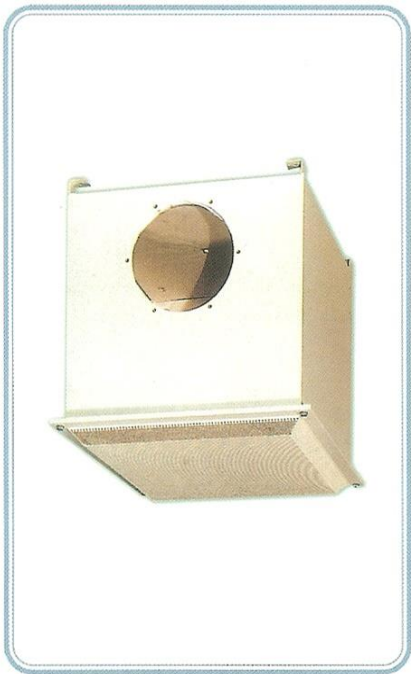
### ■ SPECIFICATION

TYPE	TLCB-1000	TLCB-1300	TLCB-1600	TLCB-1900
AIR VELOCITY(m/s)	0.4m/s over			
AIR VOLUME(CMM)	20	26	32	38
ILLUMINATION	1000 Lux			
NOISE dB(A)	<65			
VIBRATION(μm)	X, Y, Z 축			
FILTERING EFFICIENCY(%)	0.3μm D.O.P 99.9% over or 0.1μm 99.999% 선택			
FL. LAMP	20Wx4EA	650W	750W	900W
POWER & CONSENT	ø3x380/220Vx50/60Hz, ø1x220/110Vx15Ax2			
POWER CONSUMPTION(W)	400W	650W	750W	900W
TABLE	SUS 304			
WEIGHT(kg)	160	190	220	240

09  
Products

▪ HEPA Filter Unit

This unit is a basic equipment for cleanroom requiring turbulent Air-flow.  
There is a HEPA Filter inside.



▪ DIMENSION

	TLHB				
	A	B	C	D	C
A TYPE	560	560	610 630	630	630
B TYPE	670	670	610 700	742	742
C TYPE	670	975	610 700	742	1047
D TYPE	670	1320	610 700	742	1392

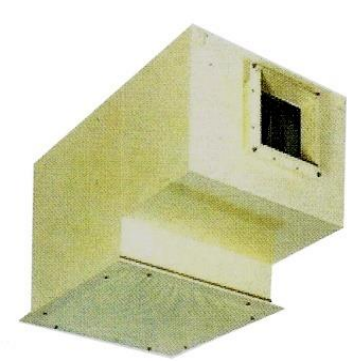
▪ SPECIFICATION

TYPE	TLHB-A	TLHB-B	TLHB-C	TLHB-C
CASING	STEEL OR SUS 304			
PUNCHING PLATE	STEEL OR SUS 304			
FILTERING EFFICIENCY	0.3µm D.O.P. @99.97%			
NUMBER OF FILTER	1	1	1	2
DAMPER	STEEL OR SUS			
NUMBER AND SIZE OF DAMPER	ø300x1	ø300x1	ø300x1	ø300x2

\* Option : Stainless HEPA Filter Unit For P.A.O Test

▪ Blower Filter Unit (BFU)

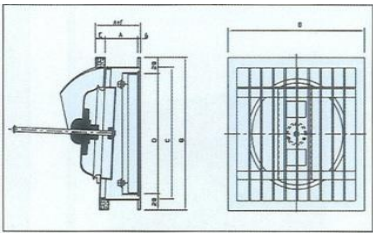
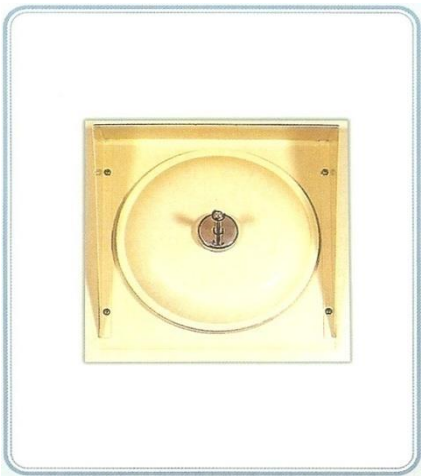
Blower Filter Unit is divided in to two groups, fan unit and filter unit.  
Blower Filter Unit utilizes small fan which produces low noise and low vibration.  
All unit are available for duct connection type



TYPE	TLBFU-A
FILTERING EFFICIENCY	0.3µm D.O.P 99.9%
FILTER	HEPA FILTER
AIR VOLUME	30 CMM
BODY	OVEN BACKED MELAMINE COATED
POWER	ø3x220/380Vx60Hz
POWER CONSUMPTION	0.35~0.67kw
WEIGHT	60KG

▪ Relief Damper

This unit keeps inside pressure higher than outside pressure to protect the cleanroom from contaminants outside.



TYPE	A	B	C	D	E	REMARKS
ø 190		282	245	226	20	ø 190
ø 250		340	302	284	25	ø 250
A-WALL THICKNESS(MM)						



## 09 Products

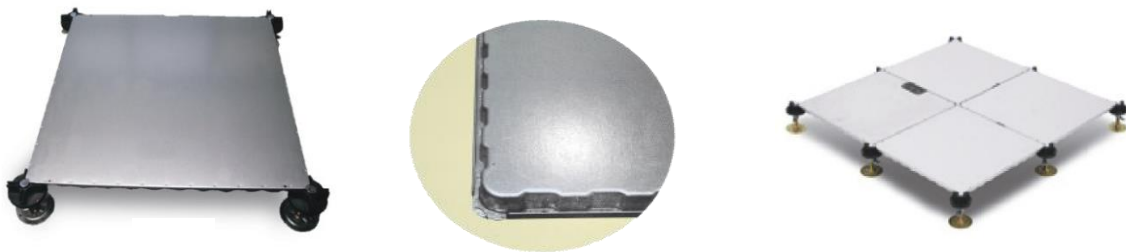
### ▪ Aluminum Access Floor (For Cleanroom)



Model		Thickness (Non Tile)	Load Specification (kgf)				Open Ratio
			Edge		Center		
			Max	2mm	Max	2mm	
07S	Solid	41-44	1,700	700	1,800	700	20%
	Perforated		1,600	600	1,700	600	
08S	Solid	38-44	2,500	900	2,800	1,000	20%
	Perforated		2,300	800	2,700	900	
10S	Solid	48-51	2,600	1,100	3,000	1,100	18%
	Perforated		2,500	1,000	2,800	1,000	
12S	Solid	48-51	2,700	1,200	3,100	1,300	20%
	Perforated		2,700	1,100	3,000	1,100	
15S	Solid	48-55	4,000	1,500	4,000	1,500	22%
	Perforated		4,000	1,400	4,000	1,500	
G55	Grating	50-51	2,700	1,200	2,800	1,200	51%
G50	Grating	50-51	2,700	1,200	2,800	1,200	50%
G30	Slotted	50	2,600	1,100	2,800	1,200	30-35%

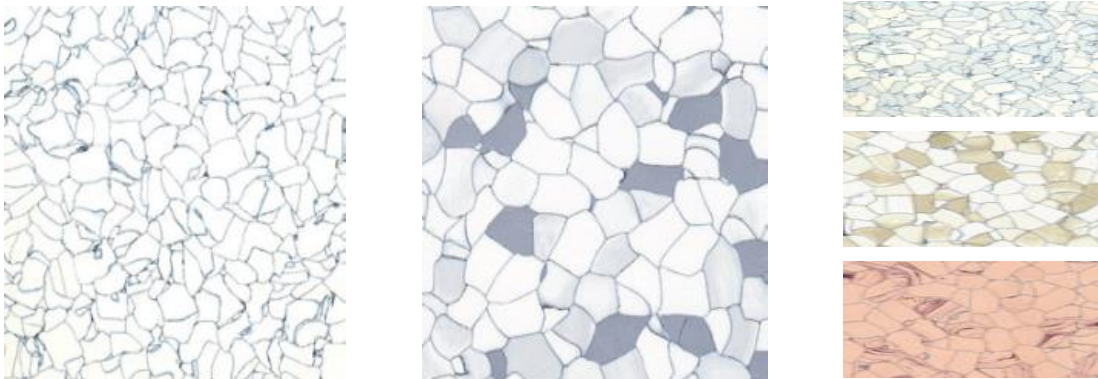
## ▪ OA Floor & Conductive Tile

### AMARU Premium 600/500 OA Floor



Particle Board Inside (Up to 800Kgf), With Non-Slip Tile

### Conductive Tile



### Products Carried :



# 10 Cleanroom Design Conditions

## Best Cleanroom needs more Meeting and Consideration

### 1. Cleanroom Conditions (Each Room)

- Space & Height : Consider Ceiling Height for Maintenance
- Temperature, Humidity : Precision Deviation
- Cleanliness : CLASS, Particle Criteria ( $0.5\mu\text{m}$  or  $0.3\mu\text{m}$ )
- No. of Personnel, Illumination
- Flow of Human & Product
- Future Extension or Upgrade

### 2. Cleanroom System

- Laminar Flow : Class 1 ~ Class 100 → Fan Filter Unit + Access Floor
- Turbulent Flow : Class 1,000 ~ Class 10,000 → HEPA Filter Unit + Blower Filter Unit
- Semi-Cleanroom : Class 10,000 ~ Class 100,000 → Air Control Unit (+ Punching Duct)

### 3. Panel & Floor

- Panel: Styrofoam(EPS), Urethane(PUR), Honey-Comb(SGP)
- Color : Ivory, White-Grey, Anti-Static Coating(Y or N)
- Door : Swing, Hanger, Automatic, Fire-Fighting, Speed Door
- Floor : Epoxy Lining, Conductive Tile, OA Tile, Access Floor, Thickness
- Window : Location, Quantity

### 4. HVAC

- Exhaust : POU (Point of Use) Size, Quantity, Type ◀ Important
- Production Equipment Heat or Electric Consumption ◀ Important
- Utilities Consumption List(Matrix) for Each Equipment ◀ Important
- Simultaneous Usage Rate & Peak Load
- Energy Source : Electricity, Gas, Boiler, Chiller(Water or Air)



## 5. Clean Equipments

- Air Shower : Location, Capacity, Automatic Door (Y or N)
- Pass Box : Location, Capacity, Showering (Y or N), Automatic Door (Y or N)
- Clean Locker : Showering (Y or N)
- Hand Washer, Work Table, Clean Bench(M.E), Clean Booth

## 6. Utilities

- Exhaust : Acid & Alkali → Wet Scrubber (PVC or FRP Duct)  
Organic → AC Tower or RTO (STS Duct)  
Heat & General → Fan, Dust → Bag filter, Cyclone
- CDA(Clean Dry Air) : Capacity, Oil Free(Y or N), Dew Point, Pipe Material, POU's
- DI(Ultra Pure Water) : Capacity, Resistivity, Pipe Material, No. of POU's
- GAS(N<sub>2</sub>, Ar, He) : Capacity, Pressure, Pipe Material, No. of POU's
- Drain & City Water : Capacity, Pressure, Pipe Material, No. of POU's, Collection
- PCW(Process Cooling Water) : Capacity, Pressure, Pipe Material, No. of POU's
- VACUUM(Process Vacuum, House Vacuum) : Capacity, Vacuum, No. of POU's

## 7. Electric & Automatic Control

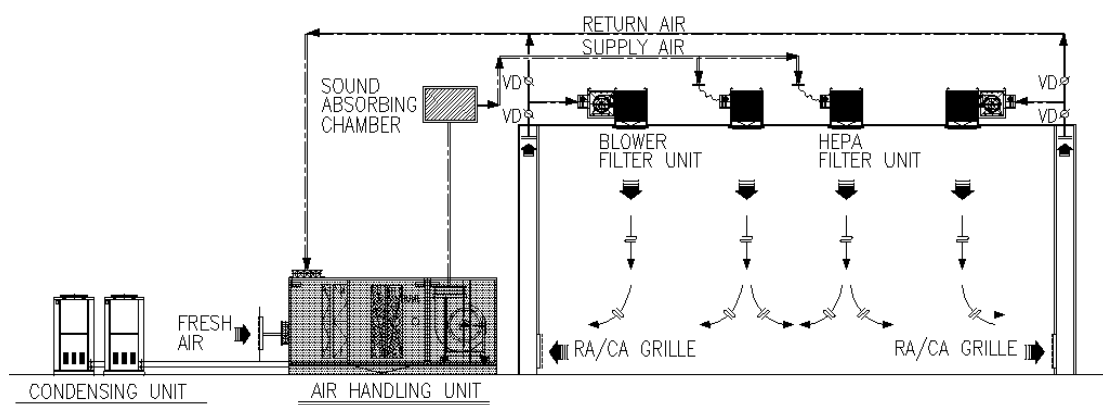
- Power : 3PH 440V/380V/220V, 1PH 220V/110V (Transformer?)
- Total Power : Cleanroom (HVAC & Utilities) + Production + Office
- Lighting Type : Fluorescent, Tear Drop, LED, Metal light
- Automatic Control : DDC, PLC, MICOM
- Control Level: CCMS, Remote Control
- Is main power capacity enough ?

## 8. Others

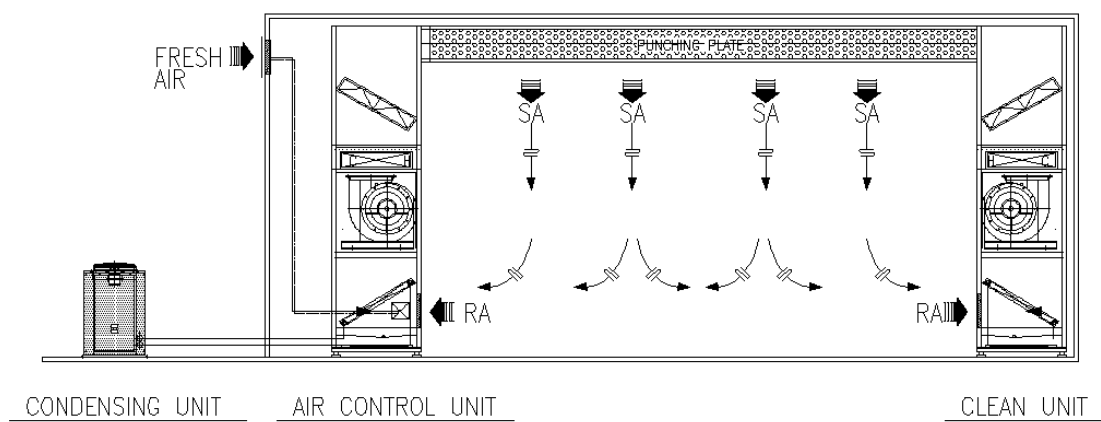
- Fire-Fighting Scope : Detector, Sprinkler, Hydrant
- Machine Room : Location, Space, Noise & Vibration, Load
- Hook-Up : Piping & Electric (normally out of contract)
- Permission : Environment (Water & Air), High Pressure Gas
- Bio-Cleanroom : GMP, HACCP Validation

## Reference Data

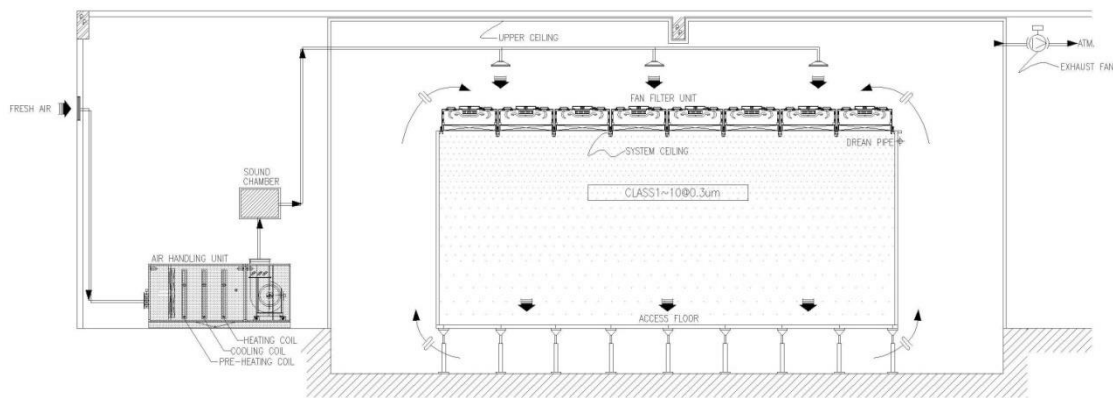
<Sample 1> Conventional Cleanroom that BFU and HFU are mixed (Class 1,000~10,000)



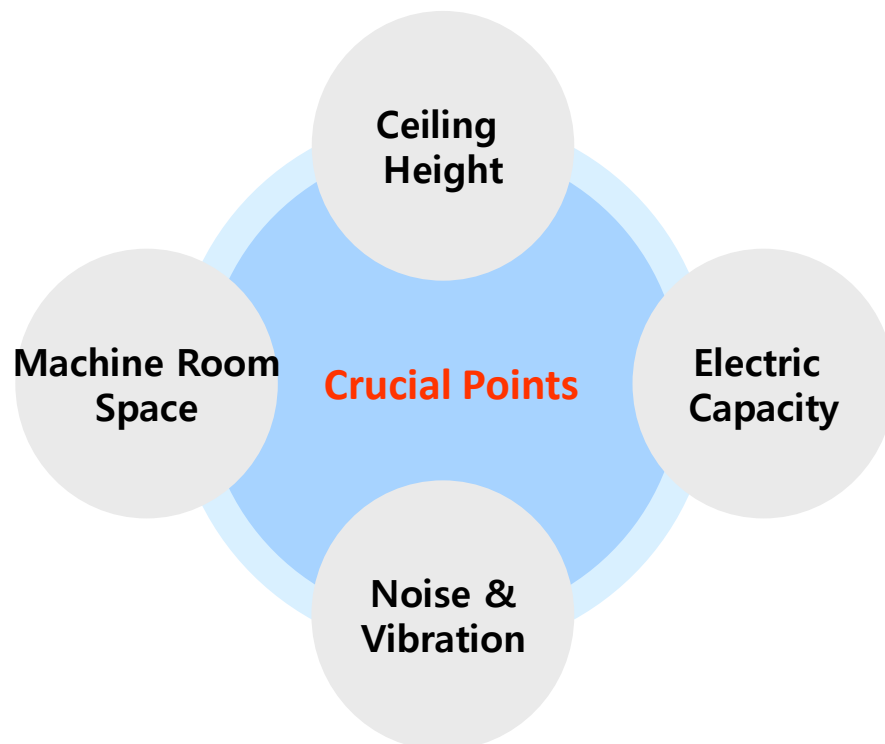
<Sample 2> Semi Cleanroom that ACU and CU are mixed. (Class 10,000~100,000)



<Sample 3> Super Cleanroom that FFU and Access Floor are used. (Class 1 ~ 100)



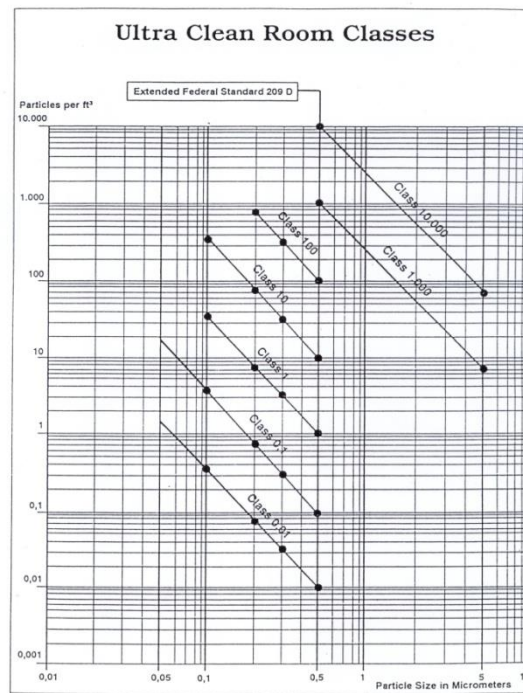
\* Precautions for Cleanroom Construction





## Reference Data

### ■ Cleanroom Cleanliness



### ■ ISO Cleanliness Classification(ISO 14644-1, Particles/m<sup>3</sup> of Air)

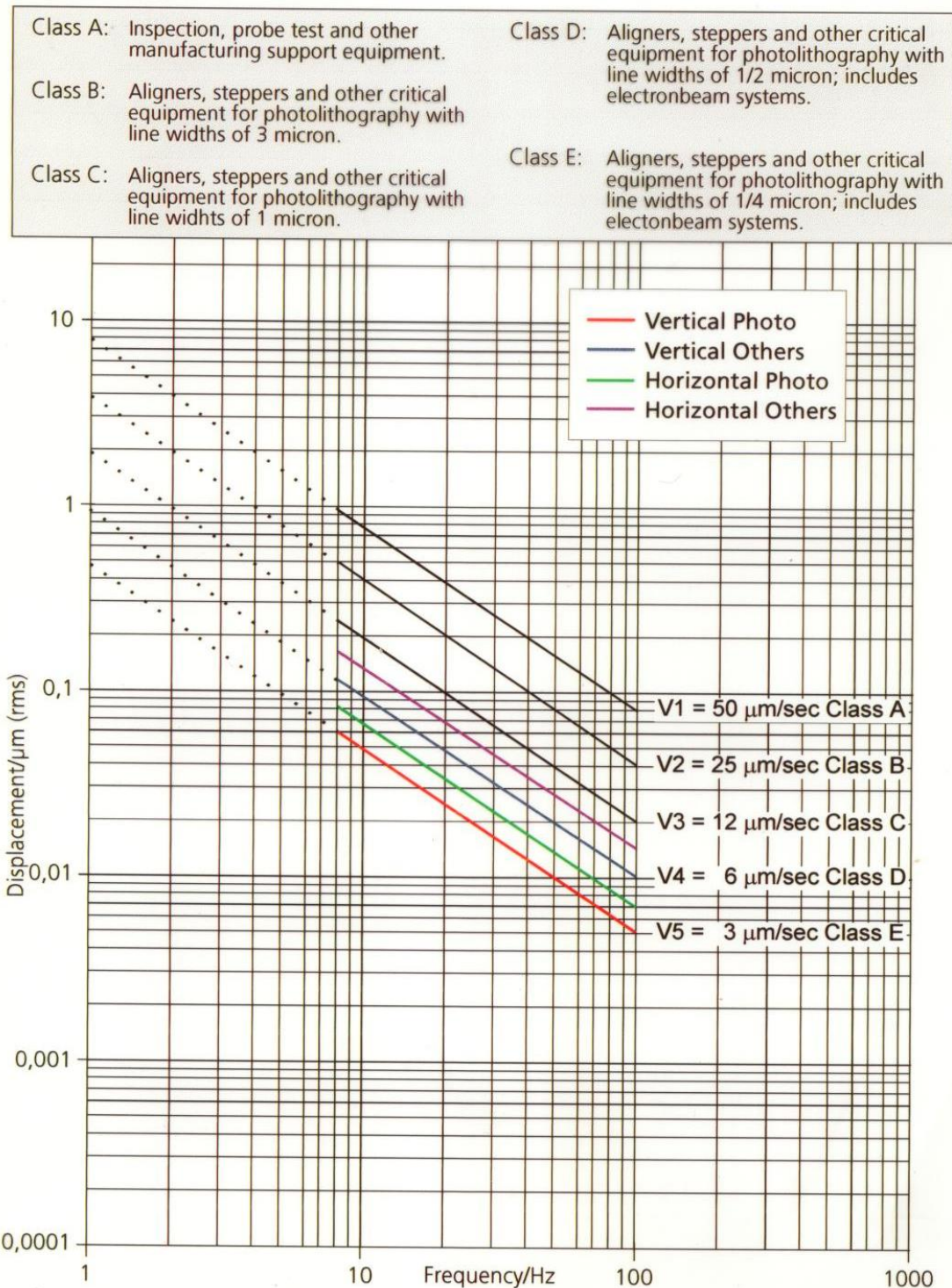
ISO CLASS (N)	0.1 $\mu\text{m}$	0.2 $\mu\text{m}$	0.3 $\mu\text{m}$	0.5 $\mu\text{m}$	1.0 $\mu\text{m}$	5.0 $\mu\text{m}$
ISO CLASS 1	10	2				
ISO CLASS 2	100	24	10	4		
ISO CLASS 3	1,000	237	102	35	8	
ISO CLASS 4	10,000	2,370	1,020	352	83	
ISO CLASS 5	100,000	23,700	10,200	3,520	832	29
ISO CLASS 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO CLASS 7				352,000	83,200	2,930
ISO CLASS 8				3,520,000	832,000	29,300
ISO CLASS 9				35,200,000	8,320,000	293,000

### ■ Comparison between ISO 14644-1 & Federal Standard 209E

ISO 14644-1	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Fed-Std-209	Class 1	Class 10	Class 100	Class 1,000	Class 10,000	Class 100,000

– Fed-Std-209 : Particles/ft<sup>3</sup> of Air

### ■ Vibration Criteria

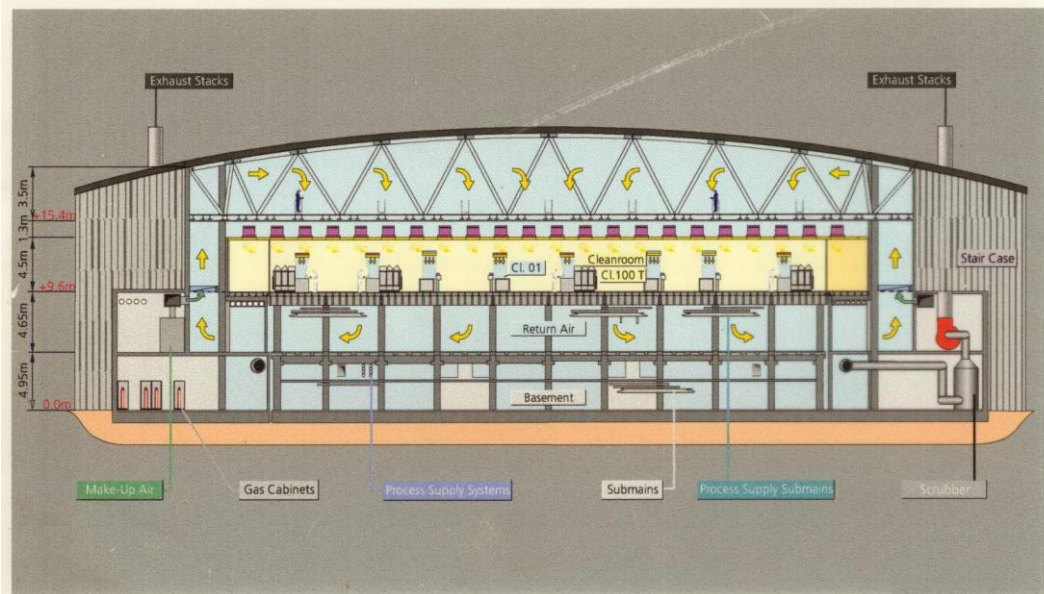




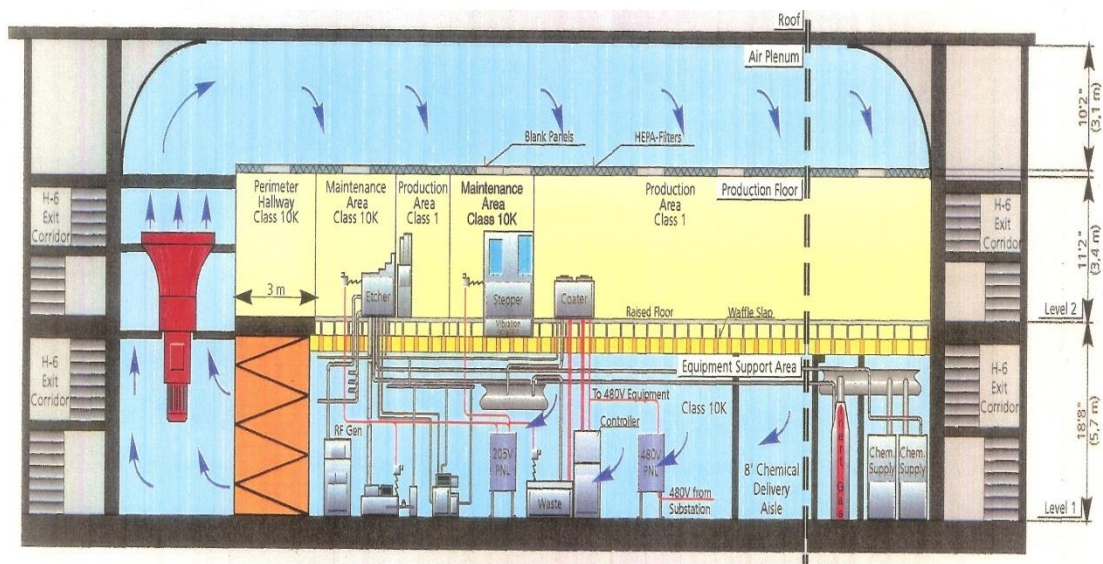
## Reference Data

- Applied in Mammoth FAB like Samsung Electronics

### 3-Level Fab - Ultra Filter Fan Units - SMIF Concept - Selfpowered Minienvironment



### 2-Level Fab-Typical Cross-Section









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