



# Company Profile

CLEANROOM & HVAC ENGINEERING SPECIALIZED COMPANY

# CEO Message



**“ We are constantly striving to realize Low Cost, High Performance, and Thorough After-Sales Service. ”**



## Greetings

“ **Trust our Leading Engineering** ”

**TL ENGINEERING**, a KONEX(Korea New Exchange) listed company is established independently "Cleanroom & HVAC Engineering Specialized Company" in December 2002 by key members of **Germany's M+W Group ([www.mwgroup.net](http://www.mwgroup.net)) Korea**, the world's best facility engineering & management company.

Our company is comprised of professional engineers with decades of experience in **cleanrooms, including air conditioning, utilities, fire-fighting design and construction**, in various fields such as semiconductor, LCD, OLED, pharmaceuticals, foods, cosmetics, medical devices, and film/coating. Since 2021, we have been manufacturing movable negative pressure isolation rooms and smart shelters under the brand HCC (Hybrid Clean Container), and we are also conducting franchise business which is breathable indoor air interior under the brand '**kkaegong(Clean Air Space)**'.

We know what our customers want through our field experience, we are constantly striving to realize the proposition of "**low cost, high performance, and thorough after-sales service**".

Based on the trust we have built up over the years, we will try to become a "**company that customers trust and look for**".

**We will be a company that practices corporate social responsibility.**

Sincerely, we wish you the best for your continuous success.

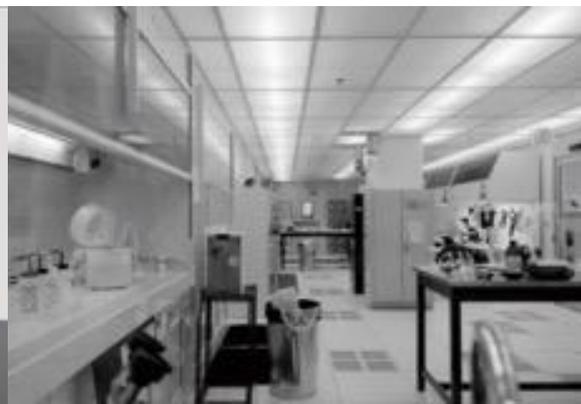
All Engineers of TL ENGINEERING



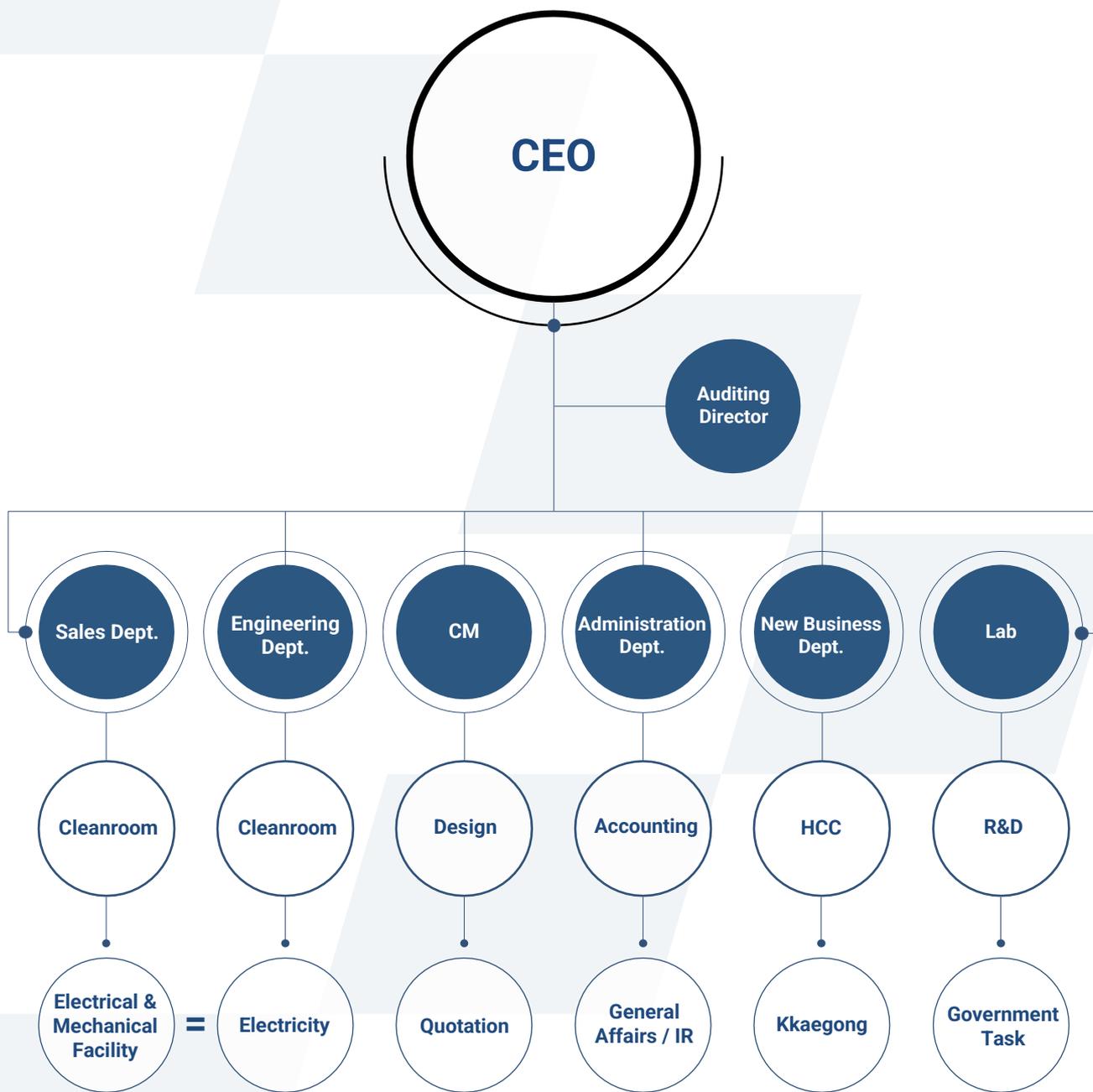
# Company Profile

## Company Overview

<b>Founded In</b>	<b>Dec. 09. 2002</b>
<b>Location</b>	<b>821, Hyundai Tera Tower, 8 Ori-ro 651beon-gil, Gwangmyeong-si, Gyeonggi-do, South Korea</b>
<b>C. E. O</b>	<b>Chris Seo</b>
<b>Gross Capital</b>	<b>6.45 Billion KRW</b>
<b>Field of Business</b>	<b>Cleanroom &amp; Utility Engineering Building Facility (HVAC &amp; Fire-fighting) HCC (Hybrid Clean Container) Manufacturing Service Kkaegong (Indoor Air Interior)</b>
<b>History of Company</b>	<p><b>Dec. 2002</b> Established Tolim E&amp;C Co., Ltd</p> <p><b>Oct. 2004</b> Registered Professional Construction Business (Mechanical Facility Construction Business)</p> <p><b>Aug. 2008</b> Registered Specialized Fire-fighting Facility Business (Mechanical &amp; Electrical)</p> <p><b>Jul. 2014</b> Established of C&amp;T, a local J.V in the Philippines</p> <p><b>Dec. 2019</b> Awarded Export tower of 1 million dollar on the Trade Day</p> <p><b>Dec. 2019</b> Awarded Minister prize by MSS (Ministry of SMEs and Startups)</p> <p><b>Nov. 2020</b> Changed company name to 'TL ENGINEERING'</p> <p><b>Nov. 2020</b> Registered Engineering Business (Facility Design Part)</p> <p><b>Dec. 2020</b> Established R&amp;D institute</p> <p><b>Feb. 2021</b> Certified Innobiz &amp; Venture Company</p> <p><b>May. 2022</b> Succeed Crowd Funding (Wadiz)</p> <p><b>Sep. 2022</b> Listed on KONEX Market</p>
<b>Chief Clients</b>	<p><b>LG Electronics / DB Hitek / Hanwha / Amkor</b></p> <p><b>Samsung Biologics / Merck / AsahiKASEI / Daewoong Pharmaceutical</b></p>

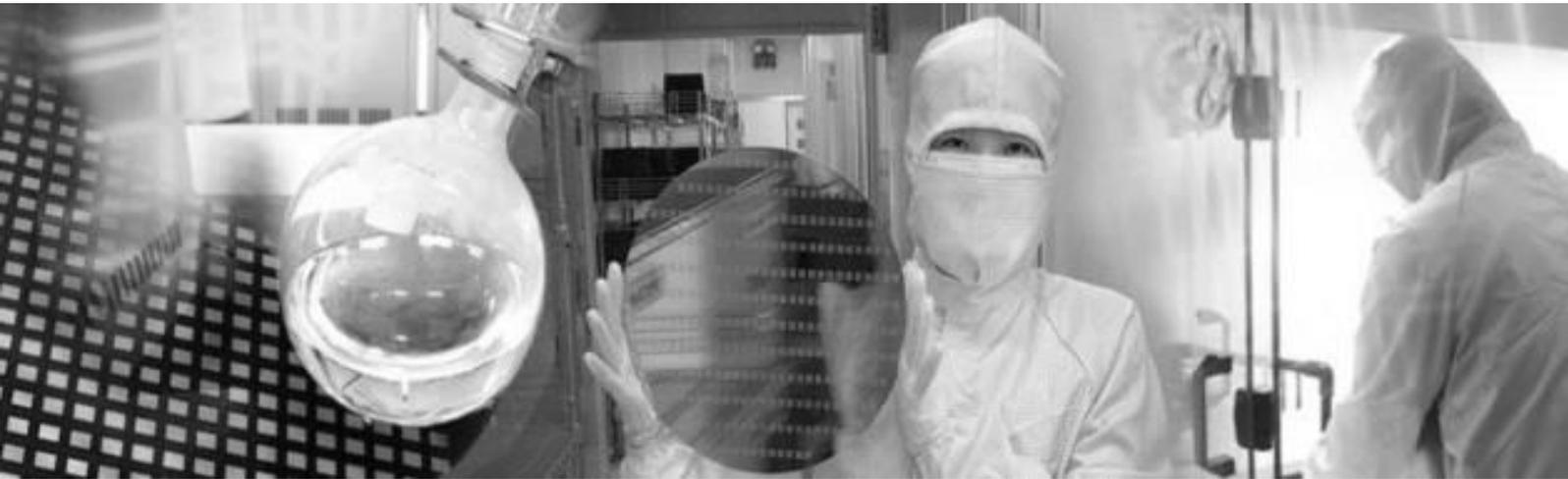


## Organization Chart





## Business Area



## Total Facility Engineering Service

### Cleanroom Design & Build

- + Semiconductor / LCD / OLED / IDC
- + Pharmaceuticals (GMP, GLP), Cosmetics (CGMP)
- + Low Humidity Room (Film, Coating, Secondary Battery)
- + Food (HACCP) / Medical Devices
- + Hospital / Biohazard (BSL)

### HVAC Engineering

- + Precise Temperature & Humidity Room
- + High-rise Large Space HVAC System
- + Fire-fighting / Hazardous Materials / Explosion-proof Facility
- + Low Temperature (Cold-storage) Warehouse
- + Electricity / Automatic Control



## Field of Business



**Steel Type HCC**  
(Negative Pressure Isolation Room & Triage Room)



**Glass Type HCC**  
(Smart Bus Shelter)



**Kkaegong Air-purifier**  
(Ceiling Mounted & Large Air Volume)



**Kkaegong System Air Flow Diagram**  
(Kkaegong means Clean Air Space)

## Utility System & Piping

- + CDA (Compressed Dry Air)
- + DI Water (UPW & WFI)
- + PCW (Process Cooling Water)
- + Vacuum (Process / House)
- + Gas (N2, Ar, O2)
- + Exhaust, Sanitary, Drain
- + Air Pollution Treatment (Scrubber, AC Tower)

## Field of New Business

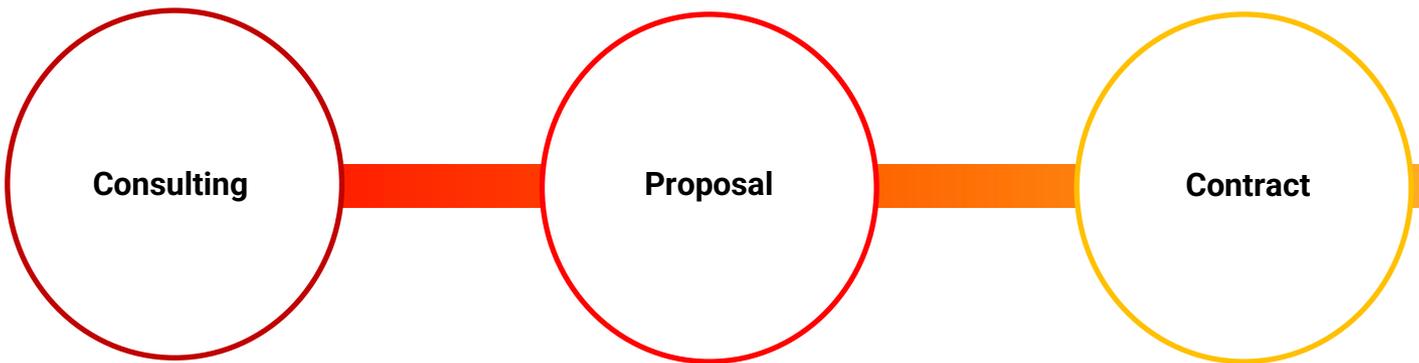
- + Indoor Kkaegong Members ([www.ufshop.kr](http://www.ufshop.kr))
  - : Air-quality Management in Retail Property (Franchise Business)
- + HCC Manufacturing Business ([www.bussshelter.co.kr](http://www.bussshelter.co.kr))
  - Negative Pressure Isolation Room (Triage Room)
  - Smart (Bus) Shelter
  - Premium Smoking Booth



## Business Flow



## Professional Consultation and Thorough Construction Management System

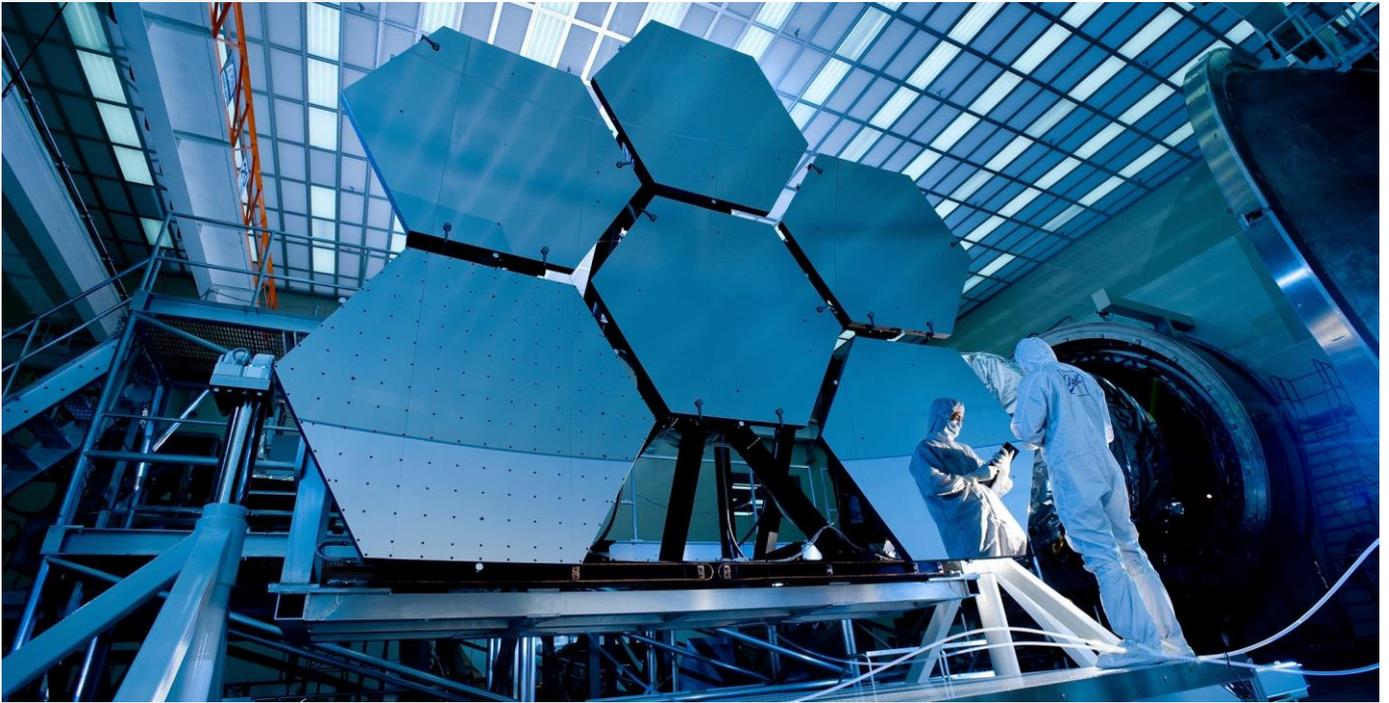


### Applied Industries

- Semiconductor / LCD / OLED / SOLAR Panel
- Pharmaceuticals / BIO / Food / Cosmetics / Medical Device
- Secondary Battery / Cellphone / Chemistry / PCB
- Film / Coating / Electric Vehicle
- Animal Laboratory / Biohazard Facility
- Research Institute / Hospital Facility



## Task Flow



**Design**

**Build**

**After-Sales Service**

### **Applied Cleanroom**

- ICR
- HACCP (Foods)

- BCR (GMP/GLP)
- Dry Room

- CGMP (Cosmetics)
- BSL / SPF



## Competitiveness

**Quick Response is TL ENGINEERING's Competitiveness!!**

**High Quality**, this is our reputation and another name for us.

**TL ENGINEERING** will further increase our pride in quality management.



### HIGH QUALITY

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

### LOW COST

- + Minimize Initial Investment
- + Save Maintenance Cost
- + Energy Saving Solution
- + V.E Suggestion / T.A.B



## Competitiveness

Our Excellent Engineering pursues Perfection!!



The best -  
**QUALITY**  
**COST**  
**SERVICE**

**QUICK  
SERVICE**



Quick After-Sales Service

Fast-Track  
(Delivery)

Quick Response of  
Production Order

Expansion Plan



# Patents



Ceiling type Air Purifier & Air Purification System (Kkaegong)



Hybrid Multipurpose Clean Container (HCC)



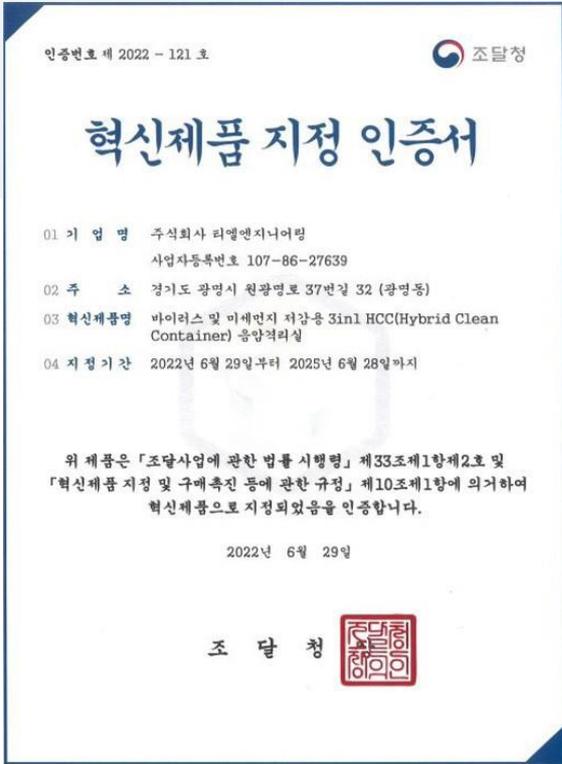
Modular type bus shelter with virus & air pollution blocking function



Facility Construction Brokerage & Management (Gongdoc) System

**Product Lineup**

3 in 1 HCC (Hybrid Clean Container) :  
Movable cleanroom that can selectively switch functions of “fine dust safe zone”, “virus safe zone”, and “emergency negative pressure isolation room” with just one container



**Public Procurement Service**



**HCC Medical Type (Negative Pressure Isolation Room)**  
Identification No. 3023169901-24351174



**HCC Premium Smoking Booth (Smoking Cafe)**



**HCC Smart Bus Shelter (Standard Type)**  
Identification No. 3022200301-24351171



**HCC Smart Shelter Type**  
Identification No. 3022200301-24522415



**HCC Smart Bus Shelter (Premium Type)**  
Identification No. 3022200301-24351173

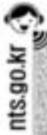


**HCC Smart Bus Shelter (Complex Type)**  
Identification No. 3022200301-24351172



# Business Certificate

## General Information Sheet




( 1 / 1 )

<b>발급번호</b> Issuance number	<b>사업자등록증명</b> <b>Certificate of Business Registration</b> (법인사업자) (Corporate Taxpayer)	<b>처리기간</b> Processing time
1905-604-3850-386		즉시 Immediately
<b>상호 (법인명)</b> Name of company (Business registration number)	(주) 티엘엔지니어링 TL Engineering Inc. (107-86-27639)	
<b>사업자등록번호</b> Business registration number	107-86-27639	
<b>성명 (대표자)</b> Name of representative (Resident(Corporation) registration number)	서충옥 SEO CHUNG OK (110111-2669260)	
<b>주민(법인)등록번호</b> Resident(Corporation) registration number	110111-2669260	
<b>사업장소재지</b> Business Address	경기도 광명시 원광명로37번길 32(광명동) <small>Republic of Korea, Gyeonggi-do, Gwangmyeong-si, Wonn-gu, 37-32, Gwangmyeong-ro, Gwangmyeong-dong, Seoul</small>	
<b>개업일</b> Date of business commencement	2002년(Year) 12월(Month) 09일(Day)	
<b>사업자등록일</b> Date of business registration	2002년(Year) 12월(Month) 10일(Day)	
<b>업태</b> Business type	서비스/제조업 Construction/Manufacturing	
<b>종목</b> Business item	기타엔지니어링 Construction of Industrial Plants 비스승강장 Manufacture of other fabricated and processed metal products n.e.c	
<b>공동사업자</b> Joint business owner	<b>성명(법인명)</b> Name(Name of company)	<b>주민(사업자)등록번호</b> Resident(Business) registration No.
	해당사항 없습니다 (No Data)	
위와 같이 증명합니다. I certify that above information is true and correct to the best of my knowledge and belief. ※ 위 내용은 발급일 현재 상황으로서 추후 변경될 수 있습니다. This information is true as of the issuance date of this certification and but maybe subject to change in the future. ※ 영문 임의 기재사항(상호, 성명(대표자), 업태, 종목, 상세주소)은 실제의 권리관계를 증명하는 효력이 없습니다. [Arbitrary name of company, name of representative, business type, business item, detail address] do not hold a power to prove the actual relationship of rights.		
<b>접수번호</b> Receipt No.	503332114016	2023년 4월 5일 Year Month Day
<b>담당부서</b> Department	민원봉사실 Taxpayer Service Center	 <b>광명세무서장</b> Head of Gwangmyeong District Tax Office (Stamp)
<b>담당자</b> Staff in Charge		
<b>연락처</b> Telephone No.	+082-2-2610-8225	







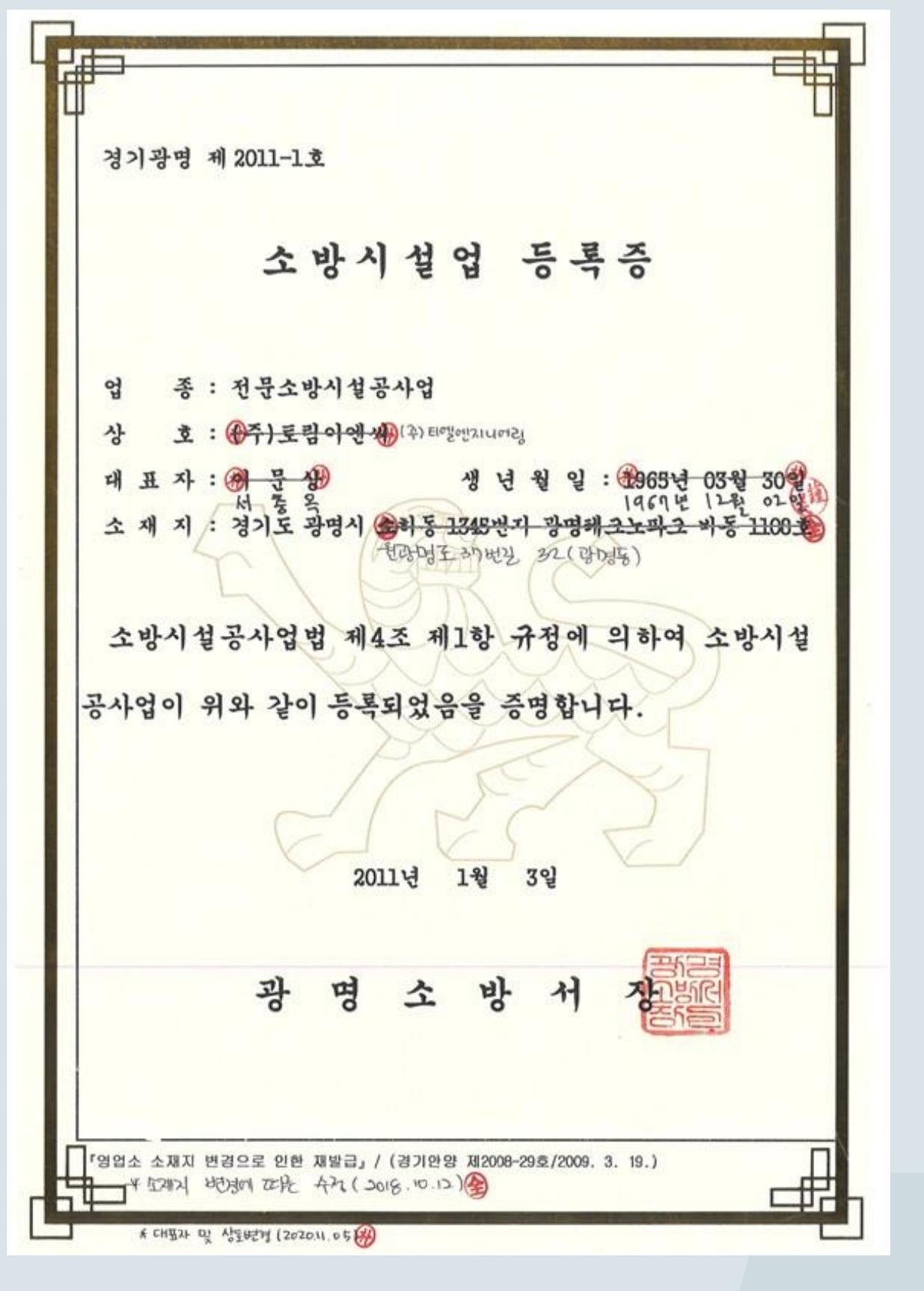
\* 본 증명서 위·변조 여부는 발급일로부터 90일 이내 「국세청 홈페이지(www.hometax.go.kr) 또는 모바일 홈택스 > 민원증명(증명발급) > 민원증명 원본확인, 예시 발급번호로 확인, 또는 문서 확인의 방법으로 확인이 가능합니다.  
 Please be advised that forgery detection of this document can be performed with either of following methods.  
 1) online with the barcode at the bottom of the document, or  
 2) with the issuance number at the bottom of the document at either Hometax website (www.hometax.go.kr) or while Hometax (Certificate of civil petition (certificate issued)  
 > Check the original certificate of civil petition) within 90 days from the date of issuance.





Certificate

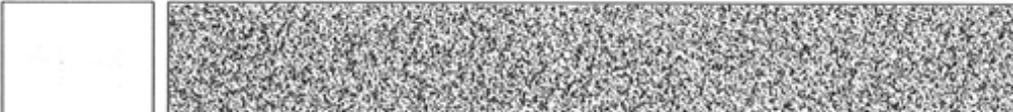
Firefighting Facility Business Certificate



## Registration Certificate

### Engineering Business Registration Certificate

20201117-SG-00000445934

엔지니어링사업자 신고증			
명 칭	(주)티엘엔지니어링		
대표자성명	서충욱	생년월일	1967.12.02
소재지	경기도 광명시 원광명로37번길 32 (광명동)	전화번호 (FAX,E-Mail)	1668-6804 050-5055-1669
엔지니어링업	신고번호	제 E - 10 - 003544 호	
	기술부문	설비 등	1 개 부문
	전문분야	설비 등	1 개 분야
엔지니어링 컨설팅업	신고번호		
	기술부문	등	개 부문
	전문분야	등	개 분야
신고연월일	2020-11-17		
<p>「엔지니어링산업 진흥법」 제21조제1항 및 같은 법 시행규칙 제7조에 따라 위와 같이 신고하였음을 증명합니다.</p> <p style="text-align: center;">2020년 11월 17일</p> <p style="text-align: center;">한국엔지니어링협회장</p> <div style="text-align: right;">  </div>			
			

본 확인서는 한국엔지니어링협회(<http://www.etis.or.kr>)에서 발급된 증명서로 우측상단의 발급번호를 이용하여 문서의 진위여부를 확인할 수 있습니다.



Certificate

Inno-Biz Certificate



## Registration Certificate

### Venture Company Certificate

제 20210101591 호

# 벤처기업확인서

업 체 명 : (주)티엘엔지니어링  
 대 표 자 : 서충욱  
 소 재 지 : 경기도 광명시 원광명로37번길 32 (광명동)  
 확 인 유 형 : 기술평가보증기업(기술보증기금)  
 평 가 기 관 : 기술보증기금  
 유효 기 간 : 2021년02월23일 ~ 2023년02월22일

위 업체는 벤처기업육성에관한특별조치법 제25조의  
 규정에 의하여 벤처기업임을 확인합니다.

2021년 02월 23일

**KIBO** 기술보증기금 이사장

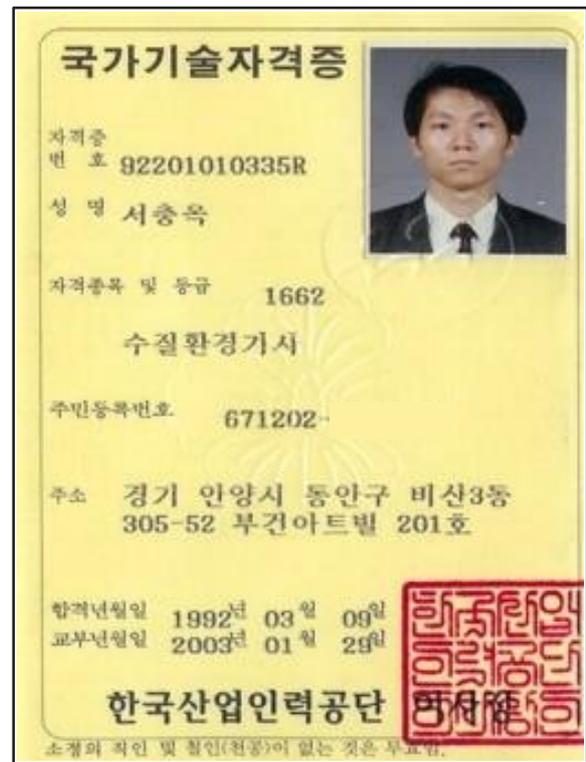


# Technical Certificate

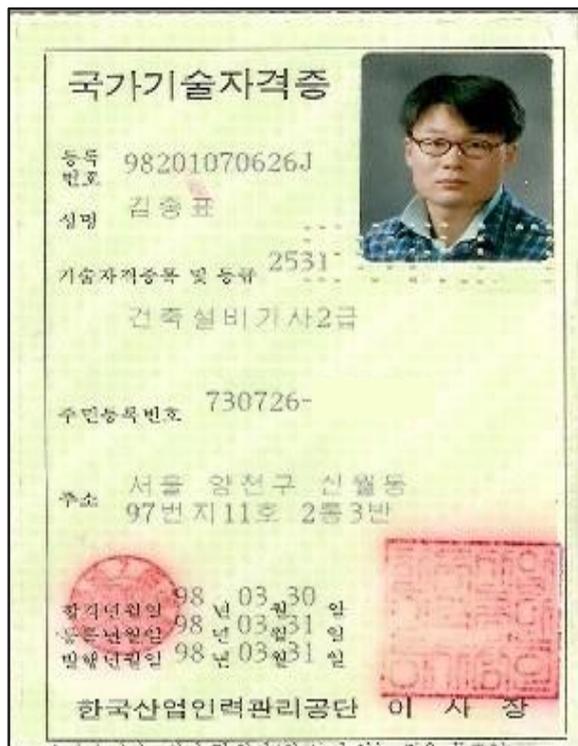
Engineer Architecture Grade-I- Moonsang Lee



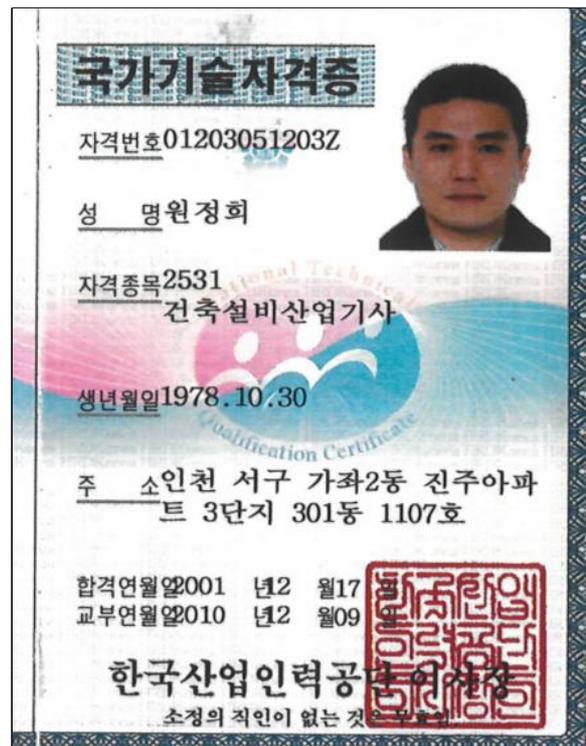
Engineer Water Pollution Environment Grade-I- Chris Seo



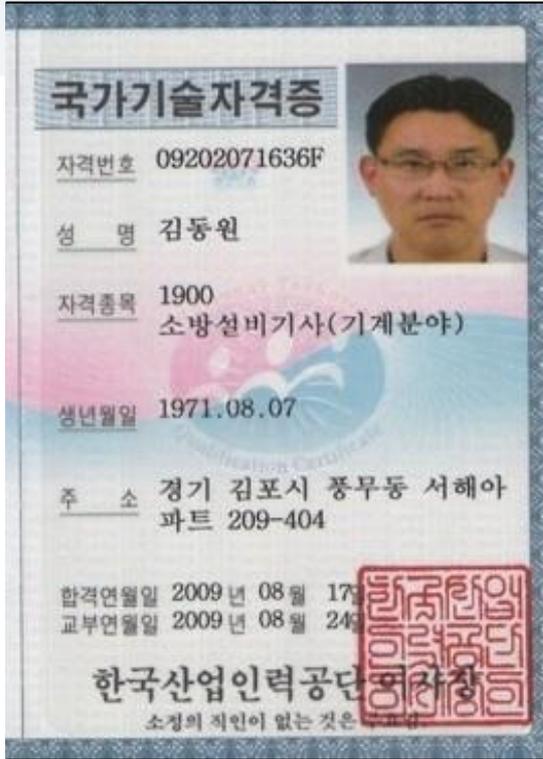
Engineer Building Facilities Grade-II- Jongpyo Kim



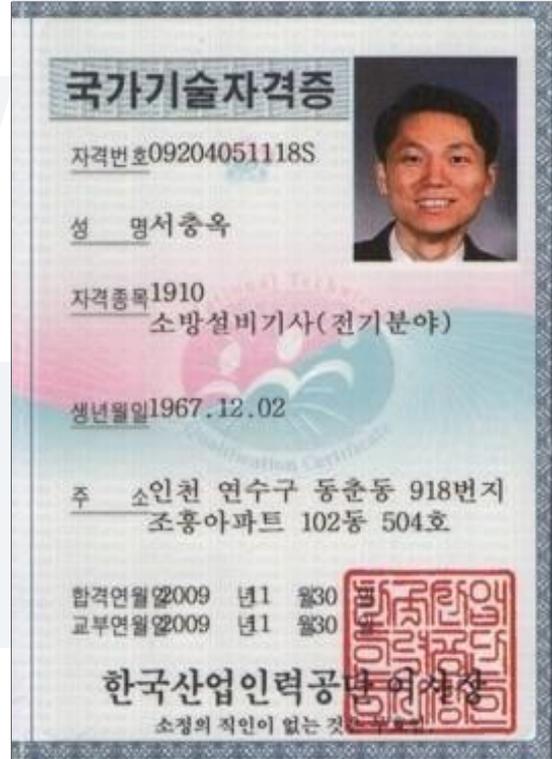
Engineer Building Facilities- Junghee Won



Engineer Fire Protection Facilities  
(Mechanical) - Dongwon Kim



Engineer Fire Protection Facilities  
(Electrical) – Chris Seo



Engineer Electricity – Deoksoo Park



Engineer HVAC– Junghee Won



# Clients

## Field of Materials / Components / Equipments

**MERCK**

액정 / OLED

**DB HiTek**

(舊) 아남반도체

**LG전자**

LCD TV

**Amkor Technology**

**WOOREE NEWOPTICS**

LCD TV

**ILJIN**

일진디스플레이

**(주)성도이엔지**  
SUNGDO ENGINEERING & CONSTRUCTION

(STI)

**츨엔지니어링(주)**

*Create Future!*  
**TES**  
Technology Engine of Science

**ICD (주)아이씨디**

**VIATRON TECHNOLOGIES**

**Selcos**

**woori MICRON**

**에이원엔지니어링**  
**ENG**

**ULVAC**

**SNF (주)에스엔에프**

**TSE**

**GMTEST**

**EXICON**

**ITEK**

아이텍반도체

**Huvitz**

**RFHIC**

**WOOREE 우리이티아이**

LED

**Entegris**

ATMI

**DS (주)디에스테크노**  
Techno DSTechno CO., LTD.

**MICRO TECH 마이크로텍**

**KOLEN**  
Korea Lens

**ASM**

## Field of Secondary Battery / Chemistry / PCB



SOLAR / 방위산업



편광판 / 전지

AsahiKASEI

2차전지 분리막

SEMENS



버숨 머트리얼즈 한양기공(주)



SFC (Hodogaya)



PCB

## Field of Film / Print



Tapex

K·ALUMINIUM  
KOREA ALUMINIUM

SKC

SANGBO

NEXFIL  
Professional Window Film Manufacturer

i-components



SAINT-GOBAIN in Korea

생고뱅 코리아

MRsolair

## Field of Machinery / Vehicle

DENSO

faurecia

BÜSCH

CKD  
CKD KOREA

SAWHWA 삼화콘덴서

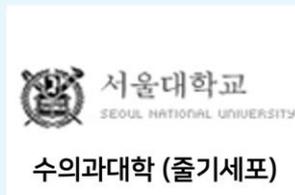
COMET network  
코멧 네트워크

FESTO

INFAC

# Clients

## Field of Pharmaceuticals / Biologics



## Field of Cosmetics / Medical Device / Hospital



## Chief Clients

### Field of Foods (HACCP)



### Field of Research Institute / Animal Laboratory / Fire Protection



# Business Reference

## Overseas Project Performance



### Singapore

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



### Norway

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



### Mexico

1. 'New Optics' LCD BM Setup Cleanroom Design & Build
2. 'New Optics' LCD BM 4Line Cleanroom Design & Build
3. 'New Optics' LCD BM 5Line Cleanroom Design & Build
4. 'LG Electronics' LCD Assembly Line Cleanroom Design & Build



### China

1. 'JS Precision' Ultra-Precision Constant Temperature and Humidity Room Design & Build



### Philippines

1. Supply of Cleanroom Materials such as FFU, HEPA Filter, Conductive Tile, Raised Floor, etc.



## Professional Design Performance (Cleanroom & HVAC Design Only)



### Overseas

1. 'NUS (National University of Singapore)' Solar Laboratory Cleanroom Design (Singapore)
2. 'Qatar Solar Technologies' Cleanroom HVAC Design (Qatar)
3. 'SUNGDO ENG' Shanghai AM Project HVAC Design (China)
4. 'HANA Micron' Semiconductor Package Fab HVAC Design (Vietnam)
5. 'CDL' FILM Line Cleanroom Design (Vietnam)



### Domestic

1. 'Hanwha Co., Ltd.' Rocket Propellant HVAC & Utility Design (Daejeon)
2. 'Natural Solution' Cosmetics CGMP Cleanroom Design (Osan)
3. 'Donga ST Pharm' Depository Area and Synthesis Area HVAC & Utility Design (Ansan)
4. 'Hanwha Co., Ltd.' Fuel Drive Operation Room HVAC Design (Asan)
5. 'STI Co., Ltd.' Cleanroom & Utility Design (Anseong)
6. 'Neo Cremar Co., Ltd.' GMP and HACCP Cleanroom & Utility Design (Iksan)
7. 'ASM Research Lab' Cleanroom (Class 10) Design (Giheung)
8. 'Amkor Technology' K4 Fab HVAC Design (Gwangju)
9. 'Amkor Technology' K5 Fab HVAC Design (Songdo)
10. 'Hanwha Co., Ltd.' Defense Industry section Exhaust System Inspection and Supplementary Design (Daejeon)
11. 'SEM CNS' New Factory Cleanroom & Utility Design (Osong)
12. 'Merck' Alpha Cell Tech Lab Cleanroom & Utility Design (Pyeongtaek)
13. 'Nanoex' MEMS FAB New Factory Cleanroom & Utility Design (Yongin)
14. 'ASE Korea' Cleanroom & Utility Design (Paju)
15. 'HB Technology' Cleanroom & Utility Design (Sejong)
16. 'NEBA Corporation' Dry Room Design (Daejeon)

# Business Reference

## Performance of <Mechanical Facility Construction> in New Factory

### TL ENGINEERING's Construction Performance (Building Facility Field)

No.	Project Name
1	Ochang 'Sias Co., Ltd.' Food Factory HACCP Mechanical Facility Construction
2	Jangan 'Daegi Faurecia Co., Ltd.' Utility & HVAC Facility Construction
3	Cheonan 'Mr. Pizza' Food Factory Mechanical Facility Construction
4	Muju DANONE Korea HACCP Factory Facility Construction
5	Songdo 'Daeyang Electric Co., Ltd.' Factory Fire Protection & Mechanical Facility Construction
6	Naju Jeollanam-do Food Industry Research Center Mechanical Facility Construction
7	Icheon 'Busch Korea Co., Ltd.' Mechanical Facility Construction
8	Seoul 'Central Micronics Co., Ltd.' Gangnam Building Mechanical Facility Construction
9	Namyangju 'Naus Co., Ltd.' Food Package Material Factory Facility Construction
10	Eumseong 'Mecaro Co., Ltd.' Chemical Business Dept. Hazardous Materials / Explosion-proof Facility Construction
11	Sejong 'FA Co., Ltd.' GMP Facility Construction
12	Guri 'Department of Education' Building Fire Protection Facility Construction
13	Daegu 'Thuringen Korea Co., Ltd.' Cosmetics CGMP Facility Construction
14	Jeungpyeong 'Jiwoo Optic Co., Ltd.' Dehumidification Room Construction
15	Iksan 'Neo Cremar Co., Ltd.' GMP & HACCP Cleanroom Construction



## Major Construction Performance Pictures



### Viatron

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



### Asahi-KASEI

- Secondary Battery Film (Separator)
- Japanese Company (Pyeongtaek)
- 1<sup>st</sup> & 2<sup>nd</sup> Plant
- Coating & Slitting



### MegaTech

- Smartphone Parts
- Korean Company (Siheung)
- Total Remodeling
- Cleanroom & Interior

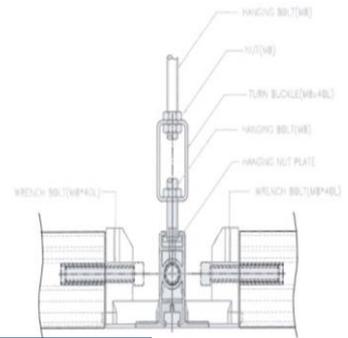
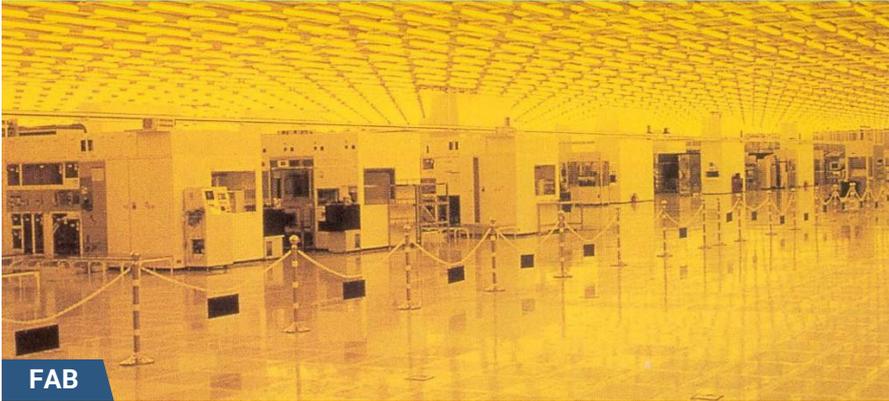


### Thuringen Korea

- Skin Cosmetics
- Korean Company (Daegu)
- CGMP Factory
- Apply Medium-temperature Water Heat Source

# Products

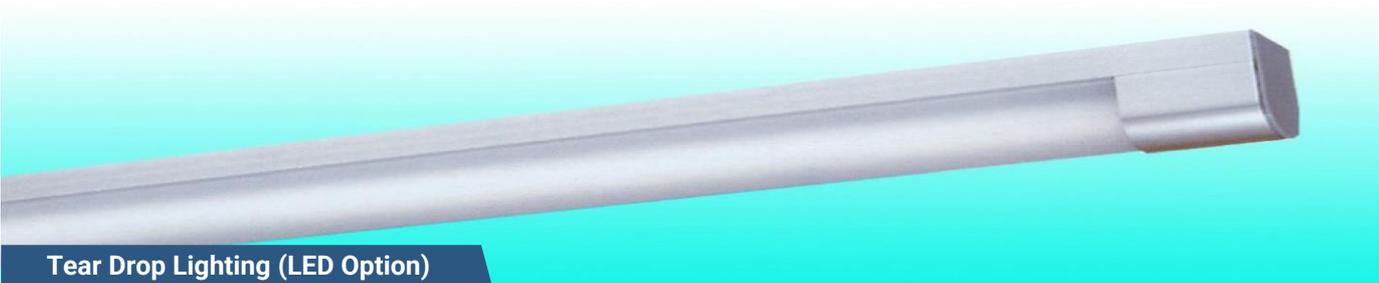
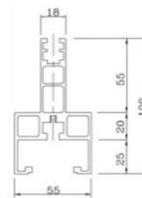
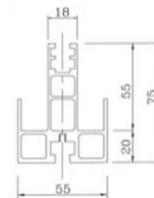
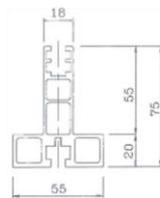
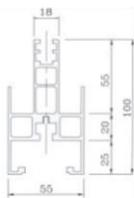
## FFU & Ceiling Grid



Ceiling Grid



FFU (Fan Filter Unit)



Tear Drop Lighting (LED Option)



## FFU Specifications



Model : TLF-S

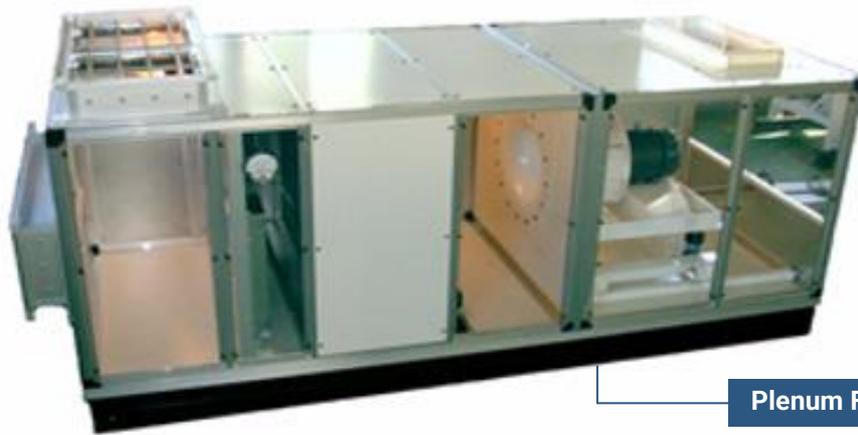
Dimension (mm)	1176W×576D×215H			22Kg
Electricity	1ph×220V×60Hz (AC)			
Air Velocity (m/s)	0.25 (L)	0.35 (M)	0.45 (H)	±10%
Air Volume (CMM)	12	15	18	±5%
Power Consumption (w)	110	115	125	±5%
Speed Controller	3 Step Controller			
RPM	870(L), 930(M), 1030(H)			
Noise Level (dB)	52	54	56	
Fan Type	Air Foil Fan (AL410 x65H)			
Motor Type	External Rotor type Motor(orIn-Motor)			
Weight (Kg)	22			Without Filter
Vibration Level ( $\mu$ m/s)	1 ~ 2			On Grid
Filter Dimension	1172×572×75(mm)			7Kg
Filter Efficiency	99.99995 % at 0.12 $\mu$ m			ULPA Filter
Pressure Loss at Filter	9.5 mmAq			
Filter Media	Fine Fibered Micro GlassFiber			
Static Pressure (mmAq)	9			Without Filter
Filter Frame	Aluminum			
Gasket	Neo-sponge / Air in - 8mm, Air out - 5mm			

\* Option : Overseas 50Hz, 3-Phase 380V, BLDC Motor, 271H or 150H, and so on. (1200\*1200 or 600\*600)

# Products

## Air Handling Unit with Plenum Fan (AHU)

1. Ultra-low Noise (65dB) & Ultra-low Vibration
2. No Need 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)

- The blower is equipped with an Air Foil-type Plenum Fan as standard, employing 'Twin City Fan(U.S), or Rosenberg Fan(Germany)' AMCA's Sound and Performance Seal-certified products, and the wings are made of steel welded or extruded aluminum.

- The driving method is a motor direct drive method, so there is no breakdown even during long-term continuous operation and minimizes the occurrence of noise and vibration.

- The ISOLATOR is installed an airtight dustproof (Spring Mount-type) to absorb vibration.

- The filter exchange should be made in a structure that can be exchanged from the front or side, and the wind speed through the filter should be less than 2.5m/sec.

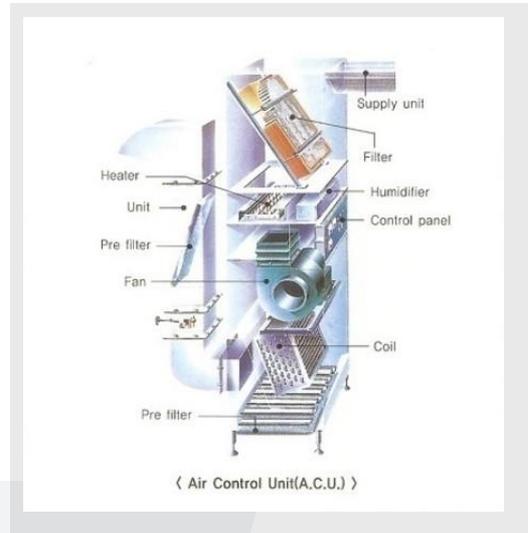
- The damper and inspection doors are Airtight-type, and the material of the DRAIN PAN uses STS 304 (1.5T).

\* Installation Examples : HD AMC, KH MC, KU Carrefour, HD HI, KCC, KPE etc.

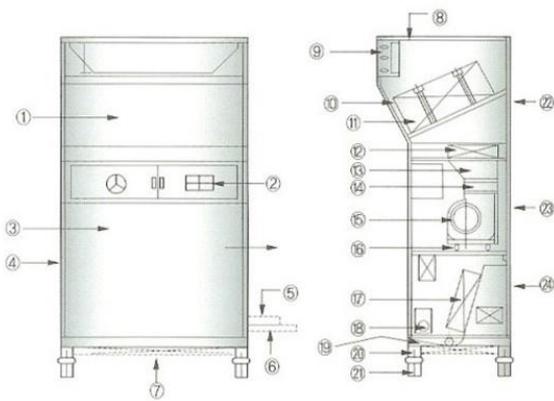


## Air Control Unit (ACU)

ACU Cleanroom System can guarantee Class 10,000 without gratings on the floor, ACU provides constant, very stabilized air flow by the line types supply duct installed on the ceiling.



**ACU's feature – Temperature & Humidity can be automatically adjusted in Cleanroom.**



NO	Particulars	Mat's	Q.TY	Description	NO	Particulars	Mat'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-filler		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	220×315×702	24	Panel		1	1.2t
12	Heater	SBC	1			Back(Bottom)			
13	Hopper	SBC	1	1.2t		Panel			

### ■ Specification

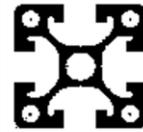
Model No.		TLCU-30	TLCU-50	TLCU-75
Air volume,	CMM	30	50	75
Fan size	#×EA	1½(S.S)×2	1½(S.S)×2	1½(D.S)×2
Fan motor	KW	0.75	1.5	2.2
Cooling cap.	kcal/h	8,400	14,300	21,500
Heating cap.	kcal/h	6,400	10,750	15,480
Elec. Heater	kw×Step	1.85×4	3.2×4	4.5×4
Humidifier cap.	kg/h	2.4	3.6	4.8
Pan type	KW	2	3	4
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		

■ NOTE : 냉방시 냉수, 난방시 온수 사용이 가능함.

- NOTE : Chilled Water and Hot Water Available

# Products

## Mini-Environment System (Clean Booth)



Al Profile



\* Option : Aluminum or Steel (Powder Coating)



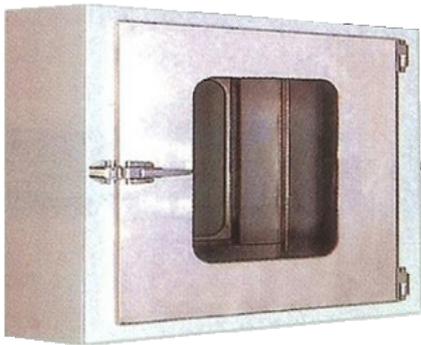
C Factory's Clean booth  
(Steel + Anti-Static Vinyl Wall)



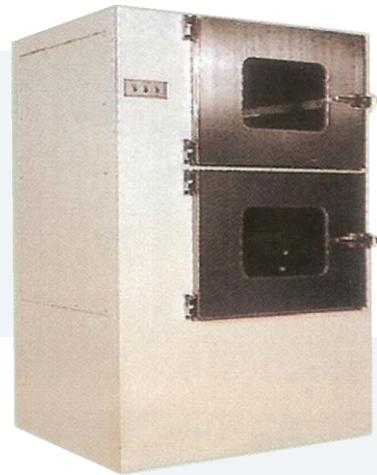
H Factory's Clean booth  
(Al Profile + Anti-Static Poly-carbonate Wall)

## Air Shower

The air shower removes dust from garments of workers entering the cleanroom.  
And it removes particles on the surface fast and powerfully.



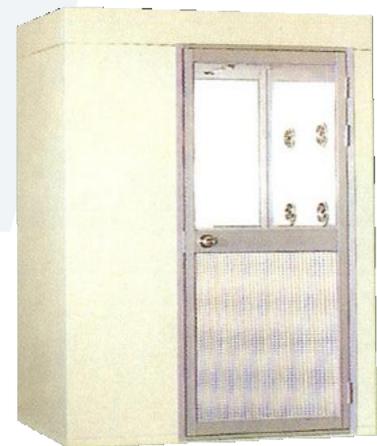
Pass Box (Mechanical)



Pass Box (Showering)



Air Shower (Automatic)

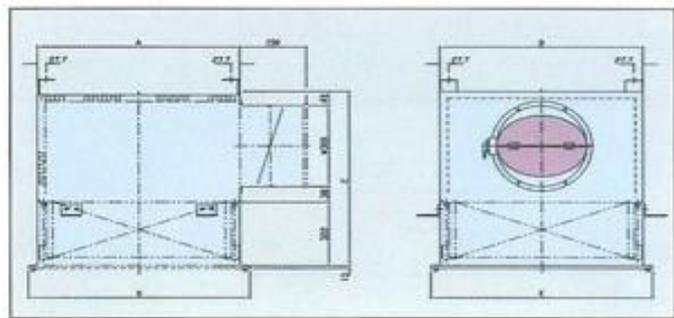


Air Shower (Manual)

# Products

## HEPA Filter Unit (HFU)

This unit is a basic equipment for cleanroom requiring turbulent Air-flow. HEPA filter is installed 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 P.A.O @99.97%			
NUMBER OF FILTER	1	1	1	2
DAMPER	STEEL or SUS 304			
SIZE OF DAMPER	ø300x1	ø300x1	ø300x1	ø300x2

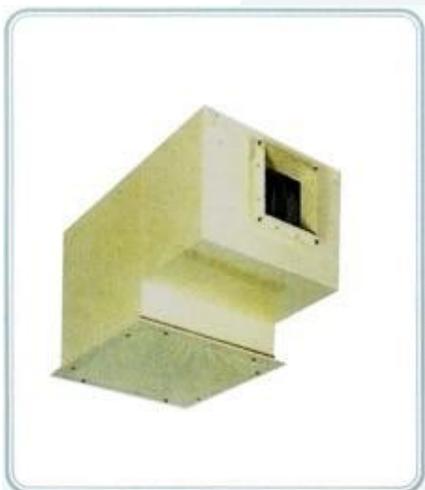
\* Option : Stainless HEPA BOX for P.A.O Test

## Blower Filter Unit (BFU)

Blower Filter Unit is similar with FFU (Fan Filter Unit).

Blower Filter Unit utilizes a fan which produce low noise and low vibration.

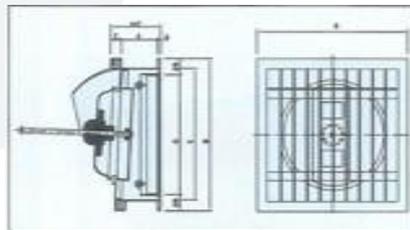
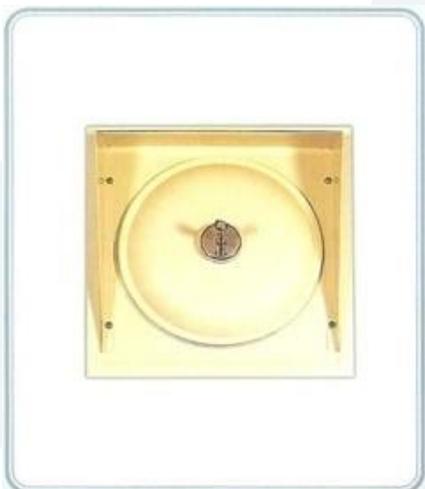
All unit are available for duct connection type.



TYPE	TLBFU-A
FILTERING EFFICIENCY	0.3 $\mu$ m P.A.O @99.9%
FILTER	HEPA FILTER
AIR VOLUME	30 CMM
BODY	OVEN BACKED MELAMINE COATED
POWER	1 $\phi$ 220V or 3 $\phi$ 380V
POWER CONSUMPTION	0.35~0.67kw
WEIGHT	50 ~ 60 KG

## Relief Damper

This unit keeps the inside pressure higher than the outside pressure to protect the cleanroom from contamination from 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)						

TYPE	WALL OPEN SIZE		WALL THICKNESS
	ø 190	ø 250	
1연식 (표준)	255Hx255W	312Hx312W	40~70mm조절

# Cleanroom Design Conditions

## 1. Cleanroom Conditions (Each Room)

Space & Height : Consider Ceiling Height for Maintenance

Temperature, Humidity : Precision Deviation

Cleanliness(CLASS) : Particle Criteria (0.5 $\mu$ m or 0.3 $\mu$ m)

Production Equipment Matrix (Electrical Specification, Exhaust Demands, Heating Load, Utility etc.)

Flow Plan : Flow of Human & Product

Comprehensive Review of Electricity Usage (Production, Air-conditioning, Utility, Office etc.)

Identification of heat sources for air conditioning (Cooling & Heating)

Future Extension or Air-conditioning Area Separation

## 2. Cleanroom System

Laminar Flow : Class 1 ~ Class 100 → Apply FFU, System Ceiling & Access Floor

Turbulent Flow : Class 1,000 ~ Class 10,000 → Apply HEPA Filter Unit or BFU

Semi-Cleanroom : Class 10,000 ~ Class 100,000 → Apply Air Control Unit & Punching Duct

## 3. Panel & Floor

Panel Type : Styrofoam(EPS), Urethane(PUR), Flame Retardant Urethane(PIR), Composite Panel(SCP)

Panel Type Color : Ivory, White-Gray, Anti-Static Coating(Y or N)

Door Type : Swing, Sliding, Automatic, Steel Fire-Fighting, Speed Door

Floor Type : Epoxy Lining, Conductive Tile, OA Tile, Access Floor

Floor Type Color : Can be specified later

Window Type : Location & Quantity

## 4. HVAC

Exhaust : POU (Point of Use) Duct Size, Quantity, Type ← Important

Production Equipment Heat or Electric Consumption ← Important

Utilities Consumption List(Matrix) for Each Equipment ← Important

Simultaneous Usage Rate & Peak Load ← Important

Energy Source : Electricity, Gas, Boiler, Chiller(Water or Air)

## 5. Clean Equipments

1. Air Shower : Location, Capacity, Automatic Door (Y or N)
  2. Pass Box : Location, Capacity, Showering (Y or N), Automatic Door (Y or N)
  3. Clean Locker : Capacity, Showering (Y or N)
  4. Hand Washer, Worktable
  5. Clean Bench, Clean Booth : Capacity, Size, Method
- 

## 6. Utilities

1. Exhaust & Processing Method :
    - Acid & Alkali → Wet Scrubber (PVC or FRP Duct)
    - Organic → AC Tower or RTO (STS Duct)
    - Heat & General Exhaust → Fan, Dust → Bag Filter, Cyclone Dust Collector
  2. CDA(Clean Dry Air) : Capacity, Oil Free (Y or N), Dew Point, Pipe Material, No. of POU's
  3. DI(Ultra Pure Water) : Capacity, Resistivity, Pipe Material, No. of POU's
  4. GAS(N<sub>2</sub>, Ar, He) : Capacity, Resistivity, Pipe Material, No. of POU's
  5. Drain & City Water : Capacity, Pipe Material, No. of POU's, Tanks
  6. PCW(Process Cooling Water) : Capacity, Temperature, Pipe Material, No. of POU's
  7. VACCUM(Process Vacuum, House Vacuum) : Capacity, Pipe Material, No. of POU's
- 

## 7. Electric & Automatic Control

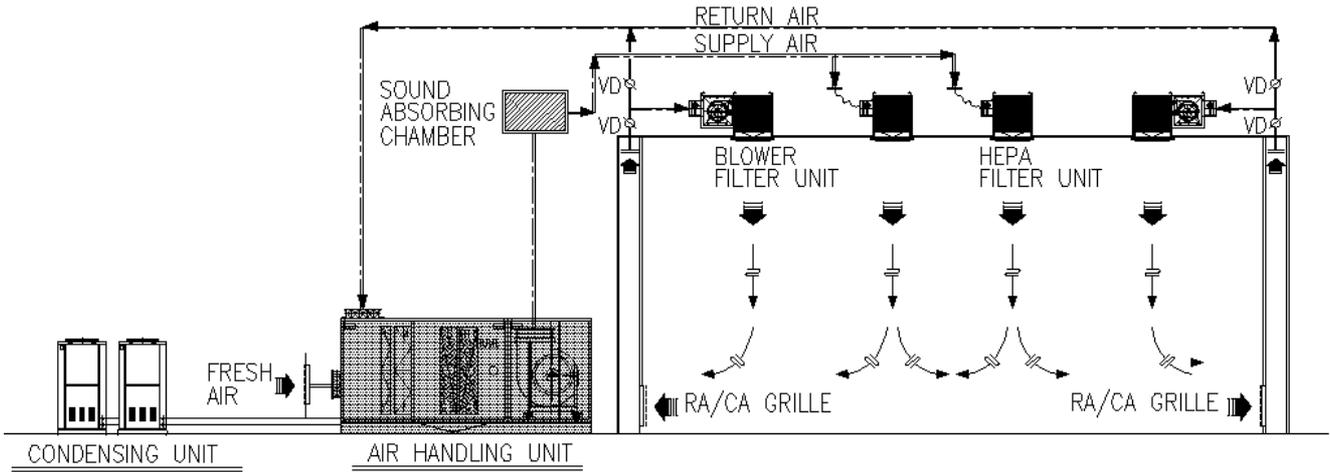
1. Power : 3PH 380V/220V, 1PH 220V (Transformer?)
  2. Total Power : Cleanroom (HVAC & Utilities), Production
  3. Lighting Type : Fluorescent, Tear Drop Lighting, LED, Metal light
  4. Automatic Control : DDC, PLC, MICOM
  5. Control Level : CMS, Remote Control
  6. Main Power Capacity (Expansion or New Installation)
- 

## 8. Others

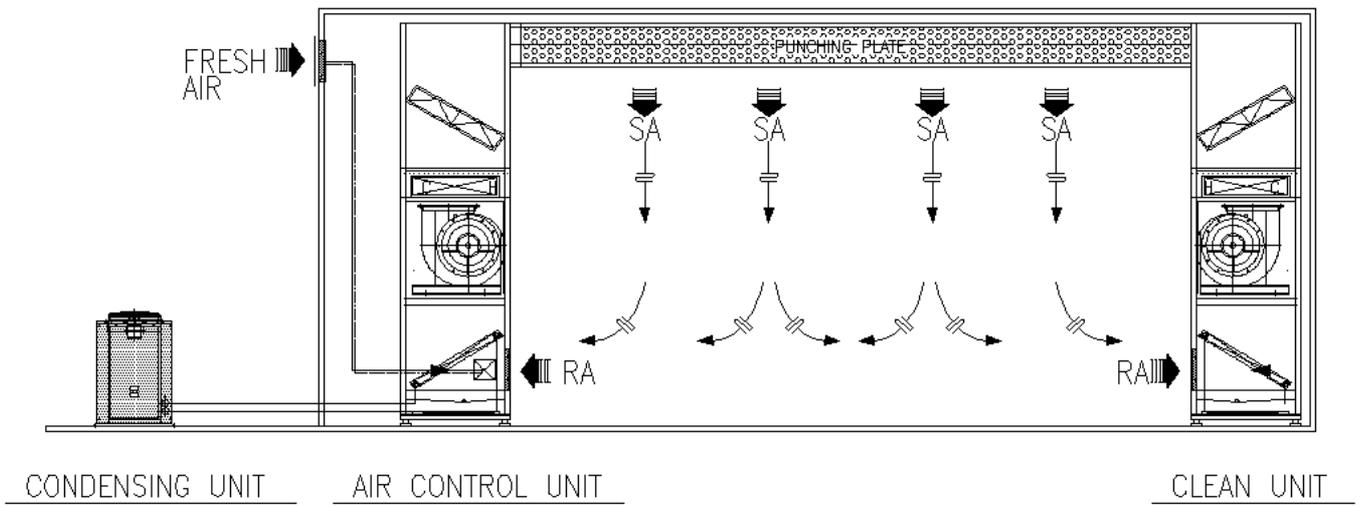
1. Fire Protection Scope : Detector, Sprinkler, Hydrant Alarm
2. Machine Room : Location, Space, Noise & Vibration, Load
3. Hook-up : Piping & Electric (normally out of contract)
4. Permission : Environment (Water & Air), High Pressure Gas
5. Bio-Cleanroom : KGMP, CGMP, HACCP Validation

# Reference Data

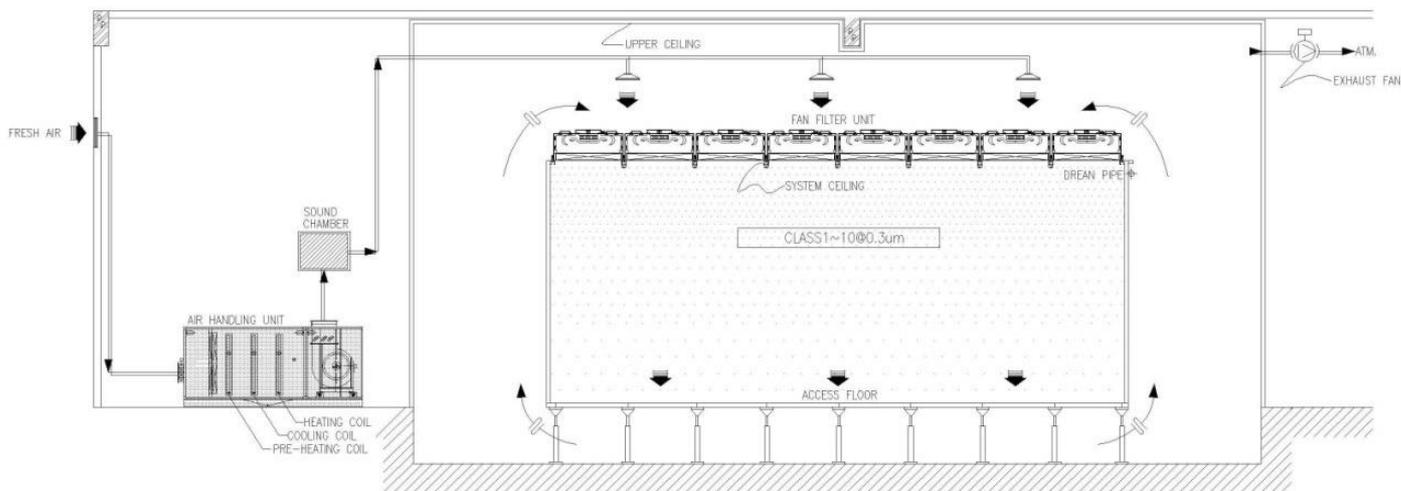
<Sample 1> General Cleanroom that BFU and HFU are mixed (Class 1,000 ~ 10,000)



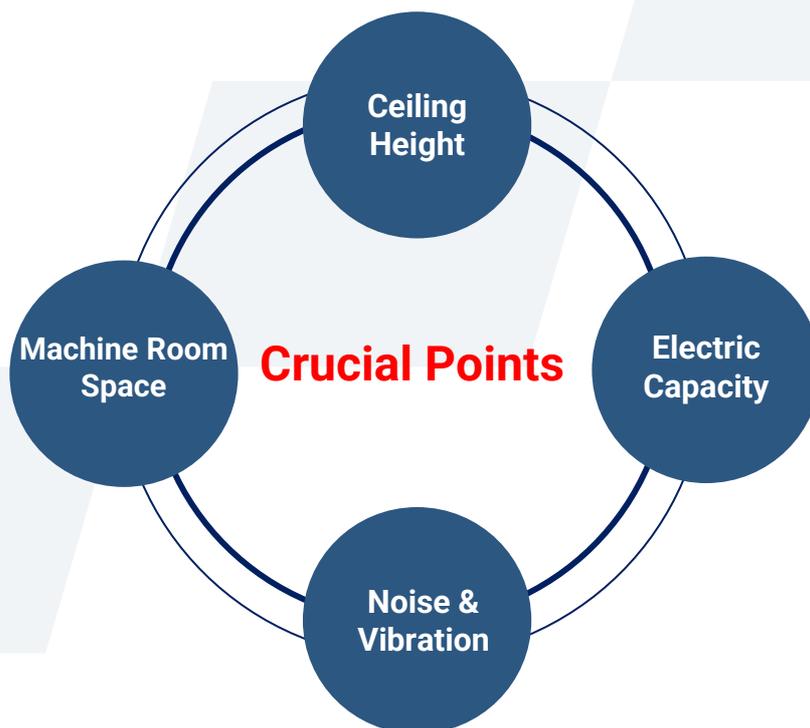
<Sample 2> Semi Cleanroom that ACU and CU are mixed (Class 10,000 ~ 100,000)



<Sample3> Super Cleanroom that FFU and Access Floor are used (Class 1 ~ 100)

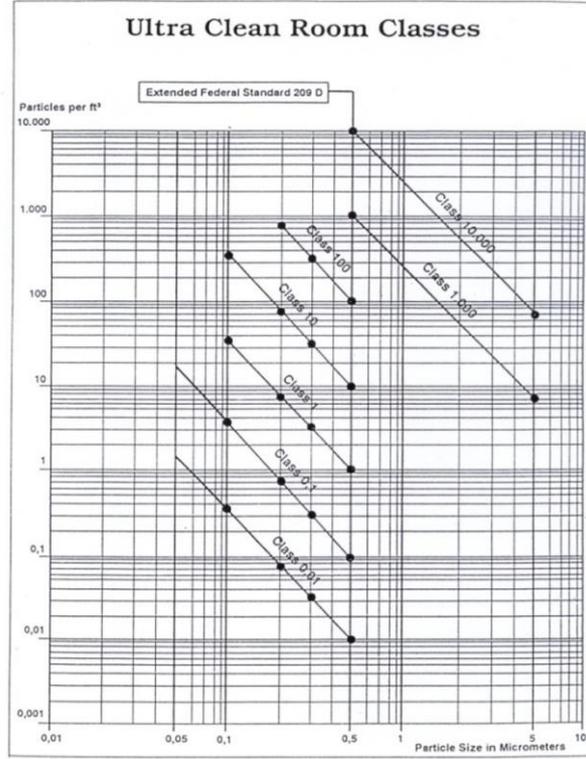


\* Precautions for Cleanroom Construction



# Reference Data

## - Cleanroom Cleanliness



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

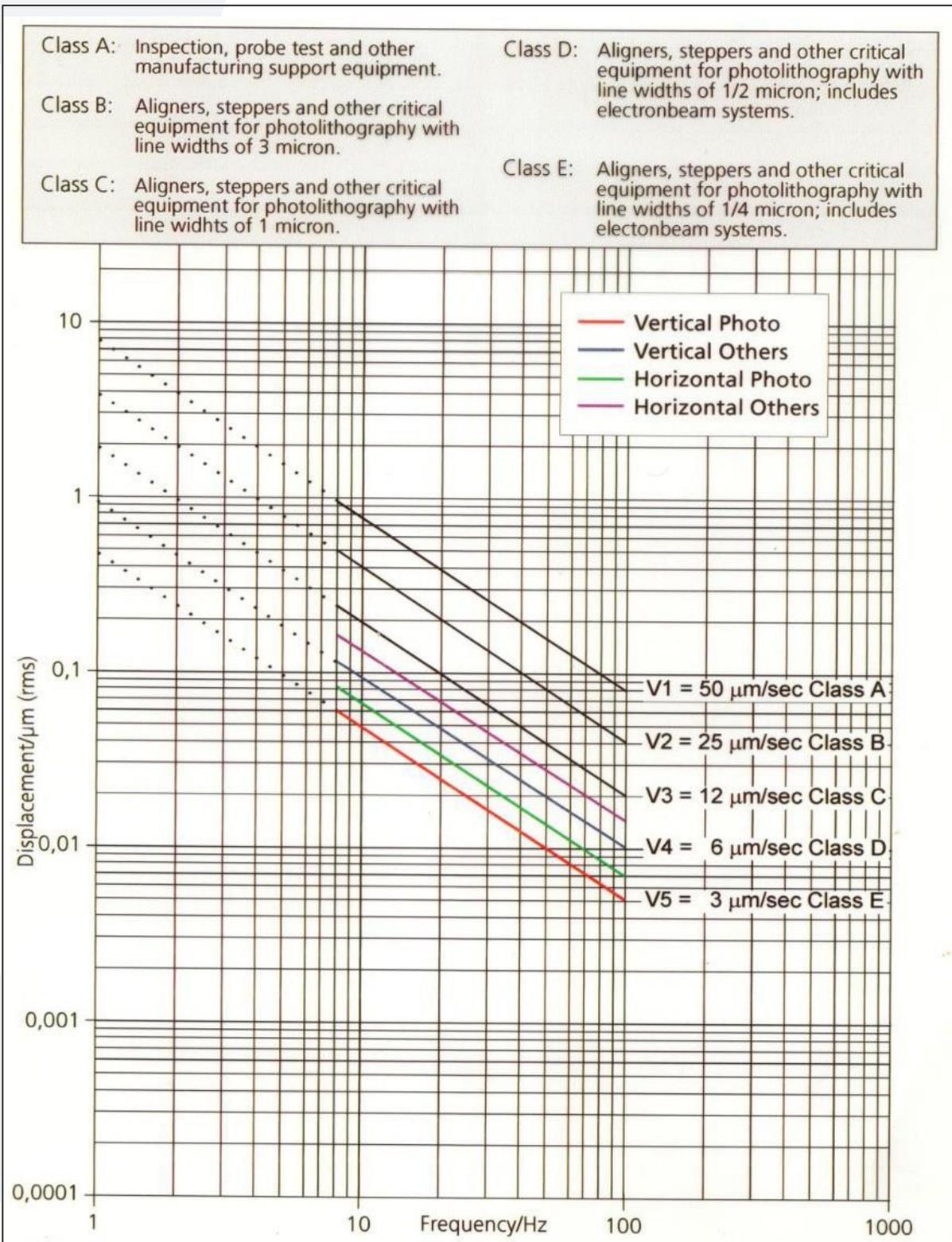
ISO CLASS (N)	0.1 μm	0.2 μm	0.3 μm	0.5 μm	1.0 μm	5.0 μm
ISO CLASS 1	10	2				
ISO CLASS 2	100	24	10	4		
ISO CLASS 3	1,000	237	102	35	8	
ISO CLASS 4	10,000	2,370	1,020	352	83	
ISO CLASS 5	100,000	23,700	10,200	3,520	832	29
ISO CLASS 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO CLASS 7				352,000	83,200	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

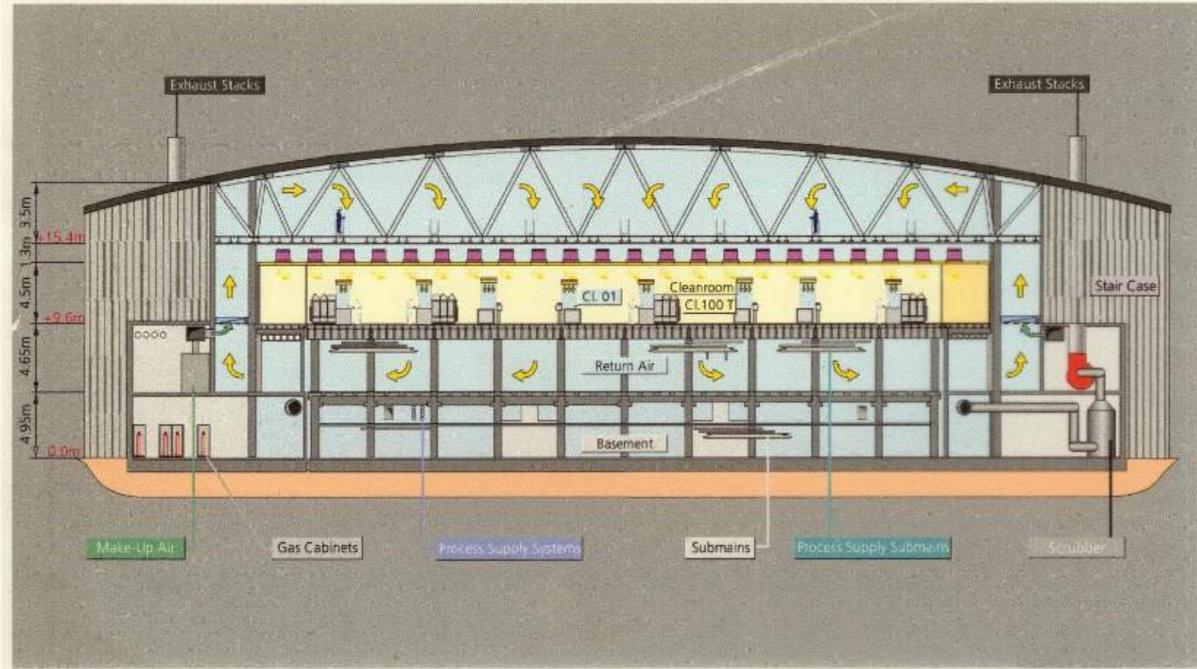
- Vibration Criteria



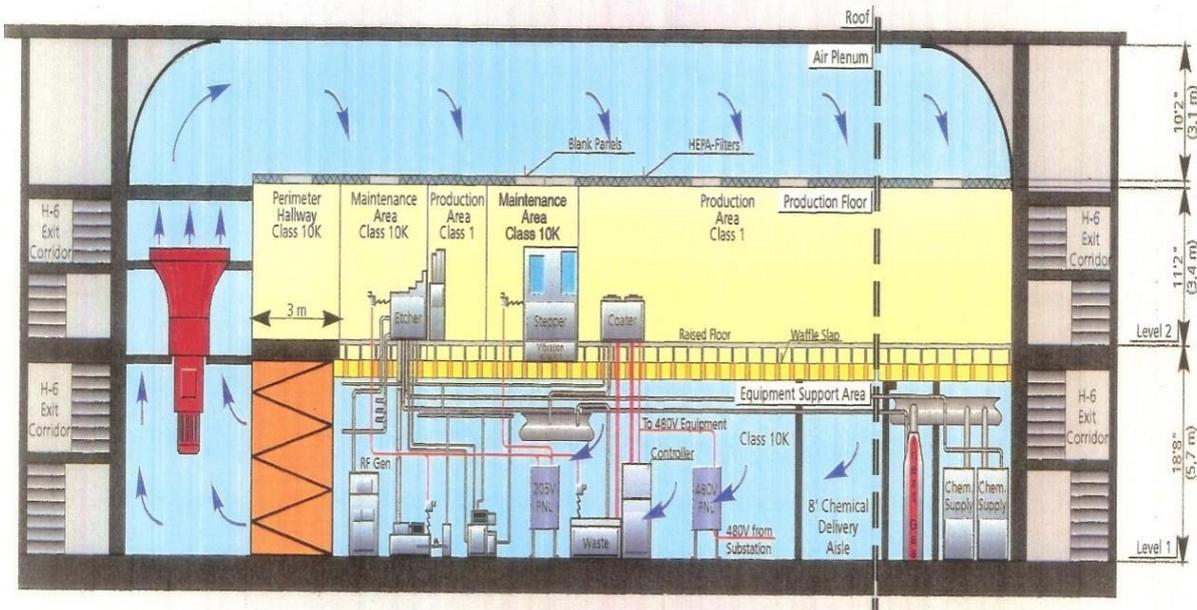
# Reference Data

- Applied in Mammoth FAB like Samsung Electronics / SK Hynix

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



## - 2-Level Fab-Typical Cross-Section (Apply Tower Fan)



## Philippine Joint Venture Company

- Philippine Corporate Name : C&T (Clean Air Tech & TL Engineering)

(PCAB)

**REGULAR CONTRACTOR'S LICENSE**

**FORM NUMBER: 71797** Contracting Fiscal Year (CFY): 2022/2023

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 annexed at the back hereof.

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 **June 17, 2022**

**NOT REGISTERED FOR GOVERNMENT PROJECTS**

**IMPORTANT NOTICE:** Filing schedule for license renewal application - on or before **April 0-15, 2023**



Semiconductor



Premium Bicycle



Semiconductor



Solar Panels



Fuses & Elec. Components



Semiconductor



Semiconductor Packaging



Pharmaceutical

