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第15回シックハウス(室内空気汚染)問題に関する検討会

中央合同庁舎第5号館6階 共用第8会議室

# シックハウス症候群患者の曝露評価 日韓台室内環境基準値・指針値

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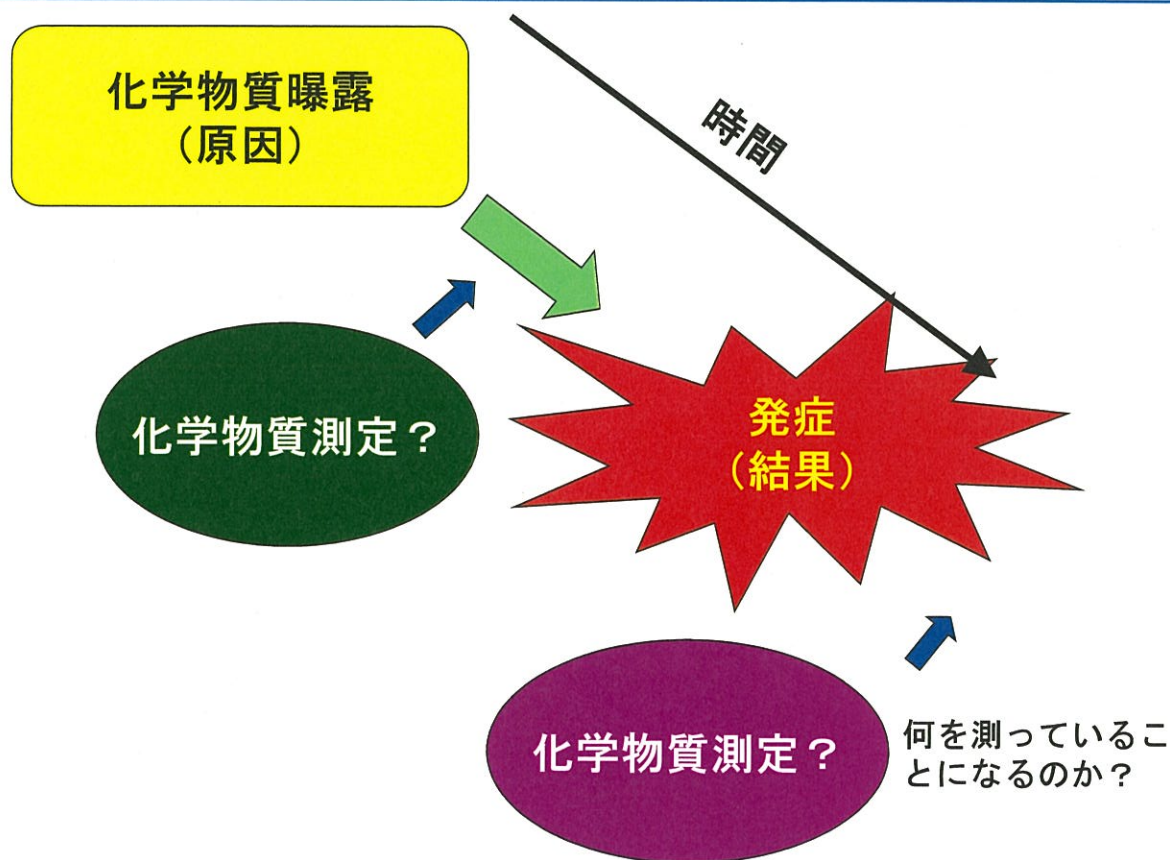
## シックハウス症候群患者の曝露評価

## 曝露量（濃度？）の把握

化学物質過敏症、シックハウス症候群あるいはその他の健康被害にせよ、現状把握、因果関係の解明、予防的対策の検討のためには、室内環境測定を含む何らかの曝露評価を行う必要がある

では、  
何を、いつ、どこで、どのように測定するか？

cf. ホルムアルデヒド？ VOC？  
自宅、学校、職場？ あるいは屋外？  
慢性曝露？ 急性曝露？

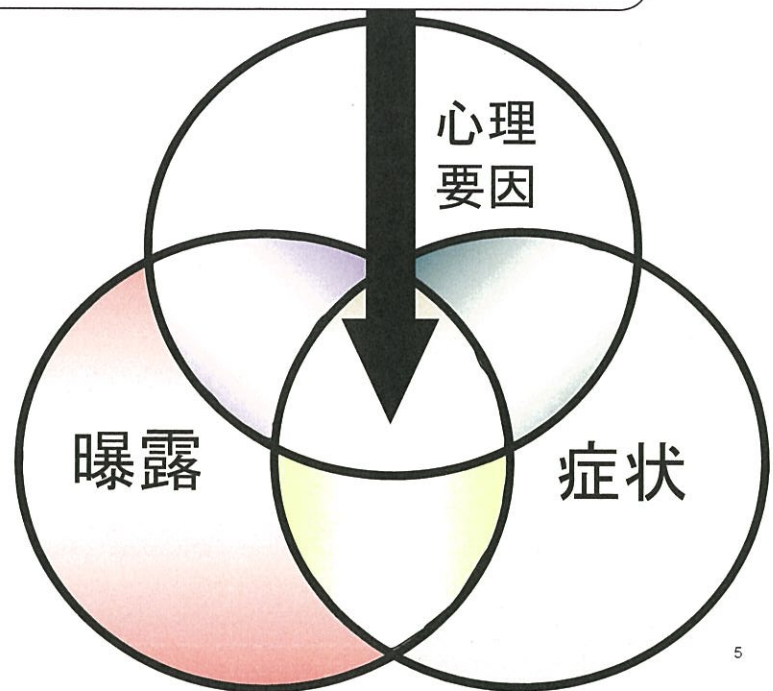


曝露量 症状 長期間調査 治療 心理状態

○ ○ ○ ○ ○

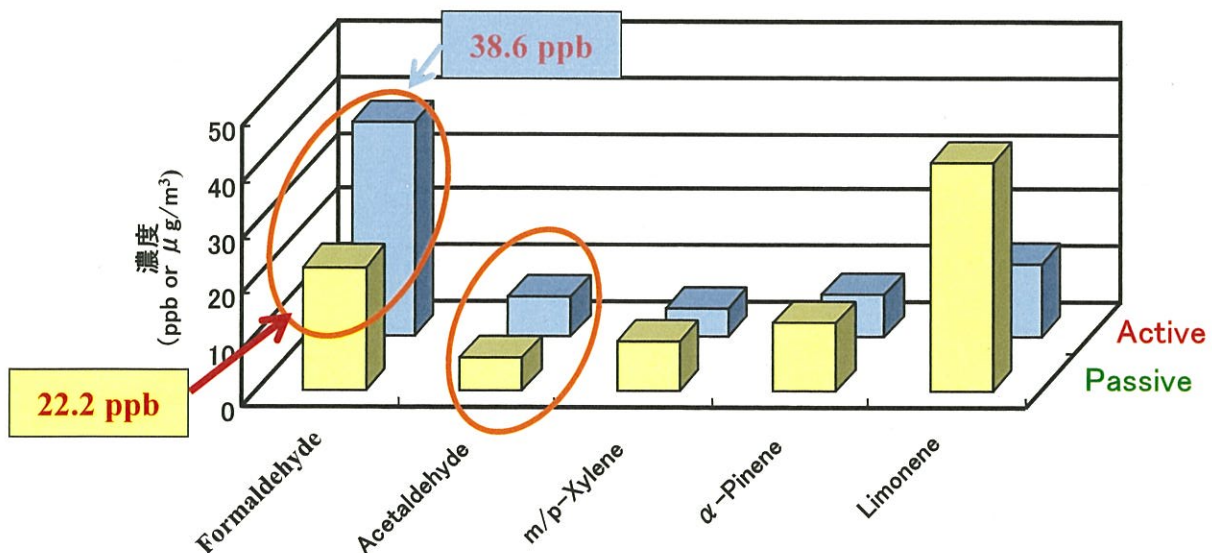
①曝露と症状の軽減の関係を検討

②曝露と症状にどのように心理状態が関係しているのかを検討



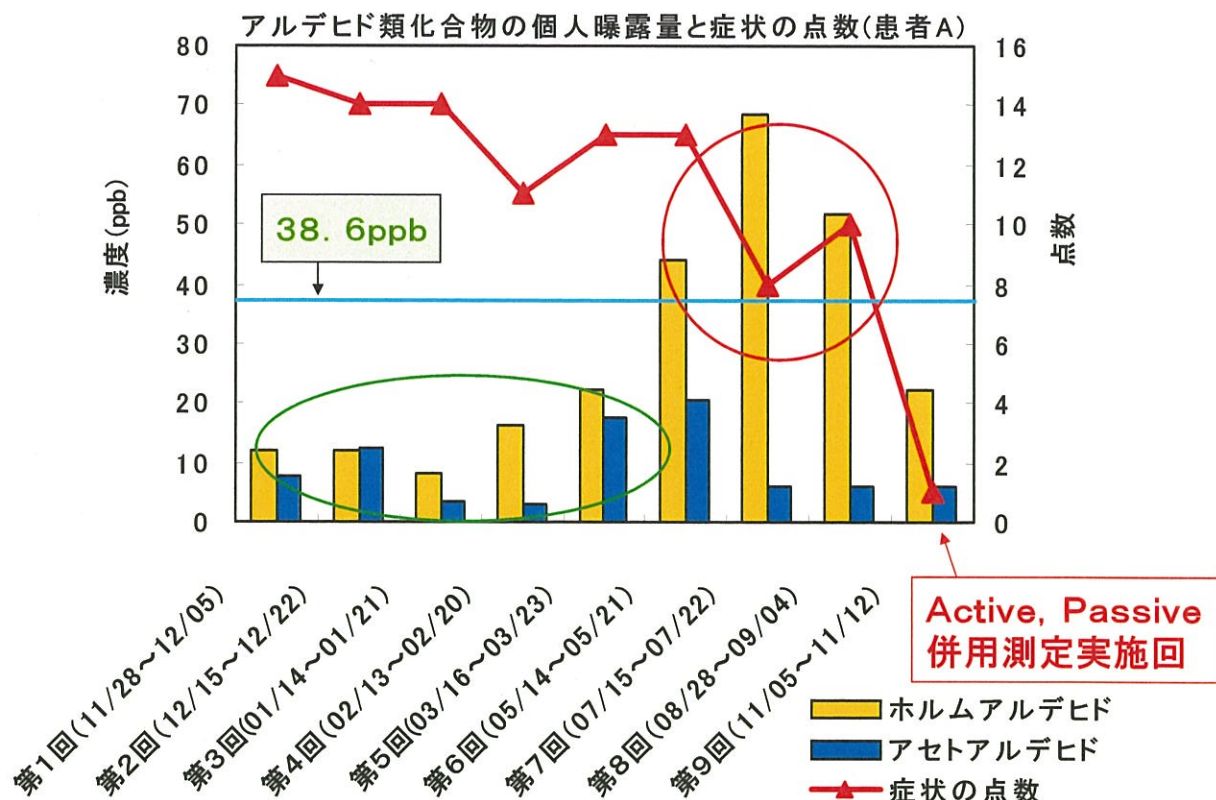
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Active, Passive併用測定結果 (患者A)

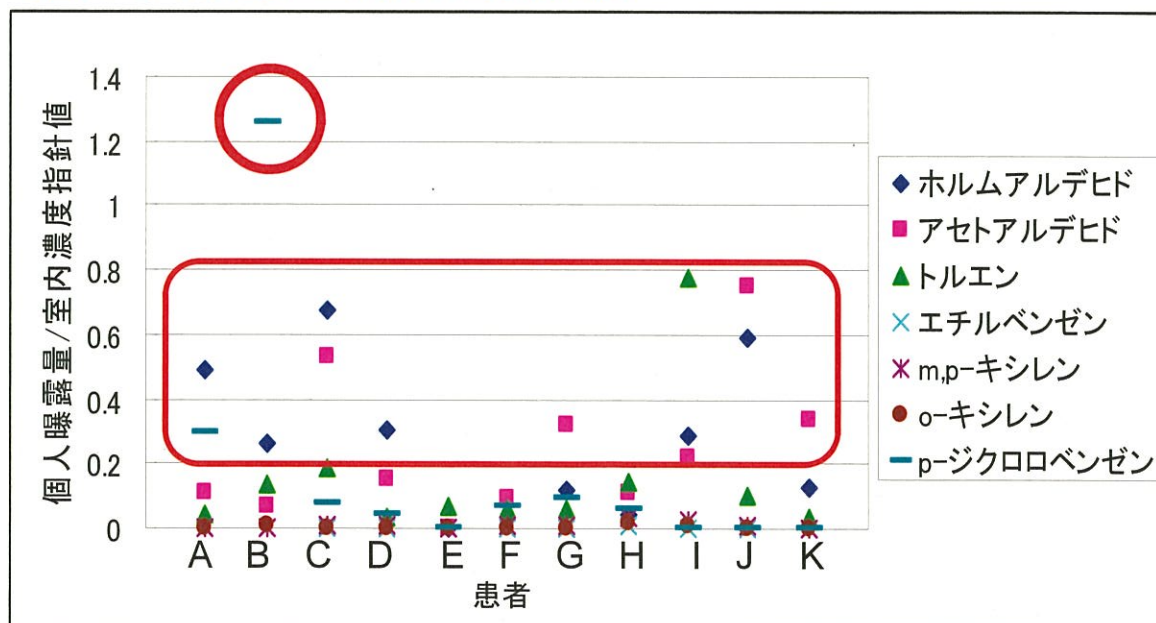


症状出現時にホルムアルデヒド濃度が一時的に上昇している。





## 個人曝露量測定結果



個人曝露量を室内濃度指標値で除した値(>1:指標値以上)。患者Bのp-ジクロロベンゼン以外全て指標値を下回った。  
室内濃度に関する実態調査結果と比較しても低濃度であった<sup>4)</sup>。

4) 国土交通省、室内空気に関する実態調査(住宅編)、平成15年度概要版。

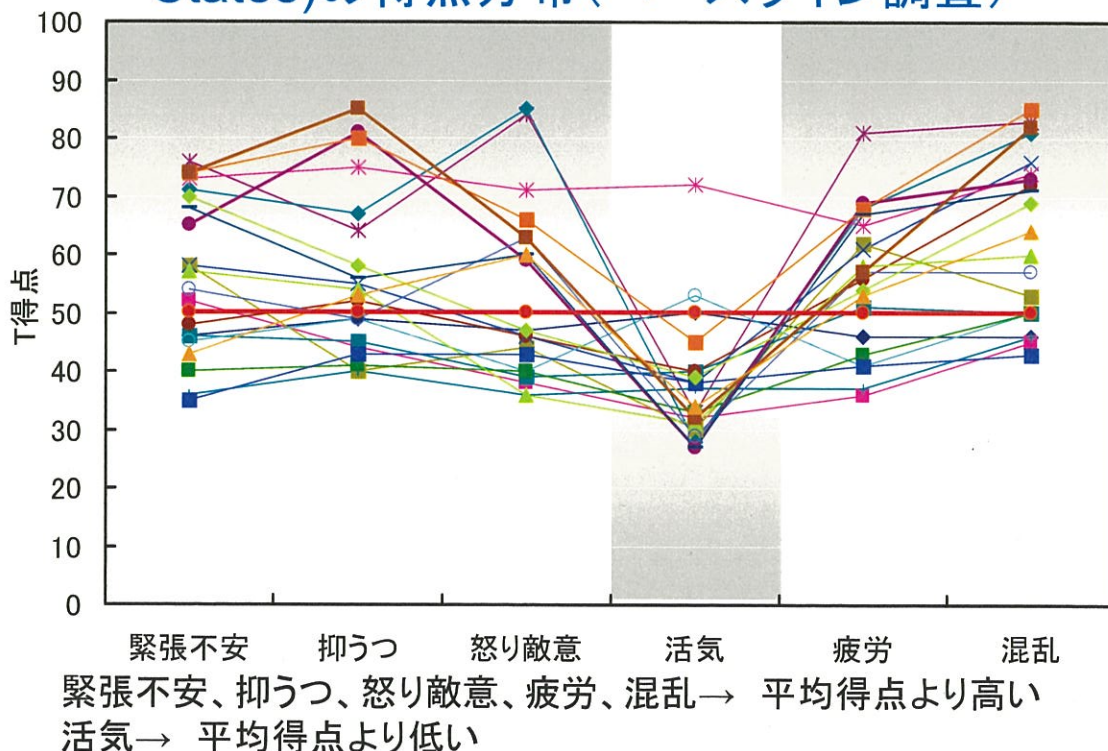
## 曝露量、治療および対策、現在の症状

患者	A	B	C	D	E	F	G	H	I	K
曝露量/指針値	0.13	0.25	0.21	0.08	0.01	0.04	0.09	0.06	0.19	0.07
栄養補給	○	×	○	○	○	○	○	○	○	○
運動など	○	×	×	○	×	×	○	×	×	○
原因物質の排除	○	○	×	○	○	○	○	×	×	○
症状(2005年1月)	↑	↑	→	↑	↑	↑	↑	→	→	↑

化学物質濃度が極端に低くなくても、治療や対策を講じることで、自覚症状の好転は望める。

原因物質を排除できていない患者は自覚症状も好転していない。(患者C,H,Iは原因物質が外気やオフィスであるため除去が難しい)

## 化学物質過敏症の患者のPOMS (Profile of Mood States)の得点分布(ベースライン調査)





## 日韓台室内環境基準値・指針値

### Indoor Air Quality Standards in Taiwan

for any closed or semi-closed space in buildings used by **the public**,  
and **any mass transportation space** that carries passengers

ホルムアルデヒド	100 $\mu\text{g}/\text{m}^3$ (1 hr)
TVOC *	0.56 ppm (1 hr)
落下細菌	1000 CFU/ $\text{m}^3$
カビ	1000 CFU/ $\text{m}^3$
PM <sub>10</sub>	75 $\mu\text{g}/\text{m}^3$ (24 hrs)
PM <sub>2.5</sub>	35 $\mu\text{g}/\text{m}^3$ (24 hrs)
CO <sub>2</sub>	1000 ppm (8 hrs)
CO	9 ppm (8 hrs)
O <sub>3</sub>	0.06 ppm (8 hrs)

TVOC: ベンゼン、トルエン、キシレン、tエチルベンゼン、スチレン、四塩化炭素、クロロホルム、1,2-ジクロロベンゼン、1,4-ジクロロベンゼン、ジクロロメタン、テトラクロロエチレン、トリクロロエチレンの合計濃度

# Comparison of IAQ Act by Ministry (Korea)

Ministry Pollutants	Ministry of Environment "Act on air quality management in underground space"	Ministry of Environment "Act on indoor air quality management in public facilities"	Ministry of Health and Welfare "Act on management for public health"	Ministry Construction and Transportation "Act on management in parking"	Ministry of Labor "Act for industrial health"
PM <sub>10</sub>	150µg/m <sup>3</sup>	100 ~ 200µg/m <sup>3</sup>	150µg/m <sup>3</sup>	—	150µg/m <sup>3</sup>
CO	25ppm	10 ~ 25ppm	25ppm	50ppm	10ppm
CO <sub>2</sub>	1000ppm	1000ppm	1000ppm	—	1000ppm
SO <sub>2</sub>	0.25ppm	—	—	—	—
NO <sub>2</sub>	0.15ppm	0.05 ~ 0.3ppm	—	—	—
HCHO	0.1ppm	120µg/m <sup>3</sup>	—	—	0.1ppm
Pb	3µg/m <sup>3</sup>	—	—	—	—
Total suspended bacteria	—	800CFU/m <sup>3</sup>	—	—	—
Radon	—	4pCi/l	—	—	—
VOC <sub>s</sub>	—	400 ~ 1000µg/m <sup>3</sup>	—	—	—
Asbestos	—	0.01/cc	—	—	—
O <sub>3</sub>	—	0.06 ~ 0.08ppm	—	—	—

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## Standards for Indoor Pollutants in Public Facilities (Korea)

Public Facilities		Underground stations /shopping malls, bus terminals, railway stations, etc.	Medical centers, Childcare centers, Nursing homes, maternity recuperation centers, etc.	Indoor parking areas
Pollutants				
Control Standards	PM <sub>10</sub> (µg/m <sup>3</sup> )	150 or less	100 or less	200 or less
	CO <sub>2</sub> (ppm)	1,000 or less		
	Formaldehyde (µg/m <sup>3</sup> )	120 or less		
	Airborne Bacteria (CFU/m <sup>3</sup> )	—	800 or less	—
	CO (ppm)	10 or less		25 or less
Recomm- ended Standards	NO <sub>2</sub> (ppm)	0.05 or less		0.30 or less
	Rn (pCi/L)	4.0 or less		
	VOC (µg/m <sup>3</sup> )	500 or less	400 or less	1,000 or less
	Asbestos (unit/cc)	0.01 or less		
	Ozone (ppm)	0.06 or less		0.08 or less

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## IAQ Management for New Collective Housing (Korea)

### New Collective Housing

- **New Collective Housing : Apartments, row houses and dormitories of more than 100 households**  
- Apply to approved construction or business since May 20, 2004
- **Constructor's obligation to measure and report IAQ**  
- Recommended standards for 6 Pollutants including formaldehyde and 5 VOCs.
- **Restriction on the use of pollutant-releasing construction materials**
- **Installation of air ventilators in new collective housing (including remodeled houses)**

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### (1) Constructor's obligation to measure and report indoor air quality



**Apartments, row houses and dormitories of more than 100 households**



**6 Pollutants including formaldehyde and VOCs**

**Measure, announce and report indoor air quality**

- Announce : on Bulletin board or anywhere easily noticeable for **60 days starting from 3 days before tenants move in**

- Report to mayor or heads of counties and districts



**Anyone not measuring / reporting or falsely reporting**

(fine of under 5 million won)

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## (2) Recommended standards for IAQ in new collective housing

- To provide basis for **assessing the appropriateness of indoor air quality** measured / reported by the constructor and encourage voluntary use of environment-friendly construction materials

※ '05.5.31 Laid the foundation for setting recommended standards in the Act

※ '05.12.30 Established recommended standards in enforcement regulations of the Act

Pollutants	Concentration ( $\mu\text{g}/\text{m}^3$ )	Pollutants	Concentration ( $\mu\text{g}/\text{m}^3$ )
Formaldehyde	<b>210 or less</b>	Ethylbenzene	<b>360 or less</b>
Benzene	<b>30 or less</b>	Xylene	<b>700 or less</b>
Toluene	<b>1,000 or less</b>	Styrene	<b>300 or less</b>

※ Recommended standards for existing housing are set in foreign countries

※ Measured with closed windows for 5 hours after 30 mins of ventilation

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## IAQ Management for pollution sources

### Restriction on the use of pollutant-releasing **construction materials**

- Encourage **use of environment-friendly construction materials** in new construction and renovation
- Restrict use of construction materials exceeding standards of formaldehyde and VOCs release in **public facilities, collective housing, and schools**

Standard for release ( $\text{mg}/\text{m}^2\cdot\text{h}$ )	Adhesives	Materials in general
Formaldehyde	<b>4 or more</b>	<b>1.25 or more</b>
VOCs	<b>10 or more</b>	<b>4 or more</b>

※ Materials in general : construction materials used for the interior of buildings like wallpaper, paint, flooring materials, timber

※ VOCs mean Total Volatile Organic Compounds

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# IAQ Management for air ventilator

## Regulations for installing air ventilators

- Based on the “Regulations on building constructions standards” (MOCT)
  - New public facilities, collective housing of more than 100 households (including remodeled houses)
- **Collective housing : natural or mechanical ventilation of 0.7 time or more per hour**
  - ※ 0.5 ~ 1.0 time/hr of ventilation in houses in other countries
- **Public facilities : mechanical ventilation**

Facilities	Necessary Ventilation (m <sup>3</sup> /person·hr)
Underground facilities	Stations : 25 or more, shopping malls : 36 or more
Cultural gathering, business areas	Museums, galleries, large stores, terminals : 29 or more
Medical, educational, welfare centers	Hospitals, funeral home, libraries, childcare centers : 36 or more
Indoor parking lots	Parking areas : 27 or more, Saunas, maternity recuperation centers : 25 or more

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## Standards/Guidelines of IAQ (for Houses)

	JAPAN Guideline (μg/m <sup>3</sup> )	KOREA Recommended Standard (μg/m <sup>3</sup> )
Where to apply	All indoor space	Newly collective housing
Formaldehyde	100	210
Toluene	260	1,000
Xylene	870	700
p-Dichlorobenzene	240	
Ethylbenzene	3800	360
Styrene	220	300
Chlorpyrifos	1 (0.1 for children)	
Di-n-butyl Phthalate	220	
Tetradecene	330	
Di-2-ethylhexyl Phthalate	120	
Diazinon	0.29	
Acetaldehyde	48	
Fenobcarb	33	
TVOC	400 (Provisional)	
Benzene		30



# Standards of IAQ for Public facility

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	JAPAN	KOREA	TAIWAN
Where to apply	School and the building with the total floor space is 8,000m <sup>2</sup> or more	Public facilities (17 types) Control and recommended standards	Any closed or semi-closed space in buildings used by the public, and any mass transportation space that carries passengers
Formaldehyde	100 µg/m <sup>3</sup>	120 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>
Toluene	260 µg/m <sup>3</sup>		
Xylene	870 µg/m <sup>3</sup>		
p-Dichlorobenzene	240 µg/m <sup>3</sup>		
Ethylbenzene	3800 µg/m <sup>3</sup>		
Styrene	220 µg/m <sup>3</sup>		
TVOC		400-1000 µg/m <sup>3</sup>	0.56 ppm
Dust Mite /Dust Mite Allergen	Number of dust mite ≤ 100		
Falling Bacterium	≤ 10 Colonies/Classroom		1000 CFU/m <sup>3</sup>
Fungi			1000 CFU/m <sup>3</sup>
Total suspended bacteria		800 CFU/m <sup>2</sup>	
SPM	0.15 mg/m <sup>3</sup>		
PM <sub>10</sub>		100-200 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>
PM <sub>2.5</sub>			35 µg/m <sup>3</sup>
CO <sub>2</sub>	1000 ppm	1000 ppm	1000 ppm
CO	10 ppm	10-25 ppm	9 ppm
NO <sub>2</sub>		0.05-0.3 ppm	
Radon		4 pCi/L	
Asbestos		0.01 /cc	
O <sub>3</sub>		0.06-0.08 ppm	0.06 ppm