

WORKING ENVIRONMENT

1) Heat : ACGIH

*Permissible Heat Exposure Threshold Limit Values
(Values are given in °C WBGT)*

Work-Rest Regimen	WBGT (°C)			
	Light	Moderate	Heavy	Very Heavy
Continuous work	29.5	27.5	26.0	-
75% Work--25% Rest, Each hour	30.5	28.5	27.5	-
50% Work--50% Rest, Each hour	31.5	29.5	28.5	27.5
25% Work--75% Rest, Each hour	32.5	31.0	30.0	29.5

Remark : WBGT : Wet Bulb Globe Temperature Index

Source : ACGIH (American Conference of the Governmental Industrial Hygienists), 2000.

2) Heat : Occupational Health and Safety Measures in Working Environment for Factory Enterprise

Work Load	Heat Level Standard Average WBGT (°C)
Light work load	34.0
Moderate work load	32.0
Heavy work load	30.0

Sources : Notification of the Ministry of Industry regarding Working Environment, Occupation Health and Safety Measurements issued under Factory Act B.E.2535 (1992), and published in the Royal Government Gazette, Vol.120, Special Part 138D dated December 3, B.E.2546 (2003).

: Notification of the Ministry of Labour B.E.2549 (2006) dated February 16, B.E.2549 (2006), and published in the Royal Government Gazette, Vol.123 Part 23A dated March 6, B.E.2549 (2006).

3) Standard of Sound Pressure Level during Working in each Day*

Working Time of Noise Exposure (hour)	Average Sound Pressure Level (TWA) Not Exceeding (dB(A))
12	87
8	90
7	91
6	92
5	93
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less than	115

Remark : *1. Working time exposing to noise and the average sound pressure level during working time (TWA) were specified as the standard shown in the above table. If no standard is available, the standard is determined by the following equation:

$$T = \frac{8}{2^{(L-90)/5}}$$

Where T means working time of noise exposure (hour)

L means sound pressure level (dB(A))

In case, the average sound pressure level during working time (TWA) determined from the equation has decimal values, the decimal values shall be cut out.

2. During working time of a day, any peak value of sound pressure levels used for calculating the average value (TWA) shall not exceed 140 dB(A).

Sources : Notification of the Ministry of Labour B.E.2549 (2006) dated February 16, B.E.2549 (2006), and published in the Royal Government Gazette, Vol.123, Part 23A dated March 6, B.E.2549 (2006).
 : Notification of the Ministry of Industry regarding Working Environment, Occupation Health and Safety Measurements issued under Factory Act B.E.2535 (1992), and published in the Royal Government Gazette, Vol.120, Special Part 138D dated December 3, B.E.2546 (2003).

4) **Lighting : Occupational Health and Safety Measures in Working Environment for Factory Enterprises**

- Direct light and reflecting light exposure to workers' eyes during working shall be prevented.
- Light intensity shall be sufficiently provided for working according to the following criteria:

Area	Lighting Intensity (Lux) not less than
1. Road and walk-ways outside of building.	20 Lux or 2 Foot Candle
2. Walk-ways inside building, verandah, stairs, waiting rooms, nursing rooms, storerooms without movement.	50
3. Area of indelicate work, such as rice-mill area, cotton unravel area, or primary step of industrial process, storage transfer area, guard house, lifts, cloth change rooms, storage area and lavatories.	100
4. Area of less delicate work such as coarse working at tables or machines, pieces of work larger than 750 μm (0.75 mm), eye checking or counting for large size stock, and storage area.	200
5. Area of low degree of delicate work such as taking cloth area, wood working with medium size pieces, bottle or can filling, drilling, boring, glue pasting and book sewing.	300
Working area with work pieces of larger than 125 μm (0.125 mm) such as typing, writing and reading, automobile assemblies, delicate wood working.	400
6. Area of moderate degree of delicate work such as drawing, painting, refined spraying and painting, alphabet proving, final checking in an automobile plant.	600
7. Area of high degree of delicate work, pieces of work from 25 μm (0.025 mm) size, such as equipment calibration, painting, spray painting, decorating special delicate piece of work, dying.	800
8. Area of inspection work, hand sewing, checking and decorating weaving cloth, separating and comparing strong color leather, comparing color for cloth dying.	1,200
9. Area of very high degree of delicate work, such as working with smaller than 25 μm (0.025 mm) tools, repairing light color knitting, checking and decorating weaving pieces, dark color knitting.	1,600
10. Area of extremely delicate work, such as checking special small utensils, cut gems, assembling watches of small sizes, knitting, repairing dark color cloth or socks.	2,400

Source : Notification of the Ministry of Industry regarding Working Environment, Occupation Health and Safety Measurements issued under Factory Act B.E.2535 (1992), which was published in the Royal Government Gazette, Vol.120, Special Part 138D dated December 3, B.E.2546 (2003).

5) *Lighting Intensity Standard in General Area*

Industrial Type	Building/Area	Lighting Intensity (Lux)
General Area of Building	Entrance	
	- Entrance to reception hall or waiting room	200
	- Reception desk	400
	- Main entrance to company	50
	- Guard's box	100
	- Loading and/or unloading	100
	Walking Area	
	- General sidewalk	20
	- Sidewalk of densed crowd	50
	- Stairs	50
	Training Room and Lecture Room	
	- General area	300
	Transportation Building (Airport, Bus terminal and Train station)	
	- Ticket office	400
	Computer Room	
	- General area	400
	Conference Room	
	General Affairs	
	- Copy room	300
	- Safety room	100
	Canteen	
	- General area	200
	- Cashier area	300
	Laundry	
	- Drying area	100
	Kitchen	
	- General area	200
- Cooking area and cleaning area	300	
Living Room		
- Clothes closet and storage area	100	
- Living room	50	
First-aid room		
- Recuperating room	50	
- Diagnosing room	400	
Toilet		
	100	

5) *Lighting Intensity Standard in General Area (Cont'd)*

Industrial Type	Building/Area	Lighting Intensity (Lux)
	<p>Storage Room</p> <ul style="list-style-type: none"> - Storage room for large-size raw materials <li style="padding-left: 20px;">: Storage without transfer <li style="padding-left: 20px;">: Storage for transfer - Storage room for medium-size or fine raw materials <li style="padding-left: 20px;">: Storage without transfer <li style="padding-left: 20px;">: Storage for transfer 	<p style="text-align: right;">50</p> <p style="text-align: right;">100</p> <p style="text-align: right;">100</p> <p style="text-align: right;">200</p>
<p>Food and Beverage Industries</p>	<p>Sugar Factory</p> <ul style="list-style-type: none"> - General area 	<p style="text-align: right;">200</p>
<p>Other Industries</p>	<p>Power Plant</p> <ul style="list-style-type: none"> - General area <p>Boiler Building</p> <ul style="list-style-type: none"> - General area <p>Control Room and Switch Room</p> <ul style="list-style-type: none"> - General area <p>Laboratory Room</p> <ul style="list-style-type: none"> - General area <p>Theatre</p> <ul style="list-style-type: none"> - Ticket box - Movie showroom <p>Power Plant</p> <ul style="list-style-type: none"> - General area <p>Boiler Building</p> <ul style="list-style-type: none"> - General area <p>Control Room and Switch Room</p> <ul style="list-style-type: none"> - General area <p>Laboratory Room</p> <ul style="list-style-type: none"> - General area <p>Theatre</p> <ul style="list-style-type: none"> - Ticket box - Movie showroom 	<p style="text-align: right;">50</p> <p style="text-align: right;">50</p> <p style="text-align: right;">200</p> <p style="text-align: right;">400</p> <p style="text-align: right;">400</p> <p style="text-align: right;">200</p> <p style="text-align: right;">50</p> <p style="text-align: right;">50</p> <p style="text-align: right;">200</p> <p style="text-align: right;">400</p> <p style="text-align: right;">400</p> <p style="text-align: right;">200</p>

6) *Lighting Intensity Standard at the Process Area*

Industrial Type	Building/Area	Lighting Intensity (Lux)
Paper and Printing Industries	Paper Manufacturing Plant	
	- Machinery room	400
	- Paper pressing room	400
	- Raw material preparation and trim room	400
	Printing House	
	Printing Press Room	
- General processing area	400	
- Inspection area	600	
Steel Industries	Steel Manufacturing Plant (rod, plate steel, wire)	
	- Plating and oven area	100
	- Annealing area	200
	- Rolling operation or coarse slicing	200
	- Cold rolling, hot rolling and automatic delicate slicing	300
	- General melting and rolling processing Area	100
	- Plate steel production area, zinc plating and tin plating area	200
	- Motor room area	600
	Steel Manufacturing Plant	
	- General processing area	200
Non-metal Industries	Milling Rocks Factory	
	- Tunnel and belt conveying area, up-down stack way, stone gutter	200
	- Stone crushing area	200
	- Separation area	200
	Glass Manufacturing Plant	
- Mixing area and burner area	200	
Other Industries	Electricity Generating Plant	
	- Boiler, turbine and pump area	200
	- Surrounding area of burner and smoke blower	200
	- Other processing area	200
	- Standard boiler area	
	- Standard control room and switch room	
	Boiler Building	
	- Coal loading and unloading area	50
- Front of boiler area	200	

6) *Lighting Intensity Standard at the Process Area (Cont'd)*

Industrial Type	Building/Area	Lighting Intensity (Lux)
	Petrol Station	
	- Oil injection area	200
	- General service area (checking, car washing, grease)	200
	Fire Station	
	- Instrumentation room	200
	Control Room and Switchboard Room	
	- Control board and switchboard area	400
	- Area behind control board and switchboard	200
	Packaging Room	
	- Packaging, marking and delivery area	200
	- Checking area	200
	Food and Beverage Industries	Sugar Factory
	- Sugar grade selection	600

7) *Lighting Intensity Standard at Work*

Industrial Type	Working Type	Lighting Intensity (Lux)
Paper and Printing Industries	Paper and Paperboard Factory	
	- Grinding	200
	- Inspection and selection	600
	Paper Box and Paper Bag Factory	
	- Corrugation plate, paper box, container and paper bag, enamel and plate processing	200
	- Printing	400
	Publishing	
	- Book cover, puncturing or binding	300
	- Binding or other machining	400
	- Decorating and picture printing	600
	Foundry Type of Printing Industrial	
	- Model making, model decorate and handing cast or precast	300
	- Printing control and selection	600
	Printing House	
Type Composition Room		
- Auto type composition machine	300	

7) *Lighting Intensity Standard at Work (Cont'd)*

Industrial Type	Working Type	Lighting Intensity (Lux)
	<ul style="list-style-type: none"> - Handing type composition - Decorate and print crushing on the printing press - Proofread Make Metal Model with Electric - All page types copy from type composition electric coat or cleaning - Decorate or searching Corrode Model with Photography and Make Metal Model - Corrode, sculpture, make metal model and corrode model with acid - Decorate or searching - Inspection 	<ul style="list-style-type: none"> 600 600 600 300 600 400 600 800
Chemical Industries	<ul style="list-style-type: none"> Chemical Production Plant - Boiling, drying, filtering, crystallizing, bleaching and extracting - Measuring instrument, gauge, valve etc. Painting and Spray painting - Dipping, baking and spraying base color - Scrubbing, spray painting, painting and decorating - Spray painting, painting and delicate decorating - Spray painting, painting or special decorating 	<ul style="list-style-type: none"> 200 100 200 400 600 800
Metal Industries	<ul style="list-style-type: none"> Mechanic Assembly Plant Rough work - Assembling of heavy machinery, large frame and parts, worked and component Medium work - Coloring engine formed and body of the car 	<ul style="list-style-type: none"> 200 400

7) *Lighting Intensity Standard at Work (Cont'd)*

Industrial Type	Working Type	Lighting Intensity (Lux)
	<p>Fine work</p> <ul style="list-style-type: none"> - Small formed, part of radio, apparatus phone or component of engine 	800
	<p>Specially Fine Work</p> <ul style="list-style-type: none"> - Tiny formed or accurate instrument engine (accurate measuring instrument and machine making) 	1,600
	<p>Plane Formed and Repaired Building</p> <ul style="list-style-type: none"> - Drilling, stitch, screwing, aluminium sheet lay out and partitioning wing building, welding, accessory building, final building or checking 	400
	<ul style="list-style-type: none"> - Engine Testing 	600
	<p>Lathing, Drilling, Metal Planing and Modify Building</p> <ul style="list-style-type: none"> - Work on Table and rough machine, counting or part checking in storage room (bigger than 750 micrometer) 	200
	<ul style="list-style-type: none"> - Work on table and medium machine, normal automatic machine, rough cutting or rubbing and medium burnishing (bigger than 125 micrometer) 	400
	<ul style="list-style-type: none"> - Work on table an fine machine medium cutting or rubbing and fine burnish (bigger than 25 micrometer) 	800
	<ul style="list-style-type: none"> - Work on table and extra fine machine, fine cutting or tool making and block uncovering (small than 25 micrometer) 	1,600
	<p>Welding and Fusing</p> <ul style="list-style-type: none"> - Gas, electricity or bass welding 	200
	<ul style="list-style-type: none"> - Point electricity welding and normal fusing 	400
	<ul style="list-style-type: none"> - Point electricity welding and small fusing 	800

7) *Lighting Intensity Standard at Work (Cont'd)*

Industrial Type	Working Type	Lighting Intensity (Lux)
	<p>- Point electricity welding and tiny fusing. Example: electric bulb</p> <p>Car Manufacturing Plant</p> <p>- Generally building process or car frame work 400</p> <p>- Final checking 600</p> <p>- Decorating (vehicle body making and vehicle body forming) 400</p> <p>Work with color use standard of painting and spray painting in chemical industries</p> <p>Upholstering of wood furniture factory used standard of wood furniture in wood industry.</p> <p>Electric Equipment Manufacturing Plant</p> <p>- Infusion and mica production 300</p> <p>- Coil making or normal insulator coating 400</p> <p>- Coil making or insulator coating with fine tool 800</p> <p>Work with metal sheet manufacturing used standard metal sheet manufacturing in steel industries</p> <p>Manufacturing or Sectional Jewel</p> <p>- Cutting jewel, burnishing or jeweled 1,600</p>	
Metal Industries	<p>Steel Manufacturing Plant (rod, sheet steel and wire)</p> <p>- Sheet steel inspection 400</p> <p>Sheet Steel Manufacturing Plant</p> <p>- Work with machine or on table, stamping, cutting off, iron out, welding and rolling 400</p> <p>Forge Industrial Plant</p> <p>- Forging and welding 200</p> <p>Building Steel Industrial Plant</p> <p>- Symbol making 400</p>	
Non-metal Industries	<p>Glass manufacturing</p> <p>- Forming, blowing glass and polishing 200</p> <p>- Grinding, cutting, and size cutting 300</p> <p>- Fine grind, sculping, decorating, angle making and checking 400</p> <p>- Fine checking and decorating 800</p>	
Other Industries	<p>Electricity Generating Plant</p> <p>- General work of turbine building 300</p> <p>- Turbine maintenance 600</p>	

7) *Lighting Intensity Standard at Work (Cont'd)*

Industrial Type	Working Type	Lighting Intensity (Lux)
	- Measuring instrument, gauge, valve etc. (excluding boilers) Work with standard boiler refer to the standard of boiler building. Boiler Building	100
	- Measuring instrument, gauge etc. Gas Station	200
	- Repairing service Laboratory and testing Room	400
	- Universal standard calibration, accurate machine, measuring instrument and testing instrument	800
Office	Computer Room	
	- Data recording	600
	- Data area (Monitor and Printer)	600
	Administration	
	- Typing, writing, reading and documentation	400
	- Working with piece color is closed to background color	600

8) *Standard of Lighting Intensity for One Employee in Working Area*

Working Type	Lighting Intensity (Lux)	Example
Specially extra fine working	2,400 or more	- Tiny checking (Example: tiny tool) - Ornament and clock manufacturing in small process - Sock knitting, dark clothes including dark clothes repairing
Extra fine working	1,600	- Delicate work at the table or machine, for example, instrument and model (of less than 25 micrometer size), measuring and checking of small parts and work being composed of small parts - Repairing of soft color fabric - Checking and decorating goods of component dark color fabric and knitting - Final length measurement
High fine working	1,200	- Checking of hand-tailor manually - Checking and decorating goods of component light color fabric and knitting by hand - Dark color leather grading and comparing - Dyeing comparing

8) Standard of Lighting Intensity for One Employee in Working Area (Cont'd)

Working Type	Lighting Intensity (Lux)	Example
	800	<ul style="list-style-type: none"> - Checking and decorating goods of component light color fabric and knitting by hand - Dark color leather grading and comparing - Dyeing comparing - Fine work on table or machines (25 micrometer size), fine checking (Example: checking, adjusting and correcting scale and precise instruments)
Moderate fine working	600	<ul style="list-style-type: none"> - Drawing or coloring, spray painting and decorating fine color work - Spell checking - Final checking in car manufacturing - Data recording on monitor
Low fine working	400	<ul style="list-style-type: none"> - Moderate working on the table or machines (125 micrometer size) - Routine work in the office, for example, typing, filing or writing - Moderate checking (for example, gauge, telephone) - Car and vehicle body assembling - Fine wood working on the table or the machine - Creating or separating steel structure size - Question or reception work
	300	<ul style="list-style-type: none"> - Writing on the blackboard or reading charts in the study room - Receive or distribute clothes - Moderate wood working on the table or the machine - Filling water into bottles or cans - Glue smearing, drilling and pagemaking for a book - Prepare cooking, cooking, dish washing.
Extra low fine working	200	<ul style="list-style-type: none"> - Coarse work on table or machine (larger than 750 micrometer size), coarse checking by eyes, counting or checking large package in storage room.

9) *Standard of Lighting Intensity (Lux) for One Employee in Working Area Using Specific Sighting in Working*

Area 1	Area 2	Area 3
1,000-2,000	300	200
more than 2,000-5,000	600	300
more than 5,000-10,000	1000	400
more than 10,000	2000	600

Remark : Area 1 means the place where the employee is working by sighting at specific points.
Area 2 means the area next to the working area of one employee in the radius of his arm.
Area 3 means the surrounding area of area 2 where one of the employees is working.

Source : Notification of the Ministry of Labour B.E.2549 (2006) dated February 16, B.E.2549, (2006) and published in the Royal Government Gazette, Vol.123, Part 23A dated March 6, B.E.2549 (2006).